GROUP I : SEMESTER I

Sr. No.	Course Code	Course Title	Hours per Week			Credits	Maximum Marks					No. of Hrs for ESE
			L	T	P		Mid-Sem Examination	Continual Assessment	End Sem Examination	Total	Minimum Passing Marks	
1	25IT101T	Engineering Chemistry	2	-	-	2	10	10	30	50	23	1.5
2	25IT101P	Engineering Chemistry Lab	-	-	2	1	-	25	25	50	25	-
3	25IT102T	Linear Algebra and Calculus	3	-	-	3	20	20	60	100	45	3
4	25IT102P	Linear Algebra and Calculus Lab	-	-	2	1	-	25	25	50	25	-
5	25IT103T	Fundamentals of IT	3	-	-	3	20	20	60	100	45	3
6	25IT104T	Logic building with C	2	-	-	2	10	10	30	50	23	1.5
7	25IT104P	Logic building with C Lab	-	-	2	1	-	25	25	50	25	-
8	25IT105P	Software Lab - I	-	-	4	2	-	25	25	50	25	-
9	25IT106P	Business Communication Skills-I Lab	-	-	2	1	-	25	25	50	25	-
10	25IT107T	Indian Knowledge Systems #	2	-	-	2	10	10	30	50	23	1.5
11	25IT108T	Co-curricular Courses - I	2	-		2	-	50	-	50	23	-
Total			**14**	**-**	**12**	**20**	**70**	**245**	**335**	**650**	**-**	**-**

 # Course to be conducted online through NPTEL

SEMESTER I

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation			
						MSE	CA	ESE	Total
25IT101T	Engineering Chemistry	2	-		2	10	10	30	50

Course Objectives	Course Outcomes
This course is intended • To acquaint the students with the basic phenomenon, concepts, knowledge and understanding of the fundamental principles of chemistry. • To develop necessary skills and abilities to succeed in engineering education, research, Industry, environment and social context.	**Students will be able to** • Develop innovative ideas for use of advanced materials in sustainable development. • Evaluate the role of nanotechnology in industrial applications such as energy storage, medicine, electronics, and environmental remediation. • Apply the Basic concepts of Electrochemistry in engineering • Evaluate the performance and advantages of Li-Ion battery, fuel cell and photochemical cell in terms of efficiency, working mechanism, and applications. • Apply the concept of e-waste management and analyze its environmental impact

Unit I Advanced Material **[10 Hrs]**

Introduction-Need for Development, Biodegradable polymers- PLA, PCL - Synthesis, Properties and Applications, Conducting Polymers- Polypyrole, PANI Synthesis, Properties and Applications, Liquid Crystal Polymers- Types, Properties and Applications, Composite Material-Constituents- Matrix & Reinforcement, Classification of composite, Advantages & Industrial Applications of Composite materials, Nanomaterials- Definition, Carbon Nanotubes, Industrial Applications of Nanotechnology

Unit II Electrochemical Phenomenon & Battery Technology **[10 Hrs]**

Introduction- brief idea about Electrochemical & Galvanic series, Electrolytic & Electrochemical Cell, Battery- Primary, Secondary & Reserve batteries- Advantages & Applications, Li Ion Battery, H_2O_2 Fuel Cell, Photochemical Cell - Construction, Working, Advantages & Applications. Electrolysis of water to produce hydrogen

Unit III Chemistry of Electronic waste **[10 Hrs]**

Introduction. E- Waste; composition and generation. Types of E-waste, E waste hazardous properties, Effects of pollutant (E-waste) on human health and surrounding environment, Basic principles of E waste management, Component of E waste management- Domestic e-waste disposal, E-waste Control measures- Reduction of waste at source, Segregation & Recycling- Hydrometallurgical, Pyro metallurgical & Direct recycling.

Text Books

S.N	Title	Authors	Edition	Publisher
1	Text Book of Engineering Chemistry	S.S. Dara,	New	S. Chand and Company Ltd. New Delhi.
2	Textbook of Engineering Chemistry	P.C. Jain and Monica Jain	Sixth	Dhanpat Rai and Sons, New Delhi.
3	E-waste Recycling and Management	Anish Khan, Inamuddin, Abdullah M. Ansiri	Ist	Springer

Reference Books

S.N	Title	Authors	Edition	Publisher
1	A Text book of Engineering Chemistry	Shashi Chawla	Ist	Dhanpat Rai& Sons, New Delhi
2	Applied Chemistry	N. Krishnamurthy:P. Vallinavagam. And K. Jeysubramanian	Ist	TMH

Online Resources

1	suchitanimbalkar@gnomio.com
2	kkhandarka@gnomio.com
3	mmjstudents@wordpress.com
4	jyotithakre@gnomio.com

SEMESTER I

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
25IT101P	Engineering Chemistry Lab			2	1	25	25	50

Course Objectives	Course Outcomes
• To Make the students aware about various techniques available for Analysis of Material. • To Impart the skill of handling chemicals and apparatus.	• Prepare chemical compounds, materials, and standard solutions using conventional laboratory techniques and demonstrate good laboratory practices. • Utilize electrochemical and conductometric methods for the quantitative estimation of chemical substances such as acids and metals. • Analyze industrial effluents to determine the concentration of pollutants using quantitative chemical analysis methods • Interpret water quality parameters and estimate metal concentrations through virtual simulations and demonstration-based experiments.

Expt. No.	Experiments based on Performance (Any SIX)
1	Synthesis of Bakelite resin using acid catalyst.
2	Synthesis of Conducting polymer (Polyaniline).
3	Determination of heavy metal from industrial effluent by complexometry method.
4	Determination of heavy metal from industrial effluent by colorimeter
5	Preparation of Natural fibre reinforcement Composite material
6	Determination of strength of the given acid Conductometrically
7	Determine electrochemical equivalent of Cu metal using Faradays law
8	Preparation of different solutions (Molar, Normal & Percent solution)
	Virtual Experiment - Any ONE
9	Determination of Hardness from Tap water/ Well water/ Sea water
10	Determination of Alkalinity of Water Sample using Warder method
11	Electro gravimetric estimation of Nickel metal
	Demonstration - Any ONE
12	Determination of turbidity from industrial effluent.
13	Determination of pH by using different methods.
	Activity - Any ONE
1	Visit to e-waste recycling plant
2	Study of Air /Water Pollution Level at different Sites in Nagpur City.
3	Study of nearby industrial chemicals and safety measures

Text Books

S.N	Title	Authors	Edition	Publisher
1	A Textbook on experiment and calculation in engineering chemistry	S.S. Dara	9th	S.Chand

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Applied Chemistry theory and practical	O.P. Virmani and A.K. Narular	Ist	New Age International
2	Laboratory Manual on Engineering Chemistry	Dr. Subdharani	Ist	Dhanpat Rai Publishing

SEMESTER-I

Course Code	Course Name	Th	Tu	Pr	Credits	MSE			
						MSE	CA	ESE	Total
25IT102T	Linear Algebra & Calculus	3	-		3	20	20	60	100

Course Objectives	Course Outcomes
This course is intended to • Develop students' conceptual understanding and computational skills in Matrix Algebra and Differential Equations for solving mathematical problems. • Enable learners to apply Multivariate and Vector Calculus for analyzing functions of several variables and modeling physical phenomena.	**Students will be able to** • Apply matrix concepts to solve and analyze linear systems. • Analyze and solve engineering problems involving eigenvalues, eigenvectors, and functions of matrices. • Solve multivariate calculus problems involving partial derivatives, Jacobians, and optimization. • Apply first order and higher order differential equations to solve problems in engineering. • Evaluate vector calculus operations and their physical applications.

Unit I	**[9Hrs]**
Matrix Algebra : Introduction to matrices, , Rank of a matrix, Consistency of system of linear equations, Linear and orthogonal transformations, Linear dependence of vectors.	
Unit II	**[9Hrs]**
Matrices: Characteristics equation, Cayley- Hamilton Theorem**,** Eigen values and Eigen vectors, Reduction to diagonal form, Reduction of quadratic form to canonical form by orthogonal transformation, Sylvester's theorem.	
Unit III	**[9Hrs]**
Multivariate Calculus: Functions of several variables and their partial derivatives, Chain rule and total differential coefficient, Jacobians and its properties, Maxima –Minima of functions of two variables, Lagrange's method of undetermined multipliers.	
Unit IV	**[9Hrs]**
Differential Equations: First order and first degree differential equations: Linear, Higher order differential equations with constant coefficients, Method of variation of parameters, Cauchy's homogeneous linear equation, Applications of differential equations.	
Unit V	**[9Hrs]**
Vector Calculus: Vector differentiation, Gradient, Directional derivatives, Divergence and Curl with their physical interpretation Solenoidal and Irrotational motions, Scalar potential, Line integral & Work done.	

Text Books

S.N	Title	Authors	Edition	Publisher
1	Higher Engineering Mathematics	B. S. Grewal	38th	Khanna Publishers, New Delhi.
2	Higher Engineering Mathematics	H. K. Das & Er. Rajnish Verma	1st	S. Chand & CO. Pvt. Ltd., New Delhi

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Higher Engineering Mathematics	B.V. Ramana,	11th reprint, 2010.	Tata McGraw Hill New Delhi
2	A Text Book of Engineering Mathematics	Peter O' Neil	8th	Thomson Asia Pvt. Ltd., Singapore.

SEMESTER-I

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
25IT102P	Linear Algebra & Calculus Lab			2	1	25	25	50

Course Objectives	Course Outcomes
This Course is intended to: • To develop students' computational proficiency in solving problems related to linear algebra, calculus, and differential equations using SageMath with an emphasis on symbolic computation and numerical methods. • To enable students to apply SageMath for solving and visualizing problems in vector calculus through effective use of graphical and analytical tools.	**Students will be able to:** • Apply fundamental matrix operations and solve systems of linear equations using SageMath. • Apply concepts of linear algebra to compute eigenvalues and eigenvectors of matrices using SageMath. • Evaluate partial derivatives of multivariable functions and solve first and higher-order ordinary differential equations using SageMath. • Analyze and visualize vector calculus operations including gradient, divergence, curl, and evaluate line and surface integrals using SageMath.

List of Experiments:-

Experiment No.	List of Experiment
1	**To Implement basic matrix operations** using SageMath's symbolic computation tools.
2	To check the consistency of a system of linear equations using augmented matrices and SageMath.
3	**To solve systems of linear equations** using various within the SageMath environment.
4	**To determine eigenvalues and eigenvectors** of matrices using built-in SageMath functions.
5	**To implement and validate the Cayley-Hamilton Theorem with the aid of SageMath.**
6	**To compute partial derivatives of various orders** for multivariable functions using SageMath.
7	**To solve first-order and higher-order differential** using SageMath's differential equation solvers.
8	To **find maxima and minima of functions of two variables** using partial derivatives and the second derivative test implemented in SageMath.
9	**To compute and visualize vector differential operations** using SageMath.
10	To compute vector integrals in SageMath.

Text Books

S.N	Title	Authors	Edition	Publisher
1	Computational Mathematics with SageMath	Paul Zimmermann	1st	SIAM Publications Library.
2	Basics of SageMath : Mathematics(Practicals)	Varun Kumar	1st	Amazon KDP

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Mathematics-SageMath Software System	Indrajeet Varhadpande & Dr. Kirti Sahu	1st	Himalaya Publication
2	Applied Mathematics Using SageMath	Dr. Kirti Sahu & Dr. Sajid Anwar	1st	Himalaya Publication

SEMESTER I

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation			
						MSE	CA	ESE	Total
24IT103T	Fundamentals of IT	3	-	-	3	20	20	60	100

Course Objectives	Course Outcomes
This course is intended	**Students will be able to**
• Explain the fundamental concepts of computer systems, including hardware, software, and their interaction. • Analyze the evolution of computers and differentiate between various computer generations and classifications. • Describe the functionalities and types of different operatingsystems. • Understand the principles of data communication and networking fundamentals. • Apply basic IT skills for effective use of computers and the internet.	• Analyze the historical development of computers. • Identify and explain the fundamental components of a computer system. • Demonstrate proficiency in installing, configuring, and using various types of operating systems. • Apply the principles of data communication and networking. • Utilize basic IT skills for effective use of computers and the internet

Unit I:	**[9Hrs]**
Introduction to Computers: What is a computer? Characteristics of computers, Evolution of Computers, Classification of Computers, Number System.	
Unit II:	**[9Hrs]**
Computer Hardware: Hardware Components, Input and Output Devices, Storage Devices, Processing Unit and Memory	
Unit III:	**[9Hrs]**
Introduction to Software: What is Software? Types of Software, System Software, Application Software	
Unit IV:	**[9Hrs]**
Operating Systems & Data Communication: Types of Operating Systems, Introduction to Networks	
Unit V:	**[9Hrs]**
The Internet and IT Applications: Introduction to the Internet, Internet Applications, IT Security and Privacy	

Text Books

Sr.No.	Title	Authors	Edition	Publisher
1	Introduction to Computers	Peter Norton	10th	Tata McGraw Hill
2	Operating Systems: Three EasyPieces	Remzi H. Arpaci- Dusseau ,Andrea C. Arpaci - Dusseau	1th	Arpaci- Dusseau Books
3	For Dummies: Networking	Ed Tittel	7th	John Wiley & Sons

Reference Books

Sr. No.	Title	Authors	Edition	Publisher
1	A Guide to technical Support	Jeans Andrews	11th	Cengage Learning
2	How the Internet Work	Richard Geldrench	6th	Que Publishing
3	Computer Network: A top down Approach	James Kurose and keith W.Ross	7th	Pearson Education

Online Resources

1	https://www.geeksforgeeks.org/
2	https://www.tutorialspoint.com

SEMESTER I

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation			
						MSE	CA	ESE	Total
25IT104T	Logic building with C	2	-		2	10	10	30	50

Course Objectives	Course Outcomes
This course is intended 1. To Provide a strong foundation in the fundamentals of C programming and develop algorithmic problem-solving skills. 2. Enable students to design, implement, programs using arrays, pointers, and functions. 3. Introduce user-defined data types, file handling, and dynamic memory allocation for solving real-world computational problems.	**Students will be able to** 1. Demonstrate understanding of fundamentals of C programming, algorithms, flowcharts, data types, operators, and control structures. 2. Apply arrays, pointers, and functions to solve computational and logical problems. 3. Implement user-defined data types such as structures and unions for modular program design, Perform string , file operations & Utilize dynamic memory allocation techniques.

Unit I Fundamentals of C-Programming **[10 Hrs]**

Introduction to C Programming, Translators- Compilers, Interpreters. Algorithms and Flowcharts: Characteristics of algorithms, .Structure of C programming., Input Output statement of C (printf & scanf). C Character Set, Identifiers, Keywords, Data Types, Constants, Variables Declarations, Operators:Arithmetic Operators, Unary Operators, Relational and Logical, Bitwise Operator, Assignment Operators the Conditional Operators. Control structure statement-Conditional, looping, and switch.

Unit II Array & User Defined Data Types **[10 Hrs]**

Introduction- Array: 1-D array, Declaration of array, initialization of array. Operation on array like searching; sorting. 2-D array, Declaration of 2-D array, initialization of 2D- array. Operation on 2D-array like addition , multiplication ,substraction , transpose of 2D matrix etc. Pointers, Declaration; initialization of pointers. Advantages of pointers. Function: Introduction to functions, why use function, Scope rule of function, call by value, call by reference, recursion, Iterative versus recursive style..

Unit III Pointers , String ,File handling & dynamic memory allocation **[10 Hrs]**

Structure: Declarations, array of structures, unions, difference between structure and union. String handling function, File I/O: file operation, file opening modes, file copy programming, Text file and binary file, file pointers, Dynamic memory allocation- Malloc(), Calloc(), free(), realloc(), Sizeof() operator.

Text Books

Sr. No.	Title	Authors	Edition	Publisher
1	Programming in ANSI C	E. Balguruswamy	2	Tata Mc-Graw Hill
2	Programming Techniques Through 'C'	M. G. Venkateshmurthy	2	Pearson Education Publications
3	Let Us 'C'	Yashwant P. Kanetkar	1	BPB Publications

Reference Books

Sr. No.	Title	Authors	Edition	Publisher
1	The Complete Reference C	Herbert Schildt	4	Tata Mc-Graw Hill
2	The 'C' programming language	Kernighan and Ritchie	1	Prentice Hall
3	Programming and Problem Solving	M. Sprankle	2	Pearson Education

Online Resources

1	https://cstutorialpoint.com/c-language-notes/#google_vignette
2	https://www.freecodecamp.org/news/the-c-programming-handbook-for-beginners
3	/https://www.w3schools.com/c/index.php
4	https://www.programiz.com/c-programming

SEMESTER I

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
25IT104P	Logic building with C Lab	-	-	2	1	25	25	50

Course Objectives	Course Outcomes
This course is intended 1. To Provide a strong foundation in the fundamentals of C programming and develop algorithmic problem-solving skills. 2. Enable students to design, implement, programs using arrays, pointers, and functions. 3. Introduce user-defined data types, file handling, and dynamic memory allocation for solving real-world computational problems.	**Students will be able to** 1. Demonstrate understanding of fundamentals of C programming, algorithms, flowcharts, data types, operators, and control structures. 2. Apply arrays, pointers, and functions to solve computational and logical problems. 3. Implement user-defined data types such as structures and unions for modular program design, Perform string , file operations & Utilize dynamic memory allocation techniques.

Sr. No.	Experiments based on
1	Conditional Control Statement & Looping Statement
2	Menu driven program (Switch Control Statement)
3	One Dimensional (1-D) array
4	Two Dimensional (2-D) array
5	Function, call by value; call by reference
6	Structure; Union
7	String Operation
8	File Handling operations
9	Dynamic memory allocation

Reference Books

Sr. No.	Title	Authors	Edition	Publisher
1	The Complete Reference C	Herbert Schildt	4	Tata Mc-Graw Hill
2	The 'C' programming language	Kernighan and Ritchie	1	Prentice Hall
3	Programming and Problem Solving	M. Sprankle	2	Pearson Education

Online Resources

1	https://cstutorialpoint.com/c-language-notes/#google_vignette
2	https://www.freecodecamp.org/news/the-c-programming-handbook-for-beginners
3	/https://www.w3schools.com/c/index.php
4	https://www.programiz.com/c-programming

SEMESTER I

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
25IT105P	Software Lab - I	-	-	4	2	25	25	50

Course Objectives	Course Outcomes
This course is intended • To provide fundamental knowledge and practical skills in MS-DOS, Microsoft Word, and Microsoft Excel for effective document creation and data management. • To develop the ability to apply advanced features of Word and Excel, including statistical functions, data visualization, and Mail Merge, for real-life problem solving and reporting.	**Students will be able to** • Execute basic MS-DOS internal and external commands • Create and format professional documents • Apply formulas, functions, and charts in Microsoft Excel for data analysis and visualization • Integrate Word and Excel using Mail Merge and develop a mini project

Expt. No.	Experiments based on
1	Introduction to MS-DOS
2	Practical's based on Executing MS-DOS Internal and External Commands
3	Practical's based on Executing MS-DOS External Commands (Copy and its types)
4	Practical's based on Introduction to Microsoft Word
5	Practical's based on Introduction to Microsoft Excel (basic)
6	Practical's based on Introduction to Microsoft Excel (advanced)
7	Practical's based on Statistical function in excel.
8	Experiment based on Introduction To Mail Merge
9	Mini Project based on Word or Excel

Text Books

SN	Title	Authors	Edition	Publisher
1	The Quick Reference Guide to M. S.DOS Commands	Van Wolverton	1st	
2	Microsoft Word 2021 Step by Step	Joan Lambert	First Edition (2021)	Microsoft Press

SEMESTER I

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
25IT106P	Business Communication Skills-I Lab	-	-	2	1	25	25	50

Course Objectives	Course Outcomes
To empower students to develop a career-oriented mindset while harnessing the power of LSRW skills.	**Students will be able to:** • Apply verbal and non-verbal skills to confidently and effectively deliver presentations. • Prepare themselves for overall language ability through listening and reading tasks. • Demonstrate formal writing skills. • Draft impactful Resumes and Cover Letters. • Prepare themselves for Personal Interviews.

Expt. No.	Title of the experiment
1	Presentation Skills
2	Poster Making (Product/ Event)
3	Reading Comprehension for Competitive Exams.
4	Writing Skills for Academic Purposes.
5	Listening Skills I
6	Business Correspondence I
7	Resume Writing and Cover Letter
8	Mock Interviews

Reference Books:

S. N	Title	Authors	Edition	Publisher
1	Communication Skills for Engineers	C. Muralikrishna & SunitaMIshra	2nd Edition, 2011	Pearson India Education Services
2	Communication Skills	Dr. L .Bisen, Dr. B. Agrawal & Dr. N. T. Kalyani	1st Edition, 2021	Himalaya Publishing House
3	Barron's IELTS Superpack	Lin Lougheed	2012	Barrons Educational Series