Shirpur Education Society's

R. C. Patel Institute of Technology, Shirpur

(An Autonomous Institute)

Course Structure

First Year B.Tech (All Branches)

with efffect from Year 2023-24

Shahada Road, Near Nimzari Naka, Shirpur, Maharashtra 425405
Ph: 02563 259 802, Web: www.rcpit.ac.in

Semester-I (Group A)

Sr	Course Category	Course Code	Course Title	Teaching Scheme			Evaluation Scheme				Total [A+Average(B,C)+D]	Credit
							Continuous Assessment			ESE		
				L	T	P	TA [A]	Term Test 1 [B]	Term Test 2 [C]	[D]		
1	BS	RCP23FCBS101	Mathematics-I	3			25	15	15	60	100	3
2	BS	RCP23FTBS101	Mathematics-I Tutorial		1		25				25	1
3	ES	RCP23FCES101	Structured Programming using C	2			25	15	15	60	100	2
4	ES	RCP23FLES101	Structured Programming using C Laboratory			2	25			25	50	1
5	BS	RCP23FCBS102	Physics	2			25	15	15	60	100	2
6	BS	RCP23FLBS102	Physics Laboratory & Tutorial		1	2	50				50	2
7	ES	RCP23FCES102	Computational Engineering Mechanics	2			25	15	15	60	100	2
8	ES	RCP23FLES102	Computational Engineering Mechanics Laboratory			2	25				25	1
9	ES	RCP23FCES103	Basic Electrical Engineering & Digital Electronics	2			25	15	15	60	100	2
10	ES	RCP23FLES103	Basic Electrical Engineering & Digital Electronics Laboratory & Tutorial		1	2	50				50	2
11	LL	RCP23FTLL101	Health and Wellness- Mind and Body Management		2		25			25	50	2
			Total	11	5	8	325	75	100	350	750	20

Checked by

Head of the Department
HOD, Applied Science
R. C. Patel Institute of Technology
Shirpur, Dist: Dhule (MS)

COE
Controller of Examination
R.C.Patel Institute of Technology
Shirpur Dist.Dhule 425 405

Dy. Director
Deputy Director
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Semester-I (Group B)												
Sr	Course Category	Course Code	Course Title	Teaching Scheme			Evaluation Scheme				Total [A+Average(B,C)+D]	Credit
							Continuous Assessment			ESE		
				L	T	P	TA [A]	Term Test 1 [B]	Term Test 2 [C]	[D]		
1	BS	RCP23FCBS101	Mathematics-I	3			25	15	15	60	100	3
2	BS	RCP23FTBS101	Mathematics-I Tutorial		1		25				25	1
3	ES	RCP23FCES101	Structured Programming using C	2			25	15	15	60	100	2
4	ES	RCP23FLES101	Structured Programming using C Laboratory			2	25			25	50	1
5	BS	RCP23FCBS103	Chemistry	2			25	15	15	60	100	2
6	BS	RCP23FLBS103	Chemistry Laboratory & Tutorial		1	2	50				50	2
7	ES	RCP23FCES104*	Engineering Graphics	2			25	15	15	60	100	2
8	ES	RCP23FLES104	Engineering Graphics Laboratory			2	25				25	1
9	HM	RCP23FCHS101	Effective Communication Skills	2			25	15	15	60	100	2
10	HM	RCP23FLHS101	Effective Communication Skills Laboratory			2	25				25	1
11	VS	RCP23FLVS101	Workshop Practices			2	25				25	1
12	HS	RCP23FTHS102	Indian Knowledge System		2		25			25	50	2
			Total	11	4	10	325	75	100	350	750	20

* Computer based assessment in college premises only.

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Semester-II (Group A)

Sr	Course Category	Course Code	Course Title	Teaching Scheme			Evaluation Scheme				Total [A+Average(B,C)+D]	Credit
							Continuous Assessment					
				L	T	P	TA [A]	Term Test 1 [B]	Term Test 2 [C]	ESE [D]		
1	BS	RCP23FCBS201	Mathematics-II	3			25	15	15	60	100	3
2	BS	RCP23FTBS201	Mathematics-II Tutorial		1		25				25	1
3	ES	RCP23FCES201	Object orieneted Programming using Java	2			25	15	15	60	100	2
4	ES	RCP23FLES201	Object orieneted Programming using Java Laboratory			2	25			25	50	1
5	PC	RCP23FCPC2CO	Foundation of Computing Technologies	2			25	15	15	60	100	2
		RCP23FCPC2EC	Electrical Networks									
		RCP23FCPC2ME	Elements of Mechanical Engineering									
		RCP23FCPC2CE	Elements of Civil Engineering									
		RCP23FCPC2EE	Electrical Netwroks									
		RCP23FCPC2DS	Fundamentals of Data Analysis									
		RCP23FCPC2AM	Fundamentals of AI & ML									
		RCP23FCPC2IT	Foundation of Information Technology									
		RCP23FCPC2AD	Fundamentals of AI & DS									
6	BS	RCP23FCBS103	Chemistry	2			25	15	15	60	100	2
7	BS	RCP23FLBS103	Chemistry Laboratory & Tutorial		1	2	50				50	2
8	ES	RCP23FCES104*	Engineering Graphics	2			25	15	15	60	100	2
9	ES	RCP23FLES104	Engineering Graphics Laboratory			2	25				25	1
10	HM	RCP23FCHS101	Effective Communication Skills	2			25	15	15	60	100	2
11	HM	RCP23FLHS101	Effective Communication Skills Laboratory			2	25				25	1
12	VS	RCP23FLVS101	Workshop Practices			2	25				25	1
13	HS	RCP23FTHS102	Indian Knowledge System		2		25			25	50	2
			Total	13	4	10	350	90	90	410	850	22

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Semester-II (Group B)

Sr	Course Category	Course Code	Course Title	Teaching Scheme			Evaluation Scheme				Total [A+Average(B,C)+D]	Credit
							Continuous Assessment			ESE		
				L	T	P	TA [A]	Term Test 1 [B]	Term Test 2 [C]	[D]		
1	BS	RCP23FCBS201	Mathematics-II	3			25	15	15	60	100	3
2	BS	RCP23FTBS201	Mathematics-II Tutorial		1		25				25	1
3	ES	RCP23FCES201	Object Oriented Programming using Java	2			25	15	15	60	100	2
4	ES	RCP23FLES201	Object Oriented Programming using Java Laboratory			2	25			25	50	1
5	PC	RCP23FCPC2CO RCP23FCPC2EC RCP23FCPC2ME RCP23FCPC2CE RCP23FCPC2EE RCP23FCPC2DS RCP23FCPC2AM RCP23FCPC2IT RCP23FCPC2AD	Foundation of Computing Technologies Electrical Networks Elements of Mechanical Engineering Elements of Civil Engineering Electrical Netwroks Fundamentals of Data Analysis Fundamentals of AI & ML Foundation of Information Technology Fundamentals of AI & DS	2			25	15	15	60	100	2
6	BS	RCP23FCBS102	Physics	2			25	15	15	60	100	2
7	BS	RCP23FLBS102	Physics Laboratory & Tutorial		1	2	50				50	2
8	ES	RCP23FCES102	Computational Engineering Mechanics	2			25	15	15	60	100	2
9	ES	RCP23FLES102	Computational Engineering Mechanics Laboratory			2	25				25	1
10	ES	RCP23FCES103	Basic Electrical Engineering & Digital Electronics	2			25	15	15	60	100	2
11	ES	RCP23FLES103	Basic Electrical Engineering & Digital Electronics Laboratory & Tutorial		1	2	50				50	2
12	LL	RCP23FTLL101	Health and Wellness- Mind and Body Management		2		25			25	50	2
			Total	13	5	8	350	90	90	410	850	22

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Mathematics - I (RCP23FCBS101)

Teaching Scheme
Lectures : 03 Hrs./week
Practical : - - - -
Tutorial : - - - -
Credit : 03

Examination Scheme
Term Test : 15 Marks
Teacher Assessment : 25 Marks
End Sem Exam : 60 Marks
Total Marks : 100 Marks

Pre-requisite Knowledge of

1. Inverse of a matrix, addition, multiplication and transpose of a matrix.
2. Algebra of Complex Numbers, Cartesian, polar and exponential form of complex number.

Course Objectives

1. To develop the basic Mathematical skills of engineering students that are imperative for effective understanding of engineering subjects. The topics introduced will serve as basic tools for specialized studies in many fields of engineering and technology.
2. To provide hands on experience using SciLab software to handle real life problems.

Course Outcomes

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Apply principles of basic operations of matrices to find rank and echelon form of matrices to solve system of simultaneous equations.	L3	Apply
CO2	Illustrate the basic concepts of Complex numbers and apply the knowledge of complex numbers to solve problems in hyperbolic functions and logarithmic functions.	L4	Analyze
CO3	Illustrate the knowledge of Expansion of function.	L4	Analyze
CO4	Illustrate the basic principles of Partial differentiation and it's application to find maxima and minima.	L4	Analyze
CO5	Illustrate SciLab programming techniques to the solution of linear and simultaneous algebraic equations.	L4	Analyze

Course Contents

Unit-I Matrices 07 Hrs.

Prerequisite: *Inverse of a matrix, addition, multiplication and transpose of a matrix*

1.1 Types of Matrices: Symmetric, Skew-Symmetric, Hermitian, Skew-Hermitian, Unitary, Orthogonal Matrices. Rank of a matrix using Echelon form

1.2 System of homogeneous and non – homogeneous equations, their consistency and solutions. Linear dependent and independent vectors.

Unit-II Complex Numbers, Hyperbolic function and Logarithm of Complex Numbers 11 Hrs.

Prerequisite: *Definition, algebra, polar and exponential form of complex numbers*

2.1 Review statement of D'Moivre's Theorem.

2.2 Application of D'Moivre's Theorem: Find Expansion of $\sin^n\theta$, $\cos^n\theta$ in terms of sines and cosines of multiples of θ, expansion of $\sin n\theta$, $\cos n\theta$ in powers of $\sin\theta$, $\cos\theta$ and to find sum of the trigonometric series.

2.3 Roots of complex number.

2.4 Circular functions of complex number and Hyperbolic functions. Inverse Circular and Inverse Hyperbolic functions. Separation of real and imaginary parts of all types of functions.

2.5 Logarithmic functions, Separation of real and Imaginary parts of Logarithmic functions.

Unit-III Expansion of Function 04 Hrs.

Prerequisite: *Derivative*

3.1 Taylor's Theorem (Statement only), Taylor's series and Maclaurin's series (Statement only). Expansion of standard functions.

Unit-IV Partial Differentiation 09 Hrs.

Prerequisite: *Derivative*

4.1 Partial Differentiation: Function of several variables, Partial derivatives of first and higher order, Differentiation of composite function, Total differentials and Implicit functions.

4.2 Euler's Theorem on Homogeneous functions with two and three independent variables (with proof). Deductions from Euler's theorem.

Unit-V Applications of Partial Differentiation 04 Hrs.

Prerequisite: *Maxima and Minima of single variable function, Partial derivatives*

5.1 Maxima and Minima of a function of two independent variables.

5.2 Jacobian's of two and three independent variables.

Unit-VI Numerical Solutions of Transcendental Equations, System of Linear and Non-Linear Equations, Curve fitting 04 Hrs.

Prerequisite: *Solution of system of equations*

6.1 Solution of Algebraic and Transcendental Equations by Newton Raphson Method.

6.2 Solution of system of linear algebraic equations by Gauss Seidal Iteration Method.

6.3 Curve fitting: Fitting a straight line, Quadratic curve.

Reference Books

1. Foundations of Complex Analysis, S. Ponnusamy, Narosa Publications.
2. Advanced Engineering Mathematics, Erwin Kreyszig, Wiley Eastern Limited, 9th Ed.
3. Advanced Engineering Mathematics by H. K. Dass, 28th edition, S. Chand 2010.
4. Introductory Methods of Numerical Analysis, S.S. Sastry, Eastern Economy Edition.
5. Numerical Methods, M. K. Jain, R. K. Jain, S. R. K. Iyengar, New Age International Publishers.
6. Matrices, Shanti Narayan, S. Chand publication.
7. Applied Numerical Methods with MATLAB for Engineers and Scientists by Steven Chapra, McGraw Hill.
8. Elementary Linear Algebra with Application by Howard Anton and Christ Rorres, 6th edition, John Wiley and Sons, INC.

Text Books:

1. Higher Engineering Mathematics, Dr. B. S. Grewal, Khanna Publication.
2. Advanced Engineering Mathematics, Dennis G. Zill, Warren S. Wright

Mathematics - I Tutorial (RCP23FTBS101)

Teaching Scheme	Examination Scheme
Lectures : - - - -	Term Test : - - - -
Practical : - - - -	Teacher Assessment : 25 Marks
Tutorial : 01 Hrs./week	End Sem Exam :- - - -
Credit : 01	Total Marks : 25 Marks

Suggested Tutorials (including SciLab programs)

- Matrices.
- Matrices (SciLab)
- Complex Numbers.
- Hyperbolic and Logarithm of complex no.
- Expansion of Function.
- Partial Differentiation.
- Application of Partial Differentiation.
- Solution of Transcendental Equations by Newton Raphson Method.
- Solution of system of linear algebraic equations by Gauss Seidal Iteration Method.
- Curve Fitting.

Minimum eight tutorials batchwise (including SciLab programs) from the above suggested list or any other experiment based on syllabus will be included, which would help the learner to apply the concept learnt.

Reference Books

1. Foundations of Complex Analysis, S. Ponnusamy, Narosa Publications.
2. Advanced Engineering Mathematics, Erwin Kreyszig, Wiley Eastern Limited, 9th Ed.
3. Advanced Engineering Mathematics by H. K. Dass, 28th edition, S. Chand 2010.
4. Introductory Methods of Numerical Analysis, S.S. Sastry, Eastern Economy Edition.
5. Numerical Methods, M. K. Jain, R. K. Jain, S. R. K. Iyengar, New Age International Publishers.
6. Matrices. Shanti Narayan, S. Chand publication.
7. Applied Numerical Methods with MATLAB for Engineers and Scientists by Steven Chapra, McGraw Hill.
8. Elementary Linear Algebra with Application by Howard Anton and Christ Rorres, 6th edition, John Wiley and Sons, INC.

Text Books:

1. Higher Engineering Mathematics, Dr. B. S. Grewal, Khanna Publication.
2. Advanced Engineering Mathematics, Dennis G. Zill, Warren S. Wright

Structured Programming using C (RCP23FCES101)

Teaching Scheme	Examination Scheme
Lectures : 02 Hrs./week	Term Test : 15 Marks
Practical : - - - -	Teacher Assessment : 25 Marks
Tutorial : - - - -	End Sem Exam : 60 Marks
Credit : 02	Total Marks : 100 Marks

Course Objectives

1. To familiarize with the logic of Computer Programming.
2. To provide exposure in developing algorithm, flowchart and thereby writing efficient codes for user defined problem.

Course Outcomes

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Implement the programs in C .	L3	Apply
CO2	Debug the C programs.	L3	Apply

Course Contents

Unit-I Introduction to Computer, Algorithm and Flowchart 03 Hrs.

1.1 The Turing Machine architecture, The Von Neumann architecture, Number system.

1.2 Introduction to Operating System Components.

1.3 System and application software.

1.4 Algorithm and flowchart:

Three constructs of Algoritham and flowchart: Sequence, Decision (Selection) and Repetition.

Compilation process: Syntax and semantic errors.

Unit-II Fundamentals of C-Programming 04 Hrs.

2.1 Character Set, Identifiers and keywords, Data types, Constants, Variables.

2.2 Operators- Arithmetic, Relational and logical, Assignment, Unary, Conditional, Bitwise and other operators. Expression, statements, Library Functions, Preprocessor.

2.3 Data Input and Output: getchar (), putchar (), scanf (), printf (), gets (), puts (), Structure of C program.

Unit-III Control Structures 05 Hrs.

3.1 Decision making with Branching: If statement, If-else Statement, Switch case statement.

3.2 Looping: while, do-while, for.

3.3 Nested control structure.

3.4 Continue statement, Break statement, goto statement.

Unit-IV Functions and Parameter 03 Hrs.

4.1 Function -Introduction of Function, defining a Function, accessing a Function, Function Prototype, Passing Arguments to a Function, Designing Recursive function.

4.2 Storage Classes –Auto, Extern, Static, Register.

Unit-V Arrays, String, Structure 07 Hrs.

5.1 Array- Concepts, Declaration, Definition, accessing array element, One-dimensional and Multidimensional array, Passing Arrays to Function.

5.2 String- Basics of String, Functions in string.h, user defined function for String handling.

5.3 Structure- Declaration, Initialization, structure within structure, Operation on structures, Array of Structure, Structure padding.

Unit-VI Pointers 04 Hrs.

6.1 Introduction, Definition and uses of Pointers, Address Operator, Pointer Variables

6.2 Pointer Arithmetic.

6.3 Call by value, call by Reference.

Text Books

1. K. R. Venugopal and Sudeep R. Prasad, "MASTERING C", Tata McGraw-Hill Publications.
2. Behrouz Forouzan, "A Computer Science –Structure Programming Approaches using C", Cengage Learning.
3. Byron S. Gottfried, "Programming with C", Schaum's Outline Series, Tata McGraw-Hill, 2006.

Reference Books

1. Behrouz Forouzan, "Basics of Computer Science" , Cengage Learning.
2. M. G. Venkateshmurthy, "Programming Techniques through C", Pearson Publication.
3. E. Balaguruswamy, "Programming in ANSI C", Tata McGraw-Hill Education.
4. Pradeep Day and Manas Gosh, "Programming in C", Oxford University Press.
5. Yashwant Kanetkar, "Let Us C", BPB Publication.

Structured Programming using C Laboratory (RCP23FLES101)

Practical Scheme	Examination Scheme
Lectures : - - - - -	Teacher Assessment : 25 Marks
Practical : 02 Hrs./week	End Sem Exam : 25 Marks
Credit : 01	Total : 50 Marks

Course Objectives

1. To familiarize with the logic of Computer Programming.
2. To provide exposure in developing algorithm, flowchart and thereby writing efficient codes for user defined problem.

Course Outcomes

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Implement the programs in C .	L3	Apply
CO2	Debug the C programs.	L3	Apply

List of Practicals/ Experiments/ Assignments

1. Write a program to swap two variables values with and without using third variable. Write algorithm and draw flowchart for the same.
2. Write a program to check odd or even number: (a) using modulus operator (b) using conditional operator.
3. Design and develop a C program to read a year as an input and find whether it is leap year or not. Also consider the end of the centuries. Write algorithm and draw flowchart for the same.
4. Write a C program to find the sum of individual digits of a 3-digit number.
5. Design and develop a flowchart or an algorithm that takes three coefficients (a, b and c) of a Quadratic equation ($ax^2+bx+c=0$) as input and compute all possible roots. Implement a C program for the developed flowchart/algorithm and execute the same to output the possible roots for a given set of coefficients with appropriate messages.
6. Write a program to count the number of digits in a given integer.
7. Write a menu driven program to perform simple arithmetic operations based on the user's choice. The user will indicate the operation to be performed using the signs e.g. + for addition, etc. Write an algorithm and draw flowchart for same.
8. Write a program to read a number of more than one digit, reverse the number and display the sum of digits of numbers. Write algorithm and draw flowchart for the same.
9. Write programs to display each of the following patterns. Write algorithm and draw flowchart for the same.

A)
```
1
2 1
3 2 1
4 3 2 1
5 4 3 2 1
```

B)
```
        A
      A B A
    A B C B A
  A B C D C B A
A B C D E D C B A
```

10. Write a C program to find maximum and minimum between two numbers using functions. Write algorithm and draw flowchart for the same.
11. Write a C program to find GCD of two integers by using recursive function.
12. Write a C program to find both the largest and smallest number in a list of integers. Write algorithm and draw flowchart for the same.

13. Develop, implement and execute a C program that reads two matrices A (m x n) and B (p x q) and Compute product of matrices A and B. Read matrix A and matrix B in row major order and in column major order respectively. Print both the input matrices and resultant matrix with suitable headings and output should be in matrix format only.

14. Write a program for deletion of an element from the specified location from Array.

15. Write a C program using user defined functions to determine whether the given string is palindrome or not.

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

17. Write a program to swap two numbers using a function. Pass the values to be swapped to this function using the call-by-value method and call-by-reference method.

18. Write a C program to find the length of the string using pointer.

19. Write a program to copy one array to another using pointer.

20. Write a program to compare two strings using pointers.

Text Books

1. K. R. Venugopal and Sudeep R. Prasad, "MASTERING C", Tata McGraw-Hill Publications.

2. Behrouz Forouzan, "A Computer Science –Structure Programming Approaches using C", Cengage Learning.

3. Byron S. Gottfried, "Programming with C", Schaum's Outline Series, 2nd Edition, Tata McGraw-Hill, 2006.

Reference Books

1. M. G. Venkateshmurthy, "Programming Techniques through C", Pearson Publication.

2. E. Balaguruswamy, "Programming in ANSI C", Tata McGraw-Hill Education.

3. Pradeep Day and Manas Gosh, "Programming in C", Oxford University Press.

4. Yashwant Kanetkar, "Let Us C", BPB Publication.

5. "Basics of Computer science", by BehrouzForouzan,Cengage Learning.

Physics (RCP23FCBS102)

Teaching Scheme	Examination Scheme
Lectures 02 Hrs./week	Term Test : 15 Marks
Practical : - - - -	Teacher Assessment : 25 Marks
Tutorial : - - - -	End Sem Exam : 60 Marks
Credit : 02	Total Marks : 100 Marks

Pre-requisite

1. Foundations of physics and mathematics till HSc or equivalent is necessary to comprehend engineering physics curriculum effectively.

Course Objectives

1. Identify and understand the fundamental physical principles underlying engineering technologies—a prerequisite to become successful engineer.
2. To provide inclusive knowledge of fundamental physical principles encouraging engineering students to venture in research field.

Course Outcomes

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Relate the scope and foundation of quantum mechanics, quantum computing and its role in development of modern technology.	L2	Understand
CO2	Apply the foundations of Optics and Photonics in precision measurements indispensable for the development of modern communication technology.	L3	Apply
CO3	Assimilate the concepts of Electrodynamics, which are prerequisite in modern developments for signal communications, Antenna Theory etc.	L2	Understand
CO4	Explore basic sensing techniques for physical measurements in modern instrumentation.	L4	Analyze

Course Contents

Unit-I Qunatam Physics and Computing 06 Hrs.

Prerequisite: *Origin of Quantum mechanics and its comparison with classical mechanics, Dual nature of radiation, Photoelectric effect, Davisson-Germer experiment, single slit experiment*

Introduction (Matter waves, De Broglie hypothesis. Wave Packet). Concept of Phase velocity and group velocity and relation with particle velocity. Heisenberg Uncertainty Principle. Wave function; Physical interpretation of wave function. Schrodinger's time dependent wave equation; time independent wave equation; Particle trapped in one dimensional infinite potential well.

Fundamentals of Quantum Computing (Difference between classical computing & quantum computing, Qubits, Quantum Superposition theorem, Quantum Entanglement theorem, Quantum cryptography)

Unit-II Optics for Engineers 06 Hrs

Prerequisite: *Wave front and Huygens's principle, reflection, refraction, interference, Young's double slit experiment, diffraction*

Thin Film Interference: Introduction (division of amplitude), Stoke's relation, Interference in thin film of constant thickness in reflected light, Formation of colors in thin film (point source & extended source); Interference in Wedge shaped film; Formation of Newton's rings; Applications (Antireflecting & High reflecting films).

Diffraction: Introduction (distinguish between interference & diffraction), Fresnel & Fraunhofer diffraction, Fraunhofer diffraction at single slit & double slit (qualitative), Diffraction Grating, Absent spectra, Resolving power & Dispersive power of a grating (qualitative), Applications.

Unit-III Photonics and Fibre Optics 06 Hrs

Prerequisite: *Absorption, recombination, energy bands of p-n junction, refractive index of a material, Snell's law, Total internal reflection)*

Laser: Spontaneous emission and Stimulated emission; Einstein's coefficients, Metastable state, Resonant cavity, Population inversion, three & four level lasers, types of pumping, Helium Neon laser; Nd:YAG laser, Applications.

Fiber optics: Structure of an optical fiber, Types: Single mode & Multimode, Step index & Graded index, Numerical Aperture for step index fiber, Modes of propagation, V number, Attenuation, Applications (Optical fibre Transmission).

Unit-IV Electrodynamics 04 Hrs

Prerequisite: *Coulomb's law-force between two-point charges, electric field due to a point charge, electric field due to a dipole, Cartesian cylindrical & Spherical co-ordinate system, Gauss's law for electrostatics & magneto statics Faraday's Law, Ampere's circuital law)*

Scalar and Vector fields. Physical significance of gradient, curl and divergence in Cartesian co-ordinate system. Divergence theorem, Stokes theorem. Maxwell's equations (Free space and time varying fields) & Applications.

Unit-V Physics of Sensors 04 Hrs.

Prerequisite: *Transducer concept, meaning of calibration, piezoelectric effect, IR waves)*

Ultrasonic sensors: Concept of inverse piezoelectricity, Applications

Light sensors: (Photodiode, LDR). Hall sensor: (Principle of Hall effect, Applications), IR sensor: (Principle & Applications).

Reference Books

1. Introduction to Quantum Mechanics- David. J. Griffiths, Cambridge university Press.
2. An Introduction to Quantum Computing Phillip Kaye Oxford Press.
3. Quantum Computing for everyone Chris Bernhardt the MIT Press.
4. Fundamentals of optics by Jenkins and White, McGraw Hill
5. Concepts of Modern Physics- Arther Beiser, Tata McGraw Hill.
6. Introduction to Electrodynamics- D. J. Griffiths, Pearson publication.
7. Instrumentation and Measurement Techniques by Albert D. Helfrick and William D. Cooper (PHI) Edition.
8. Handbook of Modern Sensors Physics design and application- Jacob Fraden, Springer, AIP press.

Text Books

1. A textbook of Engineering Physics-Avadhanulu and Kshirsagar, S. Chand.
2. Problems in Engineering Physics- Avadhanulu and Kshirsagar, S. Chand.
3. A textbook of Engineering Physics, S. O. Pillai, New Age International Publishers
4. A textbook of Optics - N. Subramanyam and Brijlal, S. Chand.
5. Quantum Mechanics: Theory and Applications-Ajoy Ghotak and S. Lokanathan.
6. Modern Engineering Physics – Vasudeva, S. Chand.

7. Engineering Physics- Wiley Editors, Wiley Publication.

8. Engineering Physics – R K Gaur and S L Gupta, Dhanpat Rai Publications.

9. Engineering Physics – Shatendra Sharma and Jyotsna Sharma, Pearson publications.

10. Engineering Physics – D. K. Bhattacharya and Poonam Tandon, Oxford publications.

11. Engineering Physics – V Rajendran, McGraw Hill Educations.

12. Optics - Ajay Ghatak, Tata Mc Graw Hill.

13. Electronic Instrumentation –H.S. Kalsi, Tata Mc Graw-Hill Education.

Physics Laboratory & Tutorial (RCP23FLBS102)

Practical Scheme
Practical : 02 Hrs./week
Tutorial : 01 Hr./week
Credit : 02

Examination Scheme
Teacher Assessment : 50 Marks

Total Marks : 50 Marks

Course Objectives

1. To provide hands-on experience of basic physics instruments.
2. To introduce students to the modern equipments, precision techniques and experimental methods for observing, understanding and verifying laws optics.
3. To provide students with a basic understanding of the Physics concept through experiments that may be required by engineers in the course of their careers.
4. To introduce the learners with the basics of light wave and electron conduction in semiconductor to facilitate his learning of the concepts in modern physics.
5. This course will cultivate skills for formulating and solving physics problems.

Course Outcomes

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Develop skill to impart practical knowldge in real time solution	L6	Create
CO2	Ability to state and verify various laws which they have studied, through experiments	L3	Apply
CO3	Understand principle, concept, working and application of new tehnology and comparision of results with theoretical calculations	L2	Understand
CO4	Gain knowldge of new concept in the solution of pratical oriented problem and to understand more deep knowldge about the solution to therotical knowldge	L2	Understand

List of Practical /Experiments/Assignments:

Students must perform minimum eight experiments from given list.

1. Determination of Planck's constant using LED.
2. Determination of wavelength using Diffraction grating and Hg source.
3. Determination of wavelength using Diffraction grating and Na source.
4. Determination of width of a slit using single slit diffraction experiment (laser source).
5. Determination of width of a double slit using (laser source).
6. Study of I-V characteristics of Photo diode.
7. Study of ultrasonic distance meter/interferometer.
8. Determination of radius of curvature of a lens using Newton's ring set up.
9. Determination of grating element & no. of lines/cm using Ruler.
10. Simulation experiments on sensors.
11. Determination of grating element or wavelength using Diffraction grating (Laser source).
12. Study of divergence of laser beam.
13. Determination of diameter of wire/hair or thickness of paper using Wedge shape film method.
14. Determination of grating element & no. of lines/cm using CD.
15. Determination of Numerical Aperture of an optical fiber.

Minimum 8 experiments as laboratory work from the above suggested list or any other experiment based on syllabus should be conducted batch wise to develop a rational temperament for scientific observations which lead to constructive inferences essential for technology studies.

Tutorials

A minimum of 8 tutorial sessions on topics covering the entire syllabus should be conducted batchwise for effective interactive sessions focusing on better understanding of the subject.

Books Recommended

1. A textbook of Engineering Physics-Avadhanulu and Kshirsagar, S. Chand.
2. Problems in Engineering Physics- Avadhanulu and Kshirsagar, S. Chand.
3. A textbook of Engineering Physics, S. O. Pillai, New Age International Publishers.
4. A textbook of Optics - N. Subramanyam and Brijlal, S. Chand.
5. Quantum Mechanics: Theory and Applications-Ajoy Ghotak and S. Lokanathan.
6. Modern Engineering Physics – Vasudeva, S. Chand.
7. Engineering Physics- Wiley.
8. Engineering Physics – R K Gaur and S L Gupta, Dhanpat Rai Publications.
9. Engineering Physics – Shatendra Sharma and Jyotsna Sharma, Pearson publications.
10. Engineering Physics – D. K. Bhattacharya and Poonam Tandon, Oxford publications.

11. Engineering Physics – V Rajendran, McGraw Hill Educations.

12. Optics - Ajay Ghatak, Tata Mc Graw Hill.

13. Electronic Instrumentation –H.S. Kalsi, Tata Mc Graw-Hill Education.

Reference Books

1. Introduction to Quantum Mechanics- David. J. Griffiths, Cambridge university Press.

2. An Introduction to Quantum Computing Phillip Kaye Oxford Press.

3. Quantum Computing for everyone Chris Bernhardt the MIT Press.

4. Fundamentals of optics by Jenkins and White, McGraw Hill

5. Concepts of Modern Physics- Arther Beiser, Tata McGraw Hill.

6. Introduction to Electrodynamics- D. J. Griffiths, Pearson publication.

7. Instrumentation and Measurement Techniques by Albert D. Helfrick and William D. Cooper (PHI) Edition.

8. MHandbook of Modern Sensors Physics design and application- Jacob Fraden, Springer, AIP press.

Computational Engineering Mechanics (RCP23FCES102)

Teaching Scheme	Examination Scheme
Lectures : 02 Hrs./week	Term Test : 15 Marks
Practical : - - - -	Teachers Assessment : 25 Marks
Tutorial : - - - -	End Sem Exam : 60 Marks
Credit : 02	Total Marks : 100 Marks

Pre-requisite

1. Basics of Trigonometry and Matrices.
2. Newton's Laws of motion.

Course Objectives

1. To acquaint learners with the concept of equilibrium.
2. To familiarize learners to analyze the motion of moving particles/bodies.

Course Outcomes

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Illustrate the effect of force and moment to determine the resultant of force system.	L2	Understand
CO2	Apply the concept of equilibrium systems with the help of free body diagram.	L3	Apply
CO3	Correlate real life application to friction and estimate the Power transmitted by the belt.	L4	Analyse
CO4	Apply the concept of geometric transformations to find the transformed position of an element/object.	L5	Evaluate
CO5	Analyze general plane motion of rigid bodies.	L4	Analyze

Course Contents

Unit-I Computation and analysis of System of Forces (Co-planar) 06 Hrs

Concept of force, Principle of transmissibility, Composition and resolution of forces. Moment of force about a point, Varignon's Theorem. Various systems of forces. Couples. Force couple system, Resultant of coplanar force system.

Unit-II Computation and analysis of Equilibrium Systems 06 Hrs

Conditions of static equilibrium. Free body diagram. Various types of supports and support reactions. Equilibrium of Connected Bodies.

Types of Beams and various types of loads. Determination of reactions at supports for beams.

Unit-III Computation and analysis of Frictional Forces 04 Hrs

Concept of Static Friction and Dynamic/ Kinetic Friction, Laws of dry friction, Coefficient of Friction. Angle of Friction, Concept of Cone of friction. Angle of Repose., Belt friction, Power transmitted by flat belt drives.(Numericals on Block, Wedge and Ladder friction excluded.)

Unit-IV Robot Kinematics (Part-I) Geometric Transformations 05 Hrs

2D transformations: Translation, Scaling, Rotation; Matrix representation and Homogeneous Coordinates; Composite transformation; Other transformations: Reflection and Shear.

Introduction to 3D Transformations: Translation, Rotation, Scaling and Reflection.

Unit-V Robot Kinematics (part-II) 05 Hrs.

General Plane motion of Rigid body. The concept of Instantaneous center of rotation (ICR) for the velocity. Velocity analysis of rigid body using ICR.

Introduction to Forward Kinematics and Inverse Kinematics. Applications of Mechanics in Robotics, Machine Learning and AI.

Books Recommended:

Text Books

1. A. K. Tayal, Engineering Mechanics, 14th Edn., Umesh Publication, 2011.

2. S. Ramamrutham, Engineering Mechanics, Dhanpat Rai Publishing company. 2016.

Reference Books

1. R. C. Hibbeler, Engineering Mechanics, Pearson education, 12th Edn., 2010.
2. Rajasekaran S and Sankarasubramanian G., "Engineering Mechanics Statics and Dynamics", 3rd Edn., Vikas Publishing House Pvt. Ltd., 2005.
3. Beer, F. P. and Johnston, E. R., Vector Mechanics for Engineers - Statics and Dynamics, 3rd Edn., Tata McGraw Hill Publishing Company, 2001.
4. Bhattacharya B., Engineering Mechanics, 3rd Edn., Oxford University press, 2008.
5. Ramkumar Agarwal, Engineering Mechanics, 1st Edn., Agarwal Education Centre: Self Publication, 2021.
6. Nelson and Mc Lean, Engineering Mechanics, 5th Edn., Tata McGraw Hill, 1997.
7. Harsh Bhasin, Python For Beginners, 1st Edn., New Age International Publishers, 2018.
8. M. Groover, CAD/CAM: Computer-Aided Design and Manufacturing, 1st Edn., Pearson Education India, 2013.
9. Rudra Pratap, Getting Started with MATLAB: A Quick Introduction for Scientists and Engineers, 1st Edn., Oxford University Press, 2010.

Computational Engineering Mechanics Laboratory (RCP23FLES102)

Practical Scheme
Lectures : - - - - -
Practical : 02 Hrs./week
Credit : 01

Examination Scheme
Teachers Assessment : 25 Marks

Total : 25 Marks

Course Objectives

1. To study basic laws of engineering mechanics and its applications to solve the problems.
2. To introduce concept of friction and to find coefficient of friction.
3. Introduction of programming software packages for solving engineering mechanics problem.

Course Outcomes

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Understand basic principles of mechanics	L2	Understand
CO2	Analyze the law's of forces for coplaner, concurrent force systems	L5	Evaluate
CO3	Analyze the characteristics of coplaner, non concurrent force systems	L5	Evaluate
CO4	Determine coefficients of friction and coefficients of restitution	L5	Evaluate
CO5	Use software programming packages for solving Engineering Mechanics problems	L3	Apply

List of Practicals/Experiments:

Part I- List of Lab experiments

1. Verification of Polygon law of coplanar forces.
2. Verification of law of Moment using Bell crank lever.
3. Determination of Support reaction for beam.
4. Determination of coefficient of friction using Inclined plane.
5. Verification of Lami's theorem using Jib crane.
6. Resultant of non-concurrent non-parallel coplanar force system.
7. Determination of coefficient of restitution for Collision of elastic bodies (Law of conservation of momentum).

   Part II- List of Programming Exercises

   Introduction to programming software packages (Python/Matlab/Scilab or any other suitable software),
8. Programming exercises on determination of Resultant of Coplanar Force System. (Application of software packages for determination of Resultant.)
9. Programming exercises on determination of Support Reaction. (Application of software packages for analysis of bodies in equilibrium.)
10. Programming exercises on Friction. (Application of software packages for computation of friction forces.)
11. Plotting of Motion Curves. (Application of software packages for plotting of motion curves.)
12. Programming exercises on transformations of basic geometric 2D elements. (Programming for transformations of basic geometric 2D elements.)
13. Simulating Kinematics of Rigid Body. (Application of software packages for simulating Kinematics of Rigid Body.)

Laboratory work should contain total 8 experiments/exercises (Any five from 1 to 7 and any three from 8 to 13).

Books Recommended:

Text Books

1. A. K. Tayal, Engineering Mechanics, 14th Edn., Umesh Publication, 2011.
2. S. Ramamrutham, Engineering Mechanics, Dhanpat Rai Publishing company. 2016.

Reference Books

1. R. C. Hibbeler, Engineering Mechanics, Pearson education, 12th Edn., 2010.
2. Rajasekaran S and Sankarasubramanian G., "Engineering Mechanics Statics and Dynamics", 3rd Edn., Vikas Publishing House Pvt. Ltd., 2005.
3. Beer, F. P. and Johnston, E. R., Vector Mechanics for Engineers - Statics and Dynamics, 3rd Edn., Tata McGraw Hill Publishing Company, 2001.
4. Bhattacharya B., Engineering Mechanics, 3rd Edn., Oxford University press, 2008.
5. Ramkumar Agarwal, Engineering Mechanics, 1st Edn., Agarwal Education Centre: Self Publication, 2021.
6. Nelson and Mc Lean, Engineering Mechanics, 5th Edn., Tata McGraw Hill, 1997.
7. Harsh Bhasin, Python For Beginners, 1st Edn., New Age International Publishers, 2018.
8. M. Groover, CAD/CAM: Computer-Aided Design and Manufacturing, 1st Edn., Pearson Education India, 2013.
9. Rudra Pratap, Getting Started with MATLAB: A Quick Introduction for Scientists and Engineers, 1st Edn., Oxford University Press, 2010.

Basic Electrical Engineering & Digital Electronics (RCP23FCES103)

Teaching Scheme	Examination Scheme
Lectures : 02 Hrs./week	Term Test : 15 Marks
Practical : - - - -	Teachers Assessment : 25 Marks
Tutorial : - - - -	End Sem Exam : 60 Marks
Credit : 02	Total Marks : 100 Marks

Pre-requisite

1. Knowledge of basic physics.
2. Knowledge of basic mathematics.

Course Objectives

1. To develop basic understanding of concepts of DC and AC circuits, and analyse their operations using various methods and techniques.
2. To get an insight of various digital electronics.

Course Outcomes

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Apply the knowledge of theorems/laws to analyse the DC circuits.	L3	Apply
CO2	Analyse single phase AC circuits.	L4	Analyse
CO3	Demonstrate knowledge of basic number system, logic gates and sequential circuits.	L3	Apply

Course Contents

Unit-I DC Circuits 05 Hrs.

- Introduction to ideal and practical voltage and current sources
- Kirchhoff's current and voltage laws
- Mesh and nodal analysis
- Supernode and supermesh analysis

Unit-II DC Network Theorems 06 Hrs.

- Source Transformation
- Star – Delta connections
- Superposition Theorem
- Thevenin's Theorem
- Maximum Power Transfer Theorem

Unit-III AC Circuits 10 Hrs

- Generation and representation of alternating voltage and currents
- RMS and Average value
- Phasor representation
- AC through resistance, inductance and capacitance
- R-L-C series, parallel circuits
- Calculation of power and power factor

Unit-IV Number Systems and Logic Gates 04 Hrs

- Review of number system
- Decimal, Binary, Binary coded decimal, Octal, Hexadecimal number systems and conversions
- Basic gates
- Universal gates
- Boolean algebra
- De Morgan's Laws

Unit-V Latches and Flip flops 03 Hrs.

- Introduction to latches
- Flip-flops: RS, JK, T, D flip-flops

Reference Books

1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
3. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
4. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.
5. M. Morris Mano. "Digital design", Prentice Hall India.

Text Books

1. B. R. Patil, "Basic Electrical Engineering", Oxford Higher Education, 2016.
2. R. R. Singh, "Network Analysis and Synthesis", McGraw Hill, 2nd Edition, 2019.
3. R. S. Sedha, "A textbook of Electronic Devices and Circuits", S. Chand, 2002.
4. R. P. Jain, "Modern Digital Electronics", McGraw Hill, 2011.

Basic Electrical Engineering & Digital Electronics Laboratory & Tutorial (RCP23FLES103)

Practical Scheme
Practical : 02 Hrs./week
Tutorial : 01 Hr./week
Credit : 02

Examination Scheme
Teachers Assessment : 50 Marks

Total : 50 Marks

Course Objectives

1. To develop basic understanding of concepts of DC and AC circuits and analyse their operations using various techniques.
2. To get an insight of digital electronics.

Course Outcomes

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Verification of DC theorems/laws to analyse the DC circuits.	L3	Apply
CO2	Understand basic operation of AC circuits	L2	Understand
CO3	Verify and analyze the truth table of different logic gate and circuits.	L3	Apply
CO4	Design and implement basic gates using universal gates.	L6	Create

Suggested experiments:

1. Study of basic laboratory instruments. (compulsory)
2. Mesh and Nodal analysis.
3. Verification of Superposition Theorem.
4. Verification of Thevenin / Maximum Power Transfer Theorem.
5. Study of R-L and R-C series circuits.
6. R-L-C series resonance circuit.
7. Verification of truth table for gates.
8. Implementing a given logic function using basic gates/SSI ICs.
9. Implementation of basic gates using universal gates.

NOTE: Batchwise laboratory work of minimum eight experiments from the above suggested list or any other experiment based on syllabus will be included, which would help the learner to apply the concept learnt.

NOTE: Batchwise tutorial sessions are to be conducted on topics which would help the learner to identify/analyze the problem and to apply problem solving techniques learnt.

Reference Books

1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
3. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
4. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.
5. M. Morris Mano, "Digital design", Prentice Hall India.

Text Books

1. B. R. Patil, "Basic Electrical Engineering", Oxford Higher Education, 2016.
2. R. S. Sedha, "A textbook of Electronic Devices and Circuits", S. Chand, 2002.
3. R.R. Singh, "Basic Electrical Engineering", Tata McGraw Hill, 2019.
4. R. P. Jain, "Modern Digital Electronics", McGraw Hill, 2011.

Liberal Learning- Health and Wellness- Mind and Body Management (RCP23FTLL101)

Teaching Scheme	Examination Scheme
Lectures : - - - -	Term Test : - - - -
Practical : - - - -	Teacher Assessment : 25 Marks
Tutorial : 02 Hrs./week	End Sem Exam : 25 Marks
Credit : 02	Total Marks : 50 Marks

Course Objectives

1. To acquaint learners with the basic concept of Health and wellbeing.
2. To develop healthy lifestyle habits for good health.
3. To understand emotional & mental well-being.
4. To impart strategies to maintain Good Health.

Course Outcomes

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Implement the knowledge of Health and wellness in daily lives.	L3	Apply
CO2	Apply appropriate & innovative methods to avoid risks from harmful habits.	L3	Apply
CO3	Employ personal development (both physical& emotional) strategies for better living.	L3	Apply
CO4	Create a plan for good health through a positive mindset.	L6	Create

Course Contents

Unit-I Fundamentals of Good Health 01 Assignment

1. Divide the students into small groups and assign each group a specific lifestyle choice (Healthy or Unhealthy) to explore.
   - Ask them to discuss the potential effects on health and present their findings to the class.

Unit-II The Basics of Health 02 Assignments

1. Create a Personalized Health Goal Plan
2. Role-play techniques to promote awareness regarding health and disease prevention.

Select a Relevant Topic: Choose a specific health-related topic such as hygiene practices, vaccination, or mental health.

Script Development: Develop a script that combines informative content with creative elements. Include key messages, facts, and practical tips related to the health issue. Use humor, drama, and relatable scenarios to capture the audience's attention.

Characterization: Each character should have a distinct personality and contribute to the overall message of the play.

Unit-III Yoga for Mind and Body (Any 2) 02 Assignments

1. Mindfulness and Meditation Session
2. Written assignment on the Role of Yoga in enhancing concentration
3. Stress Awareness Discussion Group
   - Create a safe and supportive space for students to discuss and share their stressors.
   - Organize a stress awareness discussion group where students can openly express their concerns, challenges, and coping strategies.
   - Facilitate meaningful conversations on stress management techniques.
   - Provide resources for support (such as counseling services) and encourage peer support within the group.

Unit-IV Emotional Intelligence and Mind Management (Any 2) 02 Assignments

1. **Role-Play on Conflict Resolution**

   a. **Find a partner**: Choose a friend who is willing to participate in this role-play activity with you

   b. **Select a scenario:** Together with your partner, select a conflict scenario to role-play. It could be a common situation that often leads to conflicts, such as a disagreement over how to divide household chores, a difference of opinion on a project at work, or a conflict over limited resources

   c. **Assign roles:** Decide who will play each role in the conflict scenario. One person will take on the role of one party involved in the conflict, and the other person will take on the role of the other party

   d. **Practice conflict resolution techniques:** Use the conflict resolution techniques you have learned, such as active listening, expressing feelings using "I" statements, seeking common ground, and brainstorming solutions

   e. **Reflect and switch roles:** After the initial role-play, take a moment to reflect on the experience. Discuss what worked well and areas that could be improved. Then, switch roles and repeat the role-play, allowing each participant to experience the situation from the perspective of the other party involved in the conflict.

   - Remember, the purpose of the activity is not to "win" the conflict but rather to practice and develop the skills necessary for constructive conflict resolution.
   - Approach the role-play with an open mind, a willingness to learn, and a commitment to respectful communication.

2. **Self-Assessment and Reflection (Mood O Meter chart activity)**

   - Begin the tutorial by facilitating self-assessment activities that encourage students to reflect on their emotions, thoughts, and behaviors.
   - Provide questionnaires or reflective exercises that prompt students to identify their strengths, areas for improvement, and triggers for stress or negative emotions.

3. **Case Study discussion based on Emotional Intelligence**

Unit-V Self-Reflection and Wellness Goal Setting 01 Assignment

Gratitude journaling: Have students maintain a gratitude journal where they write down three things, they are grateful for each day on the following indicators:

1. How did it feel to write in the gratitude journal?
2. Did you find it challenging or easy to identify things to be grateful for?
3. What positive emotions or thoughts arose while writing the journal?
4. Do you think maintaining a gratitude journal can have a positive impact on your well-being as an engineering student?

Mini Project – Community Health and Wellness Initiative

1. Research and Assess Community Needs
   - Conduct surveys or interviews to assess the health and wellness needs of your community.
   - Identify specific areas where improvements can be made, such as physical fitness, mental health, social connections, or access to healthcare resources.
2. Fitness and Recreation Events
   - Arrange fitness events, such as community walks or runs, group exercise classes, yoga sessions, or sports tournaments.
3. Health Education Campaigns
   - Launch health education campaigns to raise awareness about specific health issues relevant to your community.
   - This could include distributing informational pamphlets, organizing educational talks, or Creating Social Media Campaigns to share important health messages.
   - Develop a plan to sustain the project beyond its initial phase.

OR

Health and Wellness Advocacy Project

- Choose a health issue you are passionate about and design a health and wellness advocacy project.
- Students can create a Persuasive Video, Infographic or Social Media Campaign to raise awareness and mobilize support for their chosen cause.

Reference Books

1. Physical Activity and Health by Claude Bouchard, Steven N. Blair, William L. Haskell.
2. Mental Health Workbook by Emily Attached & Marzia Fernandez, 2021.
3. Mental Health Workbook for Women: Exercises to Transform Negative Thoughts and Improve Well-Being by Nashay Lorick, 2022
4. Lifestyle Diseases: Lifestyle Disease Management, by C. Nyambichu & Jeff Lumiri, 2018.
5. Physical Activity and Mental Health by Angela Clow & Sarah Edmunds, 2013
6. Yoga for Beginners: A Practical Guide" by Iyengar B.K.S ,Dorling Kindersley,2006
7. Emotional Intelligence: Why It Can Matter More Than IQ By Daniel Goleman,Bantam, 2006
8. Atomic Habits: An Easy & Proven Way to Build Good Habits & Break Bad Ones by James Clear, Penguin,2018

Chemistry (RCP23FCBS103)

Teaching Scheme	Examination Scheme
Lectures : 02 Hrs./week	Term Test : 15 Marks
Practical : - - - -	Teacher Assessment : 25 Marks
Tutorial : - - - -	End Sem Exam : 60 Marks
Credit : 02	Total Marks : 100 Marks

Pre-requisite

1. Properties of light and spectrum, wavelength and wave number.
2. Basic process of polymerization and its properties and types.

Course Objectives

1. To obtain a strong hold on basic concepts of Chemistry that form fundamental principles of technology.
2. To give exposure to recent material development in the field of engineering.

Course Outcomes

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Recognize new approaches of analysis, which are more convenient, less hazardous and sustainable to perform.	L2	Understand
CO2	Describe applications based on nanomaterials and modern polymers in engineering techniques.	L2	Understand
CO3	Analyze the quality of fuel for energy efficiency.	L5	Evaluate
CO4	Recognize properties of materials and alloys with phase transformation.	L2	Understand
CO5	Identify the parameters responsible for water pollution using suitable methods of water treatment.	L1	Knowledge

Course Contents

Unit 1 Sustainable approach to Chemistry 08 Hrs.

(A) Spectroscopic Techniques and Applications

- Introduction: Electromagnetic spectrum, its origin, properties and applications. Numericals based on energy of photon.
- Spectroscopy: Principle, classification and types
- Relation between electromagnetic spectrum, spectroscopy types and energy changes.
- Flame Photometry: Principle, Instrumentation, working, applications, interferences, advantages and disadvantages.
- Jablonski diagram, Introduction to florescence and phosphorescence,
- Applications of fluorescence.

(B) Green Chemistry

- Introduction: Definition, significance.
- Twelve Principles of green chemistry.
- Conventional and green synthesis of :(i) Carbaryl (ii) Indigo (iii) Adipic acid (iv) Acrylamide
- Percentage atom economy (Numericals).
- Green solvent: Supercritical CO_2

Unit 2 Engineering Materials 05 Hrs.

(A) Nanomaterials

- Introduction to nanomaterials
- Fullerenes: Properties and applications
- Carbon nanotubes: Types, Properties, Method of preparation (Laser, CVD), Applications

(B) Polymers

- Compounding of plastic, Fabrication of plastic by Compression, Injection, Transfer and Extrusion moulding.
- Effect of heat on polymers (glass transition temperature), Viscoelasticity.
- Conducting polymers and applications

Unit 3 Fuels and Combustion 05 Hrs.

- Introduction: Definition, classification, characteristics of a good fuel.
- Calorific value: Definition, Units, Gross or Higher calorific value and Net or lower calorific value, Dulongs formula and numerical for calculations of Gross and Net calorific values.
- Analysis of coal- Proximate and Ultimate Analysis (theory and numericals).

- Combustion: Calculations for requirement of oxygen and air (by weight and by volume) for given fuels.
- Power alcohol
- Green fuel: Biodiesel (Synthesis and advantages)

Unit 4 Phase Rule and Applications 04 Hrs.

- Phase Rule-Gibbs Phase Rule, Terms involved with examples.
- One Component System (Water).
- General characteristics of two component system.
- Reduced Phase Rule.
- Two Component System (Pb-Ag).
- Eutectic system: Applications and Numericals.
- Advantages and Limitations of Phase Rule.

Unit 5 Water Technology 04 Hrs.

- Introduction - Impurities in water.
- Hardness of water- units, types and numericals.
- Determination of hardness of water by EDTA method and numericals.
- Softening of water by Ion Exchange process and numericals.
- BOD, COD- Definition, significance and numericals.

Text Books

1. Engineering Chemistry - Jain and Jain (DhanpatRai)
2. Engineering Chemistry - Dara and Dara (S Chand)
3. Elementary Organic Spectroscopy - Y.R. Sharma (S Chand)
4. An introductory text on green chemistry: for undergraduate students - Indu Tucker Sidhwani, Rakesh Kumar Sharma (Wiley)
5. Nanomaterials - A.K. Bandyopadhyay (New Age Publishers)

Reference Books

1. Engineering Chemistry - Wiley India (ISBN - 9788126519880)
2. A Textbook of Engineering Chemistry - Shashi Chawla (DhanpatRai)
3. Concise Inorganic Chemistry - J D LEE
4. Essentials of Physical Chemistry - B S Bahl, Arun Bahl, G D Tuli.
5. Fundamentals of molecular spectroscopy - Colin N. Banwell (Tata McGraw-Hill Publications)
6. Green Chemistry - V.K. Ahluwalia (Narosa Publications)
7. Basic Atomic and Molecular Spectroscopy - J. Michael Hollas (Royal Society of Chemistry)
8. Nanotechnology: An Introduction to Synthesis, Properties and Applications of Nanomaterials - Thomas Varghese and K.M. Balakrishna (Atlantic)

Chemistry Laboratory and Tutorial (RCP23FLBS103)

Practical Scheme
Practical : 02 Hrs./week
Tutorial : 01 Hr./week
Credit : 02

Examination Scheme
Teacher Assessment : 50 Marks

Total : 50 Marks

Course Objectives

1. To learn basic laboratory concepts of Chemistry through experimental procedures.
2. To apply the knowledge of chemistry to understand the properties of engineering materials.

Course Outcomes

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Measure some properties of water such as chloride content and hardness of water.	L5	Evaluate
CO2	Estimate the percentage value of moisture content of coal sample and Zn or Cu in brass.	L5	Evaluate
CO3	Measure pH of different solutions and surface tension by specific instruments.	L5	Evaluate
CO4	Explain the properties of oils such as saponification value and acid value.	L4	Analyze

Suggested Experiments:

1. To determine Chloride content of water by Mohrs Method.
2. To determine total, temporary and permanent hardness of water sample by EDTA method.
3. To determine pH of different solutions using pH meter.
4. Determination of percent of Zn/Cu in brass.
5. Molecular weight determination of polymers by Oswald Viscometer.
6. Synthesis of UF, PF, Nylon 66.
7. Determination of COD.
8. Determination of surface Tension of a given liquid at room temperature using Stalgmometer by drop number method.
9. Determination of percent of Fe in Plain carbon steel.
10. Determination of Moisture content of coal.
11. Determination of Ash content of coal.
12. Saponification value of oil.
13. Acid value of oil.
14. To estimate the emf of Cu-Zn system by Potentiometry.
15. To determine lambda max of a given solution by using UV Spectrophotometer.
16. To validate Beer-Lambert law using UV Spectrophotometer/ colorimeter.
17. To determine metal ion concentration using colorimeter.
18. Determination of strength of a given solution (Acid/Base) by using conductometric titration.
19. Construction of concentration cell and determination of emf by potentiometry.

Minimum eight experiments from the above suggested list or any other experiment based on syllabus will be included, which would help the learner to apply the concept learnt.

Tutorials: Minimum eight tutorials based on syllabus will be conducted. Mini project relevant to the subject may be included, which would help the learner to apply the concept learnt.

Text Books

1. Engineering Chemistry - Jain and Jain (DhanpatRai)
2. Engineering Chemistry - Dara and Dara (S Chand)
3. Elementary Organic Spectroscopy - Y.R. Sharma (S Chand)
4. An introductory text on green chemistry: for undergraduate students - Indu Tucker Sidhwani, Rakesh Kumar Sharma (Wiley)
5. Nanomaterials - A.K. Bandyopadhyay (New Age Publishers)

Reference Books

1. Engineering Chemistry - Wiley India (ISBN - 9788126519880)
2. A Textbook of Engineering Chemistry - Shashi Chawla (DhanpatRai)
3. Concise Inorganic Chemistry - J D LEE
4. Essentials of Physical Chemistry - B S Bahl, Arun Bahl, G D Tuli.
5. Fundamentals of molecular spectroscopy - Colin N. Banwell (Tata McGraw-Hill Publications)
6. Green Chemistry - V.K. Ahluwalia (Narosa Publications)
7. Basic Atomic and Molecular Spectroscopy - J. Michael Hollas (Royal Society of Chemistry)
8. Nanotechnology: An Introduction to Synthesis, Properties and Applications of Nanomaterials - Thomas Varghese and K.M. Balakrishna (Atlantic)

Engineering Graphics (RCP23FCES104)

Teaching Scheme
Lectures : 02 Hrs./week
Practical : - - - -
Tutorial : - - - -
Credit : 02

Examination Scheme
Term Test : 15 Marks
Teacher Assessment : 25 Marks
End Sem Exam : 60 Marks
Total Marks : 100 Marks

Pre-requisite

1. Basics of geometrical constructions

Course Objectives

1. Students should be able to visualize the objects.
2. They should be able to understand and read drawing.
3. To impart and inculcate proper understanding of the theory of projection.
4. They should be able to present the same.

Course Outcomes

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Recognize the value of engineering graphics, as a language of engineers.	L3	Apply
CO2	Construct orthographic views of lines, and basic shapes of solids.	L3	Apply
CO3	Interpret and sketch orthographic and sectional orthographic views of various machine components.	L3	Apply
CO4	Visualize objects, and draw isometric views.	L3	Apply
CO5	Build 2D sketches using Auto CAD.	L3	Apply

Course Contents

Unit-I — 02 Hrs.

Introduction to Engineering Drawing:

Types of Lines, Dimensioning Systems as per IS conventions, Types of Projections.

****Introduction to Auto CAD:**

Basic Drawing and Editing Commands. Knowledge of setting up layers, Dimensioning, Hatching, plotting and Printing.

Unit-II — 05 Hrs.

Orthographic projections:

- Different views of simple machine parts as per the first angle projection method recommended by I.S.
- Full Sectional views of Simple Machine parts.

****Drawing of orthographic projections using Auto CAD**

Unit-III — 05 Hrs.

Sectional Orthographic projections:

- Concept of sectioning and drawing section lines,
- Need for drawing sectional views
- Section of simple geometrical solids-cases involving different types of cutting planes.

****Drawing of Sectional orthographic projections using Auto CAD**

Unit-IV — 06 Hrs.

Isometric Views Isometric Views/Drawings of blocks (plain and cylindrical, excluding spheres).

****Drawing of Isometric Views using Auto CAD.**

Unit-V — 08 Hrs.

Projection of Solids: (Prism, Pyramid, Cylinder & Cone only) Projections of Solids with the axis inclined to HP and VP. (Exclude Spheres, Composite, Hollow solids and frustum). Use change of position or Auxiliary plane method.

****Drawing of Projection of Solid using Auto CAD.**

** Should be covered during Auto CAD Practical.

Reference Books

1. K. Venugopal (2007), 'Engineering Drawing and Graphics + AutoCAD New Age International Publishers.
2. M. L. Dabhade (2008), 'Engineering Drawing, Vision Publications.
3. Dhananjay A. Jolhe, 'Engineering Drawing with an Introduction to AutoCAD Tata McGraw Hill Education Private Limited.

Text Books

1. N. D. Bhatt, 'Engineering Drawing', Charotar Publishing House.
2. M. B. Shah and B. C. Rana "Engineering Drawing', Pearson Education.
3. Basant Agrawal, C M Agrawal, Engineering Drawing,Third Edidtion, Tata McGraw Hill Education Private Limited.

Reference Books

1. K. Venugopal (2007), Engineering Drawing and Graphics + AutoCAD, New Age International Publishers.
2. M. L. Dabhade (2008), Engineering Drawing, Vision Publications.
3. Dhananjay A. Jolhe, Engineering Drawing with an Introduction to AutoCAD, Tata McGraw Hill Education Private Limited.

Engineering Graphics Lab (RCP23FLES104)

Practical Scheme
Lectures : - - - - -
Practical : 02 Hrs./week
Credit : 01

Examination Scheme
Teacher Assessment : 25 Marks

Total : 25 Marks

Course Objectives

1. Students should be able to visualize the objects.
2. They should be able to understand and read drawing.
3. To impart and inculcate proper understanding of the theory of projection
4. They should be able to present the same

Course Outcomes

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Recognize the value of engineering graphics, as a language of engineers	L2	Remember
CO2	Construct orthographic views of lines, and basic shapes of solids	L3	Apply
CO3	Interpret and sketch orthographic and sectional orthographic views of various machine components	L3	Apply
CO4	Visualize objects, and draw isometric views	L4	Analyse
CO5	Build 2D sketches using Auto CAD	L4	Create

Suggested Exercises

1. Orthographic Projections model 1 Using Auto CAD.
2. Orthographic Projections model 2 Using Auto CAD.
3. Sectional Orthographic Projections model 1 Using Auto CAD.
4. Sectional Orthographic Projections model 2 Using Auto CAD.
5. Sectional Orthographic Projections model 3 Using Auto CAD.
6. Isometric Views model 1 Using Auto CAD.
7. Isometric Views model 2 Using Auto CAD.
8. Isometric Views model 3 Using Auto CAD.
9. Projection of solids (Prism and Pyramid only) model 1 Using Auto CAD.
10. Projection of solids (Prism and Pyramid only) model 2 Using Auto CAD.
11. Layout Planning using AutoCAD for PCB.
12. Layout Planning using AutoCAD for Motherboard.

Minimum eight exercises from the above suggested list covering all the topics or any other experiment based on syllabus will be included, which would help the learner to apply the concept learnt.

Reference Books

1. K. Venugopal (2007), 'Engineering Drawing and Graphics + AutoCAD', New Age International Publishers.
2. M. L. Dabhade (2008), 'Engineering Drawing', Vision Publications.
3. Dhananjay A. Jolhe, 'Engineering Drawing with an Introduction to AutoCAD'. Tata McGraw Hill Education Private Limited.

Text Books

1. N. D. Bhatt, 'Engineering Drawing', Charotar Publishing House.
2. M. B. Shah and B. C. Rana 'Engineering Drawing', Pearson Education.

Effective Communication Skills (RCP23FCHS101)

Teaching Scheme
Lectures : 02 Hrs./week
Practical : - - - -
Tutorial : - - - -
Credit : 02

Examination Scheme
Term Test : 15 Marks
Teacher Assessment : 25 Marks
End Sem Exam : 60 Marks
Total Marks : 100 Marks

Pre-requisite

1. Basic proficiency in English Language

Course Objectives

1. To acquaint learners with the basics of communication with a focus on LSRW
2. To develop the learner's proficiency in public speaking skills
3. To enable learners to use the principles of business writing for effective communication
4. To impart strategies for personal development

Course Outcomes

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Use skills related to the various aspects of communication to express ideas with greater clarity	L3	Apply
CO2	Apply appropriate verbal/non-verbal cues in social and workplace situations and overcome the barriers to communication	L3	Apply
CO3	Employ personal development strategies for self-assessment, goal setting and maintaining a professional persona online	L3	Apply

Course Contents

Unit-I Fundamentals of Communication 10 Hrs.

1.1 Introduction to Theory of Communication

- Definition
- Objectives
- The Process of Communication

1.2 Methods of Communication

- Verbal Communication
- Non-verbal Communication

1.3 Barriers to Communication

- Physical/Environmental
- Mechanical
- Linguistic
- Psychological
- Socio-Cultural

1.4 Channels of Communication in an Organization

- Formal (Upward, Downward and Horizontal)
- Informal (Grapevine)

Unit-II Speaking Skills 02 Hrs.

2.1 Developing Verbal Aptitude

- Meaning of Words in Context
- Synonyms and Antonyms
- Identifying Common Errors
- Subject - Verb Agreement
- One Word Substitution
- Pairs of Confused Words

- Articles
- Prepositions

2.2 Public Speaking

- Planning your speech
- Delivery of speech (Vocalics and Body Language)
- Dealing with stage fear

Unit-III Reading Skills 03 Hrs.

3.1 Mechanics of Reading

3.2 Undesirable Reading Habits

3.3 Types of Reading

3.4 Guidelines for Improving Reading Skills

3.5 Reading Comprehension

3.6 Summarization Techniques

Unit-IV Listening Skills 02 Hrs.

4.1 Purpose of Listening

4.2 Process of Listening

4.3 Barriers to Listening

4.4 Techniques for Improving Listening Skills

Unit-V Writting Skills 06 Hrs.

5.1 Professional Letter Writing

- Seven Cs of Business Correspondence
- Parts of a Formal Letter
- Complete Block Format
- Types of Letters (Request, Grievance and Sales)

5.2 Email Communication

- Popularity of Email

- Problems in Email Communication
- Techniques for Writing Effective Emails
- Email etiquette

Unit-VI Personal Development Planning 03 Hrs.

6.1 Self- Assessment strategies (SWOT Analysis)

6.2 Digital Footprints-Maintaining a Professional Persona

6.3 Goal Setting

Books Recommended

1. Hemphill, P. D., McCormick, D. W., & Hemphill, R. D. (2001). Business Communication with Writing Improvement Exercises. Upper Saddle River, NJ: Prentice Hall.
2. Locker, Kitty O. Kaczmarek, Stephen Kyo. (2019). Business Communication: Building Critical Skills. Place of publication not identified: Mcgraw-hill.
3. Murphy, H. (1999). Effective Business Communication. Place of publication not identified: Mcgraw-Hill.
4. Raman, M., & Sharma, S. (2016). Technical Communication: Principles and Practice. New Delhi: Oxford University Press.
5. Kaul, A. (2015). Effective Business Communication. Place of publication not identified: Prentice-Hall of India.
6. Rizvi, A. M. (2010). Effective Technical Communication: A guide for scientists and engineers. New Delhi: Tata McGraw Hill.
7. Lewis, N. (2014). Word Power Made Easy. Random House USA.
8. Sanjay Kumar & Pushp Lata (2018). Communication skills with CD. New Delhi: Oxford University Press.
9. Mathew, Shirley (2022). Professional Communication and Ethics-I. Technical Publication.
10. Koneru, A. (2018). Professional Communication. McGraw Hill.

Effective Communication Skills Laboratory (RCP23FLHS101)

Practical Scheme
Lectures : - - - - -
Practical : 02 Hrs./week
Credit : 01

Examination Scheme
Teacher Assessment : 25 Marks

Total : 25 Marks

Course Objectives

1. To acquaint learners with the basics of communication with a focus on LSRW
2. To develop the learner's proficiency in public speaking skills
3. To enable learners to use the principles of business writing for effective communication
4. To impart strategies for personal development

Course Outcomes

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Use skills related to the various aspects of communication to express ideas with greater clarity	L3	Apply
CO2	Apply appropriate verbal/non-verbal cues in social and workplace situations and overcome the barriers to communication.	L3	Apply
CO3	Employ personal development strategies for self-assessment, goal setting and maintaining a professional persona online.	L3	Apply

List of Practicals/Assignments:

1. Self Introduction
2. Group Discussion
3. Mock Press
4. Extempore
5. Expansion of an Idea
6. Technical Description of an Object

Any Five Practicals/assignments from above .

Books Recommended

1. Hemphill, P. D., McCormick, D. W., & Hemphill, R. D. (2001). Business Communication with Writing Improvement Exercises. Upper Saddle River, NJ: Prentice Hall.
2. Locker, Kitty O. Kaczmarek, Stephen Kyo. (2019). Business Communication: Building Critical Skills. Place of publication not identified: Mcgraw-hill.
3. Murphy, H. (1999). Effective Business Communication. Place of publication not identified: Mcgraw-Hill.
4. Raman, M., & Sharma, S. (2016). Technical Communication: Principles and Practice. New Delhi: Oxford University Press.
5. Kaul, A. (2015). Effective Business Communication. Place of publication not identified: Prentice-Hall of India.
6. Rizvi, A. M. (2010). Effective Technical Communication: A guide for scientists and engineers. New Delhi: Tata McGraw Hill.
7. Lewis, N. (2014). Word Power Made Easy. Random House USA.
8. Sanjay Kumar & Pushp Lata (2018). Communication skills with CD. New Delhi: Oxford University Press.
9. Mathew, Shirley (2022). Professional Communication and Ethics-I. Technical Publication.
10. Koneru, A. (2018). Professional Communication. McGraw Hill.

Workshop Practice (RCP23FLVS101)

Practical Scheme
Lectures : - - - - -
Practical : 02 Hrs./week
Credit : 01

Examination Scheme
Teacher Assessment : 25 Marks

Total : 25 Marks

Course Objectives

1. To explain the concepts of industrial safety and important of working safely.
2. To identify tools, work material and measuring instruments useful for fitting, welding, carpentry, sheet metal, plumbing, PCB and house wiring practice.
3. To understand various fabrication processes and machine protocols.
4. To handle tools and instruments and use them to prepare joints/jobs of specific shape and size.
5. To understand the basic concept and structure of computer hardware and networking
6. To understand the basic work tools of house wiring and house wiring connection etc

Course Outcomes

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Apply the fundamentals of manufacturing to identify manufacturing process for given job drawing	L3	Apply
CO2	Select proper job material, tools, equipments and machines required for operations according to the job drawing with safety measures	L4	Analyze
CO3	Plan the sequence of operations required for manufacturing/fabrication of the job as per drawing	L3	Apply
CO4	Acquire hands-on experience and complete job as per job drawing within allotted time adhering to safety norms and set procedures	L5	Create
CO5	Inspect the job dimensions as per job drawing	L4	Analyze

Course Contents

Group A

1 Fabrication Processes 12 Hrs.

Use of setting of fitting tools for chipping, cutting, filing, making, center punching, drilling, tapping and finishing.

Edge preparation for welding jobs, Arc welding for different job like, Lap welding of two plates, butt welding of plates with simple cover, are welding to join plates at right angles.

2 PCB 12 Hrs.

Design, Layout drawing, Positive and negative film making, PCB etching and drilling. Tinning and soldering technique, Component mounting and circuit testing.

3 House Wiring 12 Hrs

Electrical safety in the workplace and safe work practices, Protection equipment, measures and tools. Introduction to house wiring, different types of cables, types of power supply, distribution of power supply, electrical wiring symbols. Wiring for two lamps (bulbs) with independent switch controls with or without looping, wiring for staircase lamp.

4 Computer Hardware and Networking 12 Hrs

Dismantling of a Personal computer (PC), Identification of components of a PC such as power supply, motherboard, processors, hard disk, memory (RAM, ROM), CMOS battery, CD Drive, monitor, keyboard, mouse, printers, disk drives etc. Assembling of PC, Installation of Operating System (any one), and Device drives, Boot-up sequence, Installation of Application software (at least one). Basic trouble shooting and maintenance. Identification of network components: LAN card, wireless card, switch, hub, router, different types of network cables (straight cables, crossover cables, rollover cables. Basic networking and crimping

Group B

5 Sheet Metal 8 Hrs.

Introduction to primary technology processes involving bending, punching and drawing, various sheet metal joints, development of joints.

6 Pipe Fitting 8 Hrs.

Use of plumbing tools, spanners, wrenches, threading dies, demonstration of preparation of a domestic line involving fixing of a water tap and use of coupling, elbow, tee and union etc.

7 CNC Machines 8 Hrs.

Introduction of CNC Machine tools, working principle, classification, constructional features of CNC Machines, CNC controller, types of motion controls in CNC Machines, application of CNC Machines. Manual part programing for turning and milling.

8	3D Printing	8 Hrs.

Introduction to Additive Manufacturing Technologies for engineering applications, 3D printing of a simple custom object using FDM, SLA and SLS technologies.

9	Drone	8 Hrs.

Introduction to drone and its applications, Fabrication and testing of mini drone.

List of Laboratory Experiments

List of Laboratory Experiments:

1. To study various types of fitting tools and make a Square joint, V joint, T joint, half round joint, dovetail joint from the given two MS pieces (Any one joint)
2. To study various welding techniques and make a V-butt joint or Lap-joint, using the given mild steel pieces by arc welding.
3. To make printed circuit board as per the given circuit drawing.
4. To make connection to two lights control by one switch in series or one light control by two-way switches.
5. To study computer hardware and operating system.
6. To study various types of sheet metal tools and make square or rectangular tray.
7. To study various types of plumbing tools and make one job containing various pipe fitting.
8. To study various operations of a CNC machining center and make one simple job on CNC turning.
9. To study various 3D printing techniques and make a simple object using any of these technique.
10. To study, fabricate and test mini drones.

Any other experiment based on syllabus may be included, which would help the learner to understand topic/concept.

Reference Books

1. Mechanical Workshop Practice, 2nd Edition, K.C. John, PHI Learning Pvt. Ltd. 2014
2. Manufacturing Technology- Vol 1, 4th Edition, P. N. Rao Tata McGraw Hill, 2014.
3. Printed Circuit Boards: Design, fabrication, assembly and testing, 1st Edition, R. S. Khandpur, Tata McGraw Hill 2005.

Text Books

1. Manufacturing Process and Systems, 9th Edition, P.F. Ostwald, John Wiley and Sons INC. UK 2008.

2. Electrical Workshop: Safety, Commissioning, maintenance and testing of electrical equipment, 3rd Edition, R.P. Singh, IK International Publishing House Pvt. Ltd. 2012.

Evaluation scheme

Term work shall consist of minimum one main job and two group jobs

The distribution of marks for term work shall be follows:

Laboratory work (Performance of experiments) : 25 Marks

Anyone Job from Group A (Main Job) : 15 Marks

Any two Jobs from Group B (Group Job) : 10 Marks

The final certification and acceptance of term work will be subject to satisfactory performance of laboratory work and upon fulfilling minimum passing criteria in the term work.

Indian Knowledge System (RCP23FTHS102)

Teaching Scheme	Examination Scheme
Lectures : - - -	Term Test : - - -
Practical : - - -	Teacher Assessment : 25 Marks
Tutorial : 02 Hrs./week	End Sem Exam : 25 Marks
Credit : 02	Total Marks : 50 Marks

Course Objectives

1. To impart knowledge about basic principles of thought process, reasoning and inferencing.
2. To make students aware of Indian Traditional knowledge Systems connecting society and nature.
3. To acquaint students with holistic lifestyle of yogic science and wisdom in modern society with rapid technological advancements and societal disruptions.

Course Outcomes

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Understand the history of Indian education system.	L2	Understand
CO2	Learn about Indian Scientists and their inventions.	L1	Knowledge
CO3	Understand and appreciate the various art forms and architecture in India.	L2	Understand
CO4	Illustrate the classic literature written in Indian languages.	L3	Apply
CO5	Know the various religions followed in India and their philosophies.	L1	Knowledge

Course Contents

Unit-I Indian Education System 04 Hrs.

- Gurukul system
- Ancient Universities (Nalanda, Takshashila,Vikramshila,Vallabhi,Nagarjuna,etc.)

Unit-II Indian Scientists and Their inventions 06 Hrs.

- Patanjali, Aryabhatta, Bhaskaracharya, Charaka, Brahmagupta, Varahmitra, Sushruta, Kanada, Baudhyana, etc.

Unit-III Indian Art and Architecture 06 Hrs.

- Mughal Paintings, Tanjore Paintings, Madhubani Paintings, Warli Paintings, etc.
- Harrappa and Mohenjo-Daro Civilization
- Temples and other religious places
- Buddhist stupas
- Forts and monuments

Unit-IV Indian Classic Literature 06 Hrs.

- Puranas
- Epics (Ramayana, Mahabharata, Shakuntala, Meghdoota, Arthashastra,Sangam Literature, Malavikagnimitram, etc.)

Unit-V Religion and Philosophy 04 Hrs.

- Vedas
- Buddhism
- Jainism and other religions

List of Tutorials/Assignments

1. Indian Education System
    - Group discussions/debates on various education systems.
2. Indian Scientists and Their inventions
    - Group presentations on various Indian scientists
    - An assignment on different inventions by Indians and their impact on world.
3. Indian art and architecture
    - Group Poster project on different painting forms and Harappa and Mohenjo-Daro civilization.
    - Group presentation on different archaeological structures in India
4. Indian Classic Literature
    - An assignment on review of any one of the Indian classic literatures.
    - Group discussion/Debate on the importance of the Indian classic literature in spreading the awareness about the importance of Indian culture and traditions.

OR

Dramatic Adaptations

- Ask students to adapt a scene or act from Indian classical literature into a dramatic performance.
- They can write scripts, create props and costumes, and rehearse their adaptations.
- Encourage creativity while staying true to the essence of the original work.
- Students can perform their adaptations for the class or in a larger setting..

5. Religion and Philosophy
    - A group discussion/debate on the various religions and their philosophies.

Suggested Text/Reference Books

1. B. Mahadevan, V. R. Bhat, Nagendra Pavana, Introduction to Indian Knowledge Systems: Concepts and Applications, PHI Learning Publications, Delhi,
2. Satishchandra Chaterjee, Dheerendramohan Datta, An Introduction to Indian Philosophy, Motilal Banarsidass Publishing House, New Delhi, 2016
3. V.Sivaramakrishnan (Ed.), Cultural Heritage of India-course material, Bharatiya Vidya Bhavan, Mumbai. 5th Edition,2014

Mathematics - II (RCP23FCBS201)

Teaching Scheme	Examination Scheme
Lectures : 03 Hrs./week	Term Test : 15 Marks
Practical : - - - -	Teacher Assessment : 25 Marks
Tutorial : - - - -	End Sem Exam : 60 Marks
Credit : 03	Total Marks : 100 Marks

Pre-requisite Knowledge of

1. Methods of integration.
2. Methods of differentiation.
3. Basics of differential equations.

Course Objectives

1. The course is aimed to develop the Mathematical skills of engineering students that are imperative for effective understanding of engineering subjects. The topics introduced will serve as basic tools for specialized studies in many fields of engineering and technology.
2. To provide hands on experience in using SciLab software to handle real life problems.

Course Outcomes

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Illustrate the concepts of Beta and Gamma function, DUIS and rectification of plane curves.	L4	Analyze
CO2	Solve the Multiple Integrals.	L3	Apply
CO3	Apply the concepts of Multiple Integrals to find Area, Volume, and mass of lamina.	L3	Apply
CO4	Solve various types of First Order and Higher Order differential equations.	L3	Apply
CO5	Apply the principles of Numerical Method for solving differential equation and numerical integration analytically and using SciLab.	L3	Apply

Course Contents

Unit-I Beta and Gamma Function, Differentiation under Integral sign and Rectification 12 Hrs.

Prerequisite: *Derivative,Integration*

1.1 Beta and Gamma functions and its properties.

1.2 Differentiation under integral sign with constant limits of integration.

1.3 Tracing of curves: Cardioid, Strophoid, Bernoulli's Lemniscate, Astroid, Cycloid, 3D Solids: Sphere, Cone, Cylinder, Paraboloid, Ellipsoid.

1.4 Rectification of plane curves in Cartesian form.

1.5 Rectification of curve in Parametric and Polar forms.

Unit-II Multiple Integrals 07 Hrs.

Prerequisite: *Integration*

2.1 Introduction, Evaluation of Double Integrals (Cartesian & Polar).

2.2 Evaluation of double integrals by changing the order of integration.

2.3 Evaluation of integrals over the given region (Cartesian & Polar).

2.4 Evaluation of double integrals by changing to polar coordinates(using Jacobian).

2.5 Introduction and evaluation of triple integral using Cartesian coordinate system.

2.6 Evaluation of triple integrals using cylindrical and spherical coordinate systems.

Unit-III Applications of Multiple Integrals 04 Hrs.

Prerequisite: *Double Integration and Triple Integration*

3.1. Application of double integrals to compute Area and Mass.

3.2. Application of triple integrals to compute Volume.

Unit-IV Differential Equations of First Order and First Degree 05 Hrs

Prerequisite: *Differential Equations, Variable seperable form*

4.1 Exact differential Equations, Equations reducible to exact form by using four rules of integrating factors.

4.2 Linear differential equations (Review), equation reducible to linear form. Bernoulli's equation.

Unit-V Higher Order Linear Differential Equations with Constant Coefficients and Variable Coefficients

07 Hrs

Prerequisite: *Unit-IV*

5.1 Linear Differential Equation with constant coefficient: complementary function, particular integrals of differential equation of the type $f(D)y = X$, where X is $e^{ax}, \sin(ax+b), \cos(ax+b), x^m, x^m \sin ax, x^m \cos ax, e^{ax}V, xV$.

5.2 Method of variation of parameters (upto 3^{rd} order).

5.3 Cauchy's homogeneous linear differential equation.

Unit-VI Numerical solution of ordinary differential equations of first order and first degree, Numerical Integration 04 Hrs.

Prerequisite: *Solution of Differential Equation*

6.1 Numerical solution of ordinary differential equation using: (a) Taylor series method, (b) Runge-Kutta method of order four.

6.2 Numerical integration by (a) Trapezoidal rule, (b) Simpson's $1/3^{rd}$ rule, (c) Simpson's $3/8^{th}$ rule (all without proof).

Reference Books

1. Calculus, Thomas and Finney, Pearson Education.
2. Advanced Engineering Mathematics, Erwin Kreyszig, Wiley Eastern Limited, 9th Ed.
3. Advanced Engineering Mathematics by H. K. Dass, 28th edition, S. Chand 2010.
4. Applied Numerical Methods with MATLAB for Engineers and Scientists by Steven Chapra, McGraw Hill.
5. A First Course in Differential Equations with Modelling Applications, Dennis G. Zill.

Text Books:

1. Higher Engineering Mathematics, Dr. B. S. Grewal, Khanna Publication
2. Advanced Engineering Mathematics, Dennis G. Zill, Warren S. Wright.

Mathematics - II Tutorial (RCP23FT2010T)

Teaching Scheme	Examination Scheme
Lectures : - - - -	Term Test : - - - -
Practical : - - - -	Teacher Assessment : 25 Marks
Tutorial : 01 Hrs./week	End Sem Exam :- - - -
Credit : 01	Total Marks : 25 Marks

Suggested Tutorials (including SciLab programs)

- Beta and Gamma Functions, DUIS and Rectification.
- Double integration.
- Triple Integration.
- Application of multiple integrals.
- Differential Equation of First Order and First Degree.
- Higher Order Differential Equation.
- Curve Tracing.
- Numerical Integration by Trapezoidal rule.
- Numerical Integration by Simpson's 1/3rd rule.
- Numerical Integration by Simpson's 3/8th rule.
- Ordinary Differential Equation.
- Numerical Solution of Ordinary Differential Equations of first order and first degree.
- Numerical Solution of Ordinary Differential Equations using Runge-Kutta fourth order method.

Minimum eight tutorials batchwise (including SciLab programs) from the above suggested list or any other experiment based on syllabus will be included, which would help the learner to apply the concept learnt.

Reference Books

1. Calculus, Thomas and Finney, Pearson Education.
2. Advanced Engineering Mathematics, Erwin Kreyszig, Wiley Eastern Limited, 9th Ed.
3. Advanced Engineering Mathematics by H. K. Dass, 28th edition, S. Chand 2010.

4. Applied Numerical Methods with MATLAB for Engineers and Scientists by Steven Chapra, McGraw Hill.

5. A First Course in Differential Equations with Modelling Applications, Dennis G. Zill.

Text Books:

1. Higher Engineering Mathematics, Dr. B. S. Grewal, Khanna Publication

2. Advanced Engineering Mathematics, Dennis G. Zill, Warren S. Wright.

Object Oriented Programming using Java (RCP23FCES201)

Teaching Scheme
Lectures : 02 Hrs./week
Practical : - - - -
Tutorial : - - - -
Credit : 02

Examination Scheme
Term Test : 15 Marks
Teacher Assessment : 25 Marks
End Sem Exam : 60 Marks
Total Marks : 100 Marks

Pre-requisite

1. Basics of Programming

Course Objectives

1. To make students familiar with basic and Object-Oriented features of Java.
2. To expose students to analyze a problem statement, develop suitable logic and implement it in Java.
3. To enable students to design and develop GUI applications.

Course Outcomes

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Develop programs by applying Object-Oriented concepts of JAVA to solve real-world problems.	L3	Apply
CO2	Achieve Robustness and Concurrency while developing programs (Exception Handling and Multithreding).	L3	Apply
CO3	Design Graphical User Interface using swing.	L3	Apply

Course Contents

Unit-I Introduction to Java as Object Oriented Programming Language 04 Hrs.

Fundamentals of Java Programming: Overview of procedure and object-oriented programming, Features of Java, Java Virtual Machine.

Principles of OOP: Object, Class, Encapsulation, Abstraction, Inheritance, Polymorphism.

Basic Constructs: Constants, variables and data types, Wrapper classes, Operators and Expressions.

Input & Output in Java: command line arguments, BufferedReader class and Scanner class.

Unit-II Branching and Looping 04 Hrs.

Branching and looping: if, if-else, nested if-else, if-else-if ladder, switch-case, break, continue, for loop, while loop, and do-while loop.

Arrays, Strings and Collection Types

Arrays, Strings (String and StringBuffer classes)

Collections: ArrayList, Vectors

Unit-III Classes and Objects 06 Hrs.

Access specifiers, static and non-static members, Passing and returning variables and references, Method Overloading, Recursion, Array of Objects.

Constructors

Constructors: Default, Parameterized Constructors, copy constructor and Constructor overloading.

Unit-IV Inheritance, Interfaces and packages 06 Hrs.

Inheritance and its types, Role of Constructors in inheritance, Method Overriding, super keyword, abstract class and abstract method, final keyword, Static and dynamic binding in Java, finalize method.

Interfaces: Implementing multiple inheritance and extending interfaces.

Packages: explore predefined packages, creating user defined packages and importing the same.

Unit-V Exception Handling and Multithreading (Robustness and Concurrency) 04 Hrs.

Error vs Exception, try, catch, finally, throw, throws, creating custom exceptions.

Multithreading: Need of Multithreading, Thread lifecycle, methods of Thread class, creating threads using Runnable interface and Thread class, Thread synchronization.

Unit-VI GUI programming in JAVA 02 Hrs.

SWING Programming: Swing Components and Containers, Swing Packages, A Simple Swing Appli-

cation, Designing Swing GUI Application and Event handling.

Text Books

1. Herbert Schildt, "Java-The Complete Reference", 11^{th} Edition, Tata McGraw Hill Publication, 2018.
2. E. Balguruswamy, "Programming with Java: A Primer", 5^{th} edition, Tata McGraw Hill Publication, 2017.
3. Sachin Malhotra and Saurabh Chaudhary, "Programming in Java", Oxford University Press, 2010.

Reference Books

1. D. T. Editorial Services, "Java 8 Programming Black Book", Dreamtech Press, 2015.
2. H. M. Deitel, P. J. Deitel, S. E. Santry, "Advanced Java 2 Platform How to Program", 11^{th} Edition, Prentice Hall, 2017.
3. ScriptDemics, "Learn to Master JAVA", from Star EDU solutions, 2017.
4. Ivor Horton, "Beginning JAVA", Wiley India.

Digital Material

1. www.nptelvideos.in
2. www.w3schools.com
3. http://spoken-tutorial.org
4. www.staredusolutions.org

Object Oriented Programming using Java Laboratory (RCP23FLES201)

Practical Scheme
Lectures : - - - - -
Practical : 02 Hrs./week
Credit : 01

Examination Scheme
Teacher Assessment : 25 Marks
End Sem Exam : 25 Marks
Total : 50 Marks

Course Objectives

1. To make students familiar with basic and Object-Oriented features of Java.
2. To expose students to analyze a problem statement, develop suitable logic and implement it in Java.
3. To enable students to design and develop GUI applications.

Course Outcomes

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Develop programs by applying Object-Oriented concepts of JAVA to solve real-world problems.	L3	Apply
CO2	Achieve Robustness and Concurrency while developing programs.	L3	Apply
CO3	Design Graphical User Interface using swing.	L3	Apply

List of Practicals/ Experiments/ Assignments

1. Program to demonstrate input using Scanner, BufferedReader and command line arguments.
2. Programs to demonstrate different decision-making statements.
3. Program to implement Arrays (1D, 2D).
4. Program on String and String Buffer.
5. Program on Collections (ArrayList/ Vectors)
6. Program to create class with members and methods.
7. Programs on static, non-static, recursive and overloaded methods.
8. Program on constructor and constructor overloading.
9. Program on passing and returning object as argument.
10. Program on creating user defined package.
11. Programs on single, multilevel and hierarchical inheritance.
12. Program to demonstrate multiple inheritance using interfaces.(Use super keyword).
13. Program on abstract class.
14. Program on dynamic method dispatch using base class and interface reference.
15. Program to demonstrate try, catch, throw, throws and finally.
16. Program to implement user defined exception.
17. Program to demonstrate concept of multithreading
18. Java programs to understand GUI designing and event handling.

Minimum 10-15 experiments from the above suggested list or any other experiment based on syllabus will be included, which would help the learner to apply the concept learnt.

Reference Books

1. D. T. Editorial Services, "Java 8 Programming Black Book", Dreamtech Press, 2015.
2. H. M. Deitel, P. J. Deitel, S. E. Santry, "Advanced Java 2 Platform How to Program", 11^{th} Edition, Prentice Hall, 2017.
3. ScriptDemics, "Learn to Master JAVA", from Star EDU solutions, 2017.
4. Ivor Horton, "Beginning JAVA", Wiley India.

Text Books

1. Herbert Schildt, "Java-The Complete Reference", 11^{th} Edition, Tata McGraw Hill Publication, 2018.
2. E. Balguruswamy, "Programming with Java: A Primer", 5^{th} edition, Tata McGraw Hill Publication, 2017.
3. Sachin Malhotra and Saurabh Chaudhary, "Programming in Java", Oxford University Press, 2010.

Digital Material

1. www.nptelvideos.in
2. www.w3schools.com
3. http://spoken-tutorial.org
4. www.staredusolutions.org

Foundation of Computing Technologies (RCP23FCPC2CE)

Teaching Scheme
Lectures : 02 Hrs./week
Practical : - - - -
Tutorial : - - - -
Credit : 02

Examination Scheme
Term Test : 15 Marks
Teacher Assessment : 25 Marks
End Sem Exam : 60 Marks
Total Marks : 100 Marks

Prerequisite: Computer Basics

Course Objectives

1. To have a thorough understanding of basic structure and operations of computer system.
2. To learn and practice data modelling using the Entity-Relationship and develop database design.
3. To introduce basic concepts and functions of different operating systems.
4. To understand and identify different types of cyber-crime and cyber offences.
5. To introduce fundamentals of Big Data, Data Science, Data Analytics, Data Warehouse and Data Mining.

Course Outcomes

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Understand the basics of computer architecture and organisation.	L2	Understand
CO2	Understand the concept of signals, error detection, wired and wireless networks.	L2	Understand
CO3	Design and draw ER diagram for the real-life applications.	L6	Create
CO4	Summarize basic functions and types of Operating System.	L2	Understand
CO5	Understand basics of computer security and different types of cyber threats.	L2	Understand
CO6	Understand fundamentals of big data, data science, data analytics, data warehouse and data mining.	L2	Understand

Course Contents

Unit-I Introduction to Computer Fundamentals 05 Hrs.

Introduction to Computers: Characteristics, Components, Advantages and Limitations, Classification of computers, Software- Classification & Application.

Introduction to Computer Architecture & Organization:

Introduction, Basic organization of computer architecture; Von Neumann model and Harvard architecture; Data Representation and Arithmetic Algorithms- Addition, Subtraction, Multiplication - unsigned multiplication, Booth's algorithm (Signed multiplication), Division of integers - restoring division, non-restoring division., Types of RAM (SRAM, DRAM, SDRAM. DDR, SSD) and ROM.

Unit-II Data Communication and Networking 04 Hrs.

Communication concepts: Characteristics of Signal (Amplitude, Frequency, Period, Wavelength). Channel Capacity for noiseless channel (Nyquist Law) and noisy channel (Shannon's Law). Data Rate versus Baud Rate, Error detection: Parity–based, CRC-based.

Wired Networks: Goals and applications of networks. LAN, MAN and WAN Architectures, Concept of WAN subnet, Overview of existing networks. Need for a Protocol Architecture, OSI Reference Model Architecture, FCS Computation. Error Control and recovery techniques. Concept of ARQ standard and its versions.

Wireless Networks: Bluetooth, Wi-Fi, Li-Fi.

Unit-III Database Management Systems 03 Hrs.

Introduction to Database: History, Characteristics, Users and Advantages, Classification of Database, Data Models, Schemas & Instances, Three Schema Architecture & Data Independence. DBMS Languages & Interfaces, Conceptual Data modeling using ER Model.

Relational Data Model Concepts: Domains, Attributes, Tuples, Relations & their characteristics. Relational Data Model Constraints- Entity Integrity, Referential Integrity, Foreign Keys and other Relational Database design using ER to Relational Mapping.

Unit-IV Fundamentals of Operating System 03 Hrs.

Definition of Operating System Objectives, types, and functions of Operating Systems, Architecture of Operating System, Internal and External Commands, Batch Files, Types of O.S- Windows, Linux, RTOS, Android, iOS, etc.

Unit-V Introduction to Computer Security 03 Hrs.

Basics of Security: Security Trends. CIA Trial, Threats, attacks, Vulnerability, Cryptography and its types, Security mechanisms.

Introduction to Cyber Security: Hacking, Data Theft, Cyber Terrorism, Virus and Worm's, Email Bombing, Pornography, online gambling, Forgery, Web Defacements, Web Jacking, Illegal online Selling, Cyber Defamation, Software Piracy, Electronics/ Digital Signature, Phishing, Password Cracking.

Unit-VI Introduction to Advanced Computing Technology 08 Hrs.

Big data: Introduction, Characteristics of big data, Big data case studies.

Data Science: Introduction to data science concept, Data Science Profile, The Data Science Process.

Data analytics: Overview, Importance of data analytics, Types of data analytics, Advantages of data analytics.

Data warehousing and Mining: Introduction to Data Warehouse and Dimensional modelling, Data Mining Task and Techniques, KDD process, Issues in Data Mining, Applications of Data Mining.

Data Engineering: Introduction to Data Engineering, Data cleansing, data transformation.

e Block chain Technology: Introduction, Bitcoin, Ethereum, Consensus algorithms, Smart contract.

Text Books

1. William Stallings, "Computer Organization and Architecture- Designing for Performance", Pearson 11^{th} Edition, 2022.
2. Andrew Tanenbaum, David Wetherall, "Computer Networks", Pearson 5^{th} Edition, 2010.
3. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, "Database System concepts", TMH 7^{th} Edition, 2021.
4. Abraham Silberschatz, Peter Galvin, "Operating System Concept", Wiley 9^{th} Edition, 2018.
5. Behrouz Forouzan, Debdeep Mukhopadhyay, "Cryptography and Network Security", TMH 3^{rd} Edition, 2015.
6. Nilakshi Jain, Ramesh Menon, "Cyber Security and Cyber Laws", Wiley 1^{st} Edition, 2020.
7. Neeraj Kumar, N. Gayathri, Md Arafatur Rahman, B. Balamurugan, "Blockchain, Big Data and Machine Learning: Trends and Applications", CRC Press 1^{st} Edition, 2020.

Reference Books

1. Mano M. Morris, "Computer System Architecture", Pearson 3^{rd} Edition, 2017.

2. Behrouz Forouzan, "Data Communications and Networking with TCP/IP Protocol", Mc Graw Hill 6th Edition, 2022.

3. Elmasri Ramez, Navathe Shamkant, "Fundamentals of Database System", Pearson 7th Edition, 2017.

4. Achyut Godbole, Atul Kahate, "Operating Systems", Mc Graw Hill 3rd Edition, 2017.

5. William Stallings, Lawrie Brown, "Computer Security - Principles and Practice", Pearson 4th Edition, 2019.

6. Nina Godbole, Sunit Belapure, "Cyber Security- Understanding Cyber Crimes, Computer Forensics and Legal Perspective", Wiley 1st Edition, 2011.

7. Gerard Cardoso, Marialena Zinopoulou, Stylianos Kampakis, Theodosis Mourouzis, "Business Models in Emerging Technologies: Data Science, AI, and Blockchain", Business Expert Press, 2022.

Electrical Networks
(RCP23FCPC2EC/RCP23FCPC2EE)

Teaching Scheme
Lectures : 02 Hrs./week
Practical : - - - -
Tutorial : - - - -
Credit : 02

Examination Scheme
Term Test : 15 Marks
Teachers Assessment : 25 Marks
End Sem Exam : 60 Marks
Total Marks : 100 Marks

Pre-requisite

1. Basic Electrical Engineering and Digital Electronics.
2. Mathematics - I.

Course Objectives

1. To analyse the circuits in time domain.
2. To study network topology, network functions, two port network.
3. To synthesize passive network by various methods.

Course Outcomes

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Apply the time-domain method for analysis of circuits	L3	Apply
CO2	Find the various parameters of two port network	L1	Remember
CO3	Apply network topology for analyzing the circuit	L3	Apply
CO4	Synthesize the network using passive elements.	L4	Analyze

Course Contents

Unit-I Graph Theory 06 Hrs.

Objectives of graph theory, Linear Oriented Graphs, graph terminologies, Matrix representation of a graph: Incidence matrix, Circuit matrix, Cut-set matrix, reduced incident matrix, tieset matrix. f-cutset matrix. KVL & KCL using matrix, solution of resistive networks and principle of duality

Unit-II Time domain analysis 06 Hrs

Transient Analysis of circuits containing R, L and C, Time domain analysis of R-L, R-C and R-L-C Circuits, Forced and natural response.

Unit-III Network functions 04 Hrs

Network functions for the one port and two port networks, driving point and transfer functions, Poles and Zeros of Network functions, necessary condition for driving point functions, necessary condition for transfer functions, Hurwitz Criterion.

Unit-IV Network Synthesis 07 Hrs.

Concept of positive real function, testing for necessary and sufficient conditions for Positive Real Functions, Synthesis of LC, RC & RL Circuits: properties of LC, RC & RL driving point functions, LC, RC & RL network Synthesis in Cauer-I & Cauer-II, FosterI & Foster-II forms.

Unit-V Two port Network 05 Hrs.

Parameters: Open Circuits, Short Circuit, Transmission and Hybrid parameters, relationship among parameters, conditions for reciprocity and symmetry (without dependent sources)

Reference Books

1. A Chakrabarti, "Circuit Theory", Dhanpat Rai & Co., Delhi, 6th Edition
2. Sudhakar, Shyammohan S. Palli "Circuits and Networks", Tata McGraw-Hill education.
3. Smarajit Ghosh, "Network Theory Analysis & Synthesis", PHI learning.
4. K.S. Suresh Kumar, "Electric Circuit Analysis", Pearson (2013)
5. D Roy Choudhury, Networks and Systems, New Age International 1998.

Text Books

1. Franklin F Kuo, "Network Analysis and Synthesis", Wiley, 2nd ed. 1966
2. M E Van Valkenburg, "Network Analysis", Prentice-Hall of India Pvt Ltd, New Delhi, 26th Indian Reprint, 2000.
3. Ravish Singh, "Circuit Theory and Networks", Tata McGraw-Hill education, 2e, 2016.

Elements of Mechanical Engineering

(RCP23FCPC2ME)

Teaching Scheme	Examination Scheme
Lectures : 02 Hrs./week	Term Test : 15 Marks
Practical : - - - -	Teacher Assessment : 25 Marks
Tutorial : - - - -	End Sem Exam : 60 Marks
Credit : 02	Total Marks : 100 Marks

Course Objectives:

1. To acquaint learners with the basics of thermodynamics and energy conversion devices.
2. To familiarize learners with the machine elements.
3. To impart the knowledge of materials, manufacturing processes and machine tools.

Course Outcomes:

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Understand the scope of mechanical engineering and fundamentals of thermodynamics.	L2	Understand
CO2	Understand working principle of various energy conversion devices.	L2	Understand
CO3	Identify various machine elements for different applications.	L2	Understand
CO4	Understand various additive and subtractive manufacturing processes, chip less and chip removal processes.	L2	Understand
CO5	Describe various types of conventional machine tools and CNC machines, with machining operations to generate cylindrical, and planar components.	L2	Understand

Course Contents

Unit-I Introduction to Mechanical Engineering (Overview only)

06 Hrs

Role of Mechanical Engineering in Industry and Society - Emerging Trends and Technologies in different sectors, such as Energy, Manufacturing, Automotive, Aerospace and Marine sectors.

Thermodynamics:

Thermodynamic work, p-dV work in various processes, p-V representation of various thermodynamic processes and cycles, Ideal gas equation, Properties of pure substance, Statements of First and Second law of thermodynamics and their applications. Carnot cycle for Heat engine, Refrigerator and Heat pump.

Unit-II Energy Conversion Devices 05 Hrs

Steam generation process, Boiler: Mountings and accessories, Fire tube and Water tube boiler, Construction and working of Babcock & Wilcox, Cochran boiler, Introduction and Working principle of Steam Turbines, Gas turbine, Hydraulic turbines: Working of Pelton wheel and Francis turbine, Reciprocating Compressor, Reciprocating Pump, Working of Reciprocating I.C. engines (2 Stroke and 4 stroke), Study of household refrigerator and air conditioner.

Unit-III Machine elements (Theoretical study and applications) 05 Hrs

Power transmission shafts, axles, keys (Types and its applications). Bearings: Purpose, Classification, sliding contact bearing: Solid journal bearing, Bush bearing, rolling contact bearing: Ball bearing, Roller bearings. Power Transmission Devices (Basic elements and its applications): Belt drives, Gear drives and Couplings: Types and its applications.

Introduction to machine design process

Unit-IV Materials and Manufacturing Processes 05 Hrs

Introduction to Engineering materials and material selection criteria. Classification of manufacturing process based on additive and subtractive process, chip-less and chip-removal process.

Additive Manufacturing process (Liquid based, Solid based & Powder based processes). Casting, Forging, Extrusion, Rolling, Sheet metal forming/cutting, Metal joining processes.

Unit-V Machine Tools 05 Hrs

Conventional machine tools required to generate cylindrical and planar components. Introduction to Numerical Control (NC) and Computer Numerical Controlled (CNC) machines.

Introduction to various non-conventional machining processes, classification based on Thermal, Electrical, Chemical and Mechanical energy.

Text Books

1. R. K. Rajput, Elements of Mechanical Engineering, Laxmi Publications Pvt Ltd, 2017.
2. B. Y. Patil and H. G. Patil, Elements of Mechanical Engineering, John Wiley & Sons, 2020.
3. Mahesh Kumar, Elements of Mechanical Engineering, John Wiley & Sons, 2019.
4. N. R. Babapurmath and V. S. Yalliwal, Basic Mechanical Engineering, Vikas Publishing, 2014.

Reference Books

1. P. K. Nag, Engineering Thermodynamics, Tata McGraw-Hill Publishing Co. Ltd, 2018.
2. Yunus A. Cengel and Boles, Thermodynamics: An Engineering Approach , Tata McGraw-Hill Publishing Co. Ltd., 2019.
3. Arora and Domkundwar, Thermal Engineering, Dhanpat Rai and Sons, 2009.
4. V. B Bhandari, Design of machine elements, Tata McGraw Hill, 2017.
5. W. A. J. Chapman, Workshop Technology Part 1 & 2, fifth edition, Routledge, Taylor & Francis Group, 2019.
6. Serope Kalpakjian and Steven R. Schmid Manufacturing Processes for Engineering Materials, Pearson, Sixth Edition, 2017.
7. Mikell P. Groover, Fundamentals of Modern Manufacturing, Materials, Processes and Systems, John Wiley & Sons, Inc, Seventh Edition, 2020.

Elements of Civil Engineering (RCP23FCPC2CE)

Teaching Scheme
Lectures : 02 Hrs./week
Practical : - - - -
Tutorial : - - - -
Credit : 02

Examination Scheme
Term Test : 15 Marks
Teacher Assessment : 25 Marks
End Sem Exam : 60 Marks
Total Marks : 100 Marks

Course Objectives

1. To familiarize students with fundamental principles and scope in civil engineering.
2. To acquaint students with practical application in the field of Civil Engineering.

Course Outcomes

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	To understand the role of civil engineer in society and to relate the various disciplines of Civil Engineering.	L3	Understand, Remember
CO2	To understand different types of buildings, building components, building materials and building construction.	L3	Understand, Remember
CO3	To understand the design and principles of planning.	L2	Understand, Apply
CO4	To understand importance, objectives and principles of surveying.	L1	Understand
CO5	To understand the basic application of various civil engineering software.	L3	Understand

Course Contents

Unit-I Introduction to Civil Engineering 05 Hrs

Introduction to various branches of civil engineering, introduction to various civil engineering structures such as buildings, highways, railways, bridges, dams, canals, elevated and ground storage reservoirs etc.

Unit-II Building Components 05 Hrs.

Part A: *Types of Structures*

Superstructure, Sub Structure, functions of foundation, types of shallow and deep foundations, suitability in different situation, Load on Structure.

Part B: *Introduction to various parts of buildings*

Plinth, walls, lintels, beams, columns, slabs, roofs, staircases, floors, doors, windows, sills, ventilation, basics of plumbing and sanitation.

Unit-III Building Planning & Construction 07 Hrs.

Building plans, principles of planning, site selection for buildings, typical plan of a residential building, plinth area, carpet area, cost of building, FSI, building bye laws, ventilation and lighting.

Unit-IV Basic Surveying 07 Hrs.

Principles of surveying, Linear and Angular Measurement, Introduction to compass, bearing, Whole Circle Bearing and Reduced Bearing systems (Theory + Numerical), local attraction, its detection and correction (Theory + Numerical). Concept of bench mark, reduced level and contours.

Unit-V Software's in Civil Engineering 07 Hrs.

Brief introduction to various computer software's in the field of Civil Engineering

- Applications of Data Science and Artificial Intelligence (AI) in Civil Engineering
- Introduction and use of AutoCAD and ZWCAD for making drawings, 3D modelling software's – 3D Max, Revit Architecture, Revit for BIM (Building Information Modelling), 3D Printing.
- Software's related to Structural Engineering: STAAD-Pro, ETABS, SAP, MIDAS, ATENA etc.
- Software's of Advance Surveying: GPS, GIS, Auto Plotter, 3D Civil
- Software's of Water Resource Engineering: HEC-HMS, HEC-RAS.
- Software's related to Construction Management and Estimation: MSP, Primavera, Sage Estimation.

Reference Books / Text Books

1. Anurag Kandya, Elements of Civil Engineering, Charotar Publishing.
2. M. G. Shah, C. M. Kale, and S. Y. Patki, Building Drawing. McGraw-Hill Publication.
3. Sushil Kumar, Building Construction, Standard Publishers Distributors.
4. M. S. Palani Gamy, Basic Civil Engineering, McGraw-Hill Publication.
5. Kanetkar T. P. and Kulkarni S. V., Surveying and Levelling, Vols. I, II and III, Vidyarthi Gruh Prakashan, Pune.
6. B. C. Punmia, Surveying, Vol. - I, Vol.-II, Vol.-III, Laxmi Publications.
7. G. K. Hiraskar, Basic Civil Engineering, Dhanpat Rai Publications.
8. Chudley. R., Construction Technology, Vol.1, 2, 3, 4, ELBS Publisher.
9. NBC 2005, National Building Code of India, Parts III, IV, VII and IX, B.I.S. New Delhi.

Fundamentals of Data Analysis (RCP23FCPC2DS)

Teaching Scheme	Examination Scheme
Lectures : 02 Hrs./week	Term Test : 15 Marks
Practical : - - - -	Teacher Assessment : 25 Marks
Tutorial : - - - -	End Sem Exam : 60 Marks
Credit : 02	Total Marks : 100 Marks

Prerequisite: Basic Mathematics and Data Interpretation

Course Objectives:

To develop skills of data analysis techniques for data modelling.

CO	Course Outcomes	Blooms Level	Blooms Description
CO1	Understand data properties.	L2	Understand
CO2	Apply statistical methods for data analysis.	L3	Apply
CO3	Articulate various techniques to improve quality of data.	L2	Understand

Course Contents

Unit-I Data 04 Hrs.

Data objects and attributes: nominal, binary, ordinal, numeric, discrete, continuous;

Characteristics of datasets: dimensionality, sparsity, resolution;

Types of data sets: record data, data matrix, graph-based data, sequential data, sequence data, time-series data, spatial data.

Unit-II Data and Text Visualization 04 Hrs.

Seven Stages of Data Visualization, Types of charts (comparison, distribution, composition, relationship), **Structured Data:** bar chart, pie chart, histogram, stacked bar graph, box plot, scatter plot, heat map, line chart, Node-link, dual axis chart.

Unstructured Data: word count, bar chart, word tree, line chart diagrams, Word clouds.

Unit-III Descriptive Statistics 06 Hrs.

Population Vs Sample;

Measure of Central Tendency: arithmetic mean, weighted mean, median, mode, grouped and ungrouped data, empirical relationship between mean, median and mode, geometric mean, harmonic mean and outliers;

Measure of Dispersion: Range, quartile deviation, mean deviation, standard deviation, variance, empirical relationship between measures of dispersion, absolute and relative dispersion, skewness, kurtosis and histogram;

Measure of Position: Quartiles, interquartile range, semi interquartile range, percentile, percentile rank, box and whisker plot.

Unit-IV Data Preprocessing 07 Hrs.

Need of Data Pre-processing

Data Cleaning: Handling missing values and noisy data;

Data Transformation: Smoothing, attribute construction, aggregation, normalization;

Data Discretization: Binning and Histogram analysis;

Outlier Detection: Types of outliers, challenges, statistical method (z-score), proximity-based method (K-NN and LOF).

Unit-V Feature Engineering 05 Hrs.

Curse of Dimensionality, Feature Selection: Univariate methods (Pearson Correlation, Chi_square) and Multivariate methods (Forward Selection, Backward Selection and Stepwise Selection).

Text Books:

1. Sharada Sringeswara, Purvi Tiwari, U. Dinesh Kumar, "Data Visualization Storytelling using Data", 1st Edition, Wiley, 2022.

2. Han Kamber, Morgan Kaufmann, "Data Mining Concepts and Techniques", Elsevier, 2022.

3. S.C.Gupta and V.K.Kapoor, "Fundamentals of Mathematical Statistics", Sultan Chand Publisher, 2020

Reference Books:

1. Jason Browniee, "Data Preparation for Machine Learning", ebook by Machine Learning Mastry, 2020.

2. Jason Osborne, "Best Practices in Data Cleaning: A Complete Guide to Everything you Need to Do Before and After Collecting Your Data", Sage Publication, 2012.

3. Ethan McCallum, "Bad Data Handbook: Cleaning Up the Data so you can get back to work", O'Reilly, 2012.

4. Max Kuhn and Keijell Johnson, "Feature Engineering and Selection: A practical Approach for Predictive Models", CRC Press, 2020.

Fundamentals of Artificial Intelligence & Machine Learning (RCP23FCPC2AM)

Teaching Scheme
Lectures : 02 Hrs./week
Practical : - - - -
Tutorial : - - - -
Credit : 02

Examination Scheme
Term Test : 15 Marks
Teacher Assessment : 25 Marks
End Sem Exam : 60 Marks
Total Marks : 100 Marks

Prerequisite: Basic knowledge of computers

Course Objectives:

To familiarize the fundamentals of Artificial Intelligence and Machine Learning.

CO	Course Outcomes	Blooms Level	Blooms Description
CO1	Understand the basics of Artificial Intelligence and its applications.	L2	Understand
CO2	Apply problem-solving techniques for problem formulation.	L3	Apply
CO3	Understand the fundamentals of Data Processing and Machine Learning.	L2	Understand

Course Contents

Unit-I Introduction to Artificial Intelligence 05 Hrs.

Introduction: Introduction, History of Artificial Intelligence, Types of AI, Intelligent Systems: Categorization of Intelligent System, Components of AI Program, Applications of AI (Robotics, Healthcare, Industry), Current trends in AI.

Intelligent Agents: Agents and Environments, The concept of rationality, The nature of environment, PEAS representation, The structure of Agents, Types of Agents. and Learning Agent.

Unit-II Problem solving and Searching Techniques 05 Hrs.

Problem Solving Agent, **Formulating Problems:** steps problem solving in AI, **Example Problems:** Vacuum world state space graph, 8 Puzzle Problem, 4 queen and 8 Queen Problem, Introduction to searching techniques in AI.

Unit-III Knowledge Representation 05 Hrs.

A Knowledge Based Agent, Overview of Propositional Logic, First Order Predicate Logic, Introduction to PROLOG, Case Study.

Unit-IV Expert Systems 05 Hrs.

Introduction, Phases in building Expert Systems, Expert system Architecture, Case Study on Expert System. Applications of Expert Systems. How to achieve AI in practical: Introduction to Machine and Deep Learning, Introduction to No code AI tools.

Unit-V Introduction to Machine Learning 06 Hrs.

History of Machine Learning, Life cycle of Machine learning, Classification of Machine Learning, Introduction to Data warehouse and data mining, Data preprocessing overview, Case study. Applications of Machine Learning.

Text Books:

1. Stuart J. Russell and Peter Norvig, "Artificial Intelligence A Modern Approach", 4th Edition, Pearson Education, 2022.
2. Saroj Kaushik, "Artificial Intelligence", 1st Edition, Cengage Learning, 2011.
3. George F Luger, "Artificial Intelligence", 5th Edition, Low Price Edition, Pearson Education, 2005.
4. Deepak Khemani, "A First Course in Artificial Intelligence", 6th reprint 2018 Edition (1 July 2017), McGraw Hill Education (India).

Reference Books:

1. Ivan Bratko, "PROLOG Programming for Artificial Intelligence", 4th Edition, Addison-Wesley, 2011.
2. Elaine Rich and Kevin Knight, "Artificial Intelligence", 3rd Edition, 2017.
3. Davis E.Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley, N.Y., 1989.
4. Patrick Henry Winston, "Artificial Intelligence", 3rd Edition, Addison-Wesley, 1992.
5. Han Kamber, "Data Mining Concepts and Techniques", Morgann Kaufmann Publishers, 3rd Edition, 2011.
6. N.P.Padhy."Artificial Intelligence and Intelligent Systems", Oxford University Press, 2005.

Online References:

1. https://onlinecourses.swayam2.ac.in/aic20_sp06/preview
2. https://onlinecourses.swayam2.ac.in/arp19_ap79/preview

Foundation of Information Technology (RCP23FCPC2IT)

Teaching Scheme	Examination Scheme
Lectures : 02 Hrs./week	Term Test : 15 Marks
Practical : - - - -	Teacher Assessment : 25 Marks
Tutorial : - - - -	End Sem Exam : 60 Marks
Credit : 02	Total Marks : 100 Marks

Prerequisite: Computer Fundamentals

Course Objectives:

The objective of the course is to introduce the learner to the basics of computers, viz., the architecture, computer arithmetic, operating system and network basics. The course will also abreast the learner of the basics of computer security.

CO	Course Outcomes	Blooms Level	Blooms Description
CO1	Understand the organization of a computer system and networking.	L2	Understand
CO2	Understand the basics of computer security.	L2	Understand

Course Contents

Unit-I Introduction to Computers and its Architecture 03 Hrs.

Von Neumann model, Input-Output Devices, Memory Hierarchy-Cache Memory, Internal Memory, External Memory, Primary Vs Secondary Storage, Data Storage & retrieval methods. Primary Storage: RAM ROM, PROM, EPROM, EEPROM. Secondary Storage: HDD, SSD.

Unit-II The Central Processing Unit 05 Hrs.

The ALU, Integer Representation, Integer Arithmetic, Floating Point Representation, Floating-Point Arithmetic, Machine Instruction Characteristics, Types of Operations – Data Transfer, Arithmetic, Logical, Conversion, Input/Output, Addressing Modes – Immediate, Direct, Indirect, Register, Register Indirect, Register Organization, Instruction Cycle.

Unit-III Computer Arithmetic 06 Hrs.

Introduction to number systems-Binary number systems, octal, hexadecimal and their operations, conversion, 1's and 2's complement. Binary Arithmetic using complements – addition, subtraction, signed and unsigned integers.

Unit-IV Operating System 05 Hrs.

Functions, Measuring System Performance, Batch Processing, Multiprogramming, Multi-Tasking, Multiprocessing, Time Sharing, DOS, Windows, Unix/Linux.

Unit-V Data Communication and Networks 04 Hrs.

Communication Process, Data Transmission speed, Communication Types (modes), Network Devices, Types of Networks, LAN Topologies, compression and its types-Lossy and Lossless.
Fundamentals of cloud computing-SaaS, PaaS, IaaS, applications.

Unit-VI Attacks on Computers and Computer Security 03 Hrs.

Introduction, Need for Security, Security Approaches, Principles of Security, Types of Attacks.

Text Books:

1. "Introduction to Computer Science", ITL Education Solutions Limited, 2nd Edition, Pearson, 2011.
2. Atul Kahate, "Cryptography and Network Security", 4th Edition, McGraw-Hill, 2019.
3. R. P. Jain, "Modern Digital Electronics", 4th Edition, Tata McGraw Hill, 2009.
4. M. Morris Mano, "Digital Logic and computer Design", 1st Edition, Pearson Education India,

2016.

Reference Books:

1. Anand Kumar, "Fundamentals of Digital Circuits", 4^{th} Edition, Prentice Hall India, 2003.
2. Donald P Leach, Albert Paul Malvino, "Digital Principles and Applications", 8^{th} Edition, Tata McGraw Hill, 2014.
3. Behrouz A. Forouzan, "Cryptography & Network Security", 3^{rd} Edition, Tata McGraw Hill, 2015.
4. William Stallings, "Computer Organization and Architecture: Designing for Performance", 10^{th} Edition, Pearson, 2015.

Fundamentals of Artificial Intelligence & Data Science (RCP23FCPC2AD)

Teaching Scheme
Lectures : 02 Hrs./week
Practical : - - - -
Tutorial : - - - -
Credit : 02

Examination Scheme
Term Test : 15 Marks
Teacher Assessment : 25 Marks
End Sem Exam : 60 Marks
Total Marks : 100 Marks

Prerequisite: Basic knowledge of computers

Course Objectives:

To familiarize the fundamentals of Artificial Intelligence and Data Science.

CO	Course Outcomes	Blooms Level	Blooms Description
CO1	Understand the basics of Artificial Intelligence and its applications.	L2	Understand
CO2	Apply problem-solving techniques for problem formulation.	L3	Apply
CO3	Understand the fundamentals of Data Science.	L2	Understand

Course Contents

Unit-I Introduction to Artificial Intelligence 06 Hrs.

Introduction, History of Artificial Intelligence, Types of AI, Intelligent Systems: Categorization of Intelligent System, Components of AI Program, Applications of AI (Robotics, Healthcare, Industry), Current trends in AI.

Intelligent Agents: Agents and Environments, The concept of rationality, The nature of environment, PEAS representation, The structure of Agents, Types of Agents, and Learning Agent.

Unit-II Problem solving and Searching Techniques 06 Hrs.

Problem Solving Agent, Formulating Problems: Steps problem solving in AI

Example Problems: Vacuum world state space graph, 8 Puzzle Problem, 4 queen and 8 Queen Problem. Introduction to searching techniques in AI.

Unit-III Expert Systems 06 Hrs.

Introduction, Phases in building Expert Systems, Expert system Architecture, Case Study on Expert System. Applications of Expert Systems. How to achieve AI in practical: Introduction to Machine and Deep Learning, Introduction to No code AI tools.

Unit-IV Fundamentals of Data Science 08 Hrs.

Introduction to data lake, Data Lake frameworks, Data Pre-Processing An Overview, Cleaning, Data Integration, Data Reduction, Data Transformation and Data discretization. Exploratory Data Analysis (EDA): Philosophy of EDA - The Data Science Process

Text Books:

1. Stuart J. Russell and Peter Norvig, "Artificial Intelligence A Modern Approach", 4^{th} Edition, Pearson Education, 2022.
2. Saroj Kaushik, "Artificial Intelligence", 1^{st} Edition, Cengage Learning, 2011.
3. George F Luger, "Artificial Intelligence", 5^{th} Edition, Low Price Edition, Pearson Education, 2005.
4. Deepak Khemani, "A First Course in Artificial Intelligence", 6^{th} reprint 2018 Edition (1 July 2017), McGraw Hill Education (India).

Reference Books:

1. Ivan Bratko, "PROLOG Programming for Artificial Intelligence", 4^{th} Edition, Addison-Wesley, 2011.

2. Elaine Rich and Kevin Knight, "Artificial Intelligence", 3rd Edition, 2017.

3. Davis E.Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley, N.Y., 1989.

4. Patrick Henry Winston, "Artificial Intelligence", 3rd Edition, Addison-Wesley, 1992.

5. Han Kamber, "Data Mining Concepts and Techniques", Morgann Kaufmann Publishers, 3rd Edition, 2011.

6. N.P.Padhy, "Artificial Intelligence and Intelligent Systems", Oxford University Press, 2005.

Online References:

1. https://onlinecourses.swayam2.ac.in/aic20_sp06/preview

2. https://onlinecourses.swayam2.ac.in/arp19_ap79/preview