D Y PATIL
DEEMED TO BE
UNIVERSITY

SCHOOL *of* ENGINEERING
& MANAGEMENT
KOLHAPUR

F.Y. B. Tech.
Data Sciences Engineering
Structure and Curriculum

Department of First Year Engineering

w. e. f. A.Y.: 2024-25

F.Y. B. Tech Data Sciences Engineering Structure 2024-25

SEMESTER – I											
			Teaching Scheme				Theory			Practical		Total Marks
Course Category	Course Type	Course Name	Credits	Contact Hrs.			ISE	MSE	ESE	INT	OE/ PoE	
				L	P	T						
Basic Sciences	BSC	Linear Algebra & Calculus	4	3	-	1	20	30	50	25	-	125
	BSC	Applied Physics	4	3	2	-	20	30	50	25	-	125
Engineering Science	ESC	Problem Solving through Programming	4	3	2	-	20	30	50	25	-	125
	ESC	Digital Logic Design	4	3	2	-	20	30	50	25	-	125
Vocational Skills Enhancement Course	VSEC	Design Thinking Through Innovation	2	1	2	-	25	-	-	25	-	50
Indian Knowledge System	IKS	Historical Places in and Around Kolhapur District	2	2	-	-	20	30	-	-	-	50
Co-Curricular Activities	CCA	Liberal Learning - I	2	-	4	-	-	-	-	50	-	50
Mandatory Course	MC	Finishing School Training - I	-	3	-	-	50	-	-	-	-	Grade
		Rural/Social Internship	-	-	-	-	-		-	50	-	Grade
		Total	**22**	**15**	**12**	**1**	**175**	**150**	**200**	**225**	**-**	**650**
SEMESTER – II												
Basic Sciences	BSC	Differential Equations & Numerical Techniques	4	3	-	1	20	30	50	25	-	125
	BSC	Applied Chemistry	4	3	2	-	20	30	50	25	-	125
Engineering Science	ESC	Generative AI	4	3	2	-	20	30	50	25	-	125
Ability Enhancement Course	AEC	Professional Communication	2	1	2	-	25	-	-	25	-	50
Co-Curricular Activities	CCA	Liberal Learning - II	2	-	4	-	50	-	-	-	-	50
Program Core Courses	PCC	Data Analytics with Spreadsheet	2	2	-	-	-	-	50	-	-	50
Vocational Skills Enhancement Cours	VSEC	Python Programming	2	1	2	-	25	-	-	25	-	50
Mandatory Course	MC	Capstone Project	-	-	-	-	-	-	-	50	-	Grade
		Finishing School Training - II	-	3	-	-	50	-	-	-	-	Grade
		Total	**20**	**13**	**12**	**1**	**210**	**90**	**200**	**175**	**-**	**575**

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F. Y. B. Tech. Scheme of Teaching and Examination w. e. f. A. Y. 2024-2025

Semester-I

Sr. No	Course Code	Course Type	Name of the Course	Teaching Scheme Per Week			Credits	Total Marks	Evaluation Scheme			
				L	P	T			Type	Max. Marks	Minimum Marks For Passing	
Students Induction Program as Per AICTE Guidelines												
1	241DSEBSCL101	BSC	Linear Algebra & Calculus	03	--	--	03	100	ISE MSE ESE	20 30 50	40	
2	241DSEBSCL105	BSC	Applied Physics	03	--	--	03	100	ISE MSE ESE	20 30 50	40	
3	241DSEESCL101	ESC	Problem Solving through Programming	03	--	--	03	100	ISE MSE ESE	20 30 50	40	
4	241DSEESCL103	ESC	Digital Logic Design	03	--	--	03	100	ISE MSE ESE	20 30 50	40	
5	241DSEVSECL101	VSEC	Design Thinking ThroughInnovation	01	--	--	01	25	ISE	25	10	
6	241DSEIKSL101	IKS	Historical Places in and Around Kolhapur District	02	--	--	02	50	ISE MSE	20 30	20	
7	241DSEBSCP102	BSC	Linear Algebra & Calculus Tutorial	--	--	01	01	25	ISE	25	10	
8	241DSEBSCP106	BSC	Applied Physics Laboratory	--	02	--	01	25	ISE	25	10	
9	241DSEESCP102	ESC	Problem Solving through Programming Laboratory	--	02	--	01	25	ISE	25	10	
10	241DSEESCP104	ESC	Digital Logic Design Laboratory	--	02	--	01	25	ISE	25	10	
11	241DSEVSECP102	VSEC	Design Thinking ThroughInnovation Laboratory	--	02	--	01	25	ISE	25	10	
12	241DSECCAP101	CCA	Liberal Learning - I	--	04	--	2	50	ISE	50	20	
Total				**15**	**12**	**01**	**22**	**650**	--	--	--	--
Mandatory Courses												
1	241DSEMC102	MC	Rural/Social Internship	--	--	--	--	50	ISE	Grade	--	--
2	241DSEMC101	MC	Finishing School Training - I	03	--	--	--	50	ISE	Grade	--	--

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F. Y. B. Tech. Scheme of Teaching and Examination w. e. f. A. Y. 2024-2025

Semester -II

Sr. No	Course Code	Course Type	Name of the Course	Teaching Scheme Per Week			Credits	Total Marks	Evaluation Scheme			
				L	P	T			Type	Max. Marks	Minimum Marks for Passing	
1	241DSEBCSL103	BSC	Differential Equations & Numerical Techniques	03	--	--	03	100	ISE MSE ESE	20 30 50	40	
2	241DSEBSCL107	BSC	Applied Chemistry	03	--	--	03	100	ISE MSE ESE	20 30 50	40	
3	241DSEESCL105	ESC	Generative AI	03	--	--	03	100	ISE MSE ESE	20 30 50	40	
4	241DSEAECL102	AEC	Professional Communication	01	--	--	01	25	ISE	25	10	
5	241DSEPCCL101	PCC	Data Analytics with Spreadsheet	02	--	--	02	50	ESE	50	20	
6	241DSEVSECL103	VSEC	Python Programming	01	--	--	01	25	ISE	25	10	
7	241DSEBSCP104	BSC	Differential Equations & Numerical Techniques Tutorial	--	--	01	01	25	ISE	25	10	
8	241DSEBSCP108	BSC	Applied Chemistry Laboratory	--	02	--	01	25	ISE	25	10	
9	241DSEESCP106	ESC	Generative AI Laboratory	--	02	--	01	25	ISE	25	10	
10	241DSEAECP103	AEC	Professional Communication Laboratory	--	02	--	01	25	ISE	25	10	
11	241DSEVSECP104	VSEC	Python Programming Laboratory	--	02	--	01	25	ISE	25	10	
12	241DSECCAL102	CCA	Liberal Learning - II	--	04	--	02	50	ISE	50	20	
			Total	**13**	**12**	**1**	**20**	**575**	--	--	--	--
Mandatory Courses												
1	241DSEMC104	MC	Capstone Project	--	--	--	--	50	ISE	Grade	--	--
2.	241DSEMC103	MC	Finishing School Training - II	03	--	--	--	50	ISE	Grade	--	--

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Course Title: Linear Algebra & Calculus	
Course Code: 241DSEBSCL101	**Semester:** I
Teaching Scheme: L-T-P: 3-1-0	**Credits:** 3
Evaluation Scheme ISE-I/MSE/ISE-II**:** 10/30/10	**ESE Marks:** 50

Prior Knowledge of:	Matrices, Derivatives

Course Objectives:

1.	To teach mathematical methodology.
2.	To develop mathematical skills and enhance the logical thinking power of students.
3.	To provide students with skills in Linear Algebra and Calculus.
4.	To imbibe graduates with mathematical knowledge, computational skills, and the ability to deploy these skills effectively in solution of engineering problems.

Curriculum Details

Course Contents	Duration
Unit 1: Unit-I Linear Algebra –I • Introduction to matrices, types of matrices • Rank of matrix by normal form and echelon form • Solution of simultaneous linear non-homogenous equations • Solution of simultaneous linear homogenous equations	**07 Hrs**
Unit 2: Numerical Solutions of Linear Algebra • Introduction • Gauss–Elimination method • Gauss –Jordan method • Gauss –Seidel method • Jacobi's iterative method • Power method	**07 Hrs**
Unit 3: Linear Algebra –II • Definition of a linear combination of vectors • Dependence and independence of vectors • Eigenvalues and its properties • Eigenvectors and their properties • Cayley-Hamilton theorem	**07 Hrs**
Unit 4: Differential Calculus • Introduction. • Partial derivatives • Total derivatives • Euler's theorem on homogeneous functions • Jacobian and its properties	**07 Hrs**

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Unit 5: Multiple Integrals • Introduction of Double integrals • Method of evaluation of Double integrals • Change of order of integration • Area enclosed by plane curves • Mass of a plane lamina	**07 Hrs**
Unit 6: Vector Spaces • The Euclidean space and vector space, subspace • Linear combination, linear span, linear dependence and independence • Basis, dimensions of finite dimensional vector space • Subspace- Row and column spaces • Rank and nullity Theorem	**07 Hrs**

Course Outcomes (COs): After successful completion of the course, students will be able to:

CO	Statements
101.1	**Reduce** matrices to echelon form and **apply** the concept of rank of matrices to solve a system of linear equations
101.2	**Solve** linear equations by numerical methods.
101.3	**Identify** Eigen values & **make use of** them for finding Eigenvectors.
101.4	**Apply** the knowledge of partial differentiation.
101.5	**Apply** multiple integrals to calculate the areas and mass of lamina.
101.6	**Recognize and use** basic properties of subspace and vector space.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

POs / COs	BTL	1	2	3	4	5	6	7	8	9	10	11	12
101.1	2, 3	3	2	--	--	1	---	--	--	--	--	--	1
101.2	3	3	2	--	--	1	--	--	--	--	--	--	1
101.3	2, 3	3	2	--	--	1	--	--	--	--	--	--	1
101.4	3	2	2	--	--	--	--	--	--	--	--	--	1
101.5	3	2	2	--	--	--	--	--	--	--	--	--	1
101.6	3	2	2	--	--	1	--	--	--	--	--	--	1

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Text Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1	Advanced Engineering Mathematics	7^{th}	Peter V. O'Neil	Cengage Learning	2012
2	Advanced Engineering Mathematics	1^{st}	H. K. Dass	S. Chand Publications, New Delhi	2011
3	A Text Book of Applied Mathematics	7^{th}	P.N.Wartikar, J.N.Wartikar	Vidyarthi Griha Prakashan, Pune.	2006
4	Higher Engineering Mathematics	36^{th}	B.S. Grewal	Khanna Publishers	2001
5	Linear Algebra		Jin Ho Kwak and Sungpyo Hong	Springer	2004
6	Numerical Methods in Engineering and Science		B.S. Grewal	Khanna Publishers	

Reference Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1	Advanced Engineering Mathematics	5^{th}	Erwin Kreyszig	India Pvt, Ltd.	2014
2	Higher Engineering Mathematics	6^{th}	B.V.Ramana	Tata M/c Graw-Hill Publication	2010
3	Numerical Methods for Scientific and Engineering Computation	5^{th}	M.K.Jain	New Age International Pvt. Ltd New Delhi	2007
4	A Textbook of Engineering Mathematics	6^{th}	N.P.Bali, Iyengar	Laxmi Publication	2004
5	Elementary Linear Algebra	5^{th}	Stephen Andrilli and David Hecker	Academic Press	2016

Useful Link /Web Resources:

1. DELNET- http://www.delnet.in
2. NDL-http://ndl.iitkgp.ac.in
3. N-LIST- http://www.nlist.inflib.ac.in
4. https://www.youtube.com/results?search_query=Dr+Navneet+Sangle

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Course Title: Linear Algebra & Calculus Tutorial	
Course Code: 241DSEBSCP102	**Semester:** I
Teaching Scheme: L-T-P: 0-1-0	**Credits:** 1
Evaluation Scheme ISE: 25	**ESE Marks: --**

Prior Knowledge of:	Matrices, Derivatives

Course Objectives:

1.	To teach mathematical methodology.
2.	To develop mathematical skills and enhance the logical thinking power of students.
3.	To provide students with skills in Linear Algebra and Calculus.
4.	To imbibe graduates with mathematical knowledge, computational skills, and the ability to deploy these skills effectively in solution of engineering problems.

List of Tutorials

Tut. No.	Title of Tutorials	Duration
01	**Linear Algebra–I:** Rank of Matrix, Solutions of Non-homogenous simultaneous linear equations	01Hr
02	**Linear Algebra–I:** Solutions of simultaneous linear homogeneous Equations	01Hr
03	**Numerical Solutions of Linear Equations:** Gauss–Elimination method, Gauss–Jordan method.	01Hr
04	**Numerical Solutions of Linear Equations:** Gauss–Seidel method, Jacobi's iterative method.	01Hr
05	**Linear Algebra:** Linear Algebra using *SCILAB* /MATLAB	01Hr
06	**Linear Algebra –II:** Dependence and Independence of vectors	01Hr
07	**Linear Algebra –II:** Eigen values and Eigen vectors of Matrix, Cayley-Hamilton Theorem	01Hr
08	**Differential Calculus:** Euler's theorem on homogeneous functions.	01Hr
09	**Differential Calculus:** Partial derivatives, Jacobian and its properties.	01Hr
10	**Multiple Integrals:** Double integrals, change of order of integration, evaluation of Double integrals, change variables to polar coordinates, area enclosed by plane curves, Mass of a plane lamina.	01Hr
11	**Vector Spaces: V**ector space, Span, Basis, dimensions, subspace- Row and column spaces, Rank and nullity Theorem	01Hr
12	**Vector Spaces:** Vector Spaces using *SCILAB* /MATLAB	01Hr

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Course Title: Applied Physics	
Course Code: 241DSEBSCL105	**Semester: I & II**
Teaching Scheme: L-T-P:3-0-0	**Credits: 03**
Evaluation Scheme ISE-I/MSE/ISE-II: 10/30/10	**ESE Marks: 50**

Prior Knowledge of:	Fundamentals of optics, semiconductors, nature of radiation, quantum mechanics, electrochemistry.

Course Objectives:

1.	To provide basic concept of modern optics
2.	To make the students grasp the working principles of LASER and its applications
3.	To perceive the fundamentals of quantum mechanics and its applications
4.	To explain electronic properties of semiconductors materials from quantum mechanical point of view
5.	To elucidate the thermodynamic and kinetic properties of cell reactions in rechargeable batteries

Curriculum Details

Course Contents	**Duration**
Unit 1: Wave Optics • Introduction: interference, diffraction, review of geometric and optical path • Theory of plane diffraction grating and grating equation • Resolving power of plane diffraction grating • Newton's ring: Experimental arrangement • Diameter of bright and dark ring • Determination of wavelength of monochromatic light using Newton's ring	**07 Hrs**
Unit 2: LASER • Concept of LASER, • Principle and working of LASER: Absorption, Spontaneous emission, Stimulated emission, Population inversion • Einstein's coefficient • Properties of LASER • Types of LASERS - Ruby LASER, He-Ne LASER • Applications of LASER: Industrial, Medical	**07 Hrs**

Unit 3: Quantum Mechanics • Introduction to quantum physics • de Broglie wavelength of matter waves and its different forms • Heisenberg's uncertainty principle • Wave function and probability interpretation • Schrödinger's time independent & dependent wave equation (1-D) • Energy of particle in 1-D potential well using Schrödinger equation • Numerical	**07 Hrs**
Unit 4: Semiconductor Physics • Fermi Dirac distribution • Formation of bands in solids • Fermi energy and Fermi level in intrinsic and extrinsic semiconductors • Dependence of Fermi energy on temperature • Hall effect: equation for Hall voltage and Hall coefficient and relation between them • Numerical	**07 Hrs**
Unit 5: Semiconductor Devices and Digital Electronics • Properties of a P-N junction • Diode equation and I-V characteristic • Construction, working and I-V characteristics of BJT, JFET and MOSFET • Introductory digital concepts: Logic levels, Digital waveform and characteristic. Time clock and timing diagram • Logic functions and logic gates: AND, OR, NOT, NAND, NOR, X-OR, and X-NOR • Numerical	**07 Hrs**
Unit 6: Supercapacitor and Battery • Introduction: Electrolytic and galvanic cells, • Electrochemical energy storage: Supercapacitors and Batteries • Types of supercapacitors and batteries • Cell reactions in rechargeable batteries • Thermodynamic and Kinetic parameters of cell reactions • Courses of the cell reactions in different rechargeable batteries • Heat effects and Battery parameters	**07 Hrs**

Self-learning topics: Fire Temperature sensor (TIR-based), NDT of materials, Optical fiber as sensors, CO_2 LASER

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Course Outcomes (COs): After completion of the course, students will be able to:

CO	Statements
105.1	**Apply** the principle of interference and **relate** concepts in various engineering applications
105.2	**Summarize** the working mechanism and applications of LASER
105.3	**Examine** 1-D potential well problems using principles of quantum mechanical phenomenon
105.4	**Interpret** the electronic properties of semiconductors
105.5	**Express** the output characteristics of P-N junction-based semiconductor devices
105.6	**Determine** the equilibrium cell voltage using thermodynamic parameters of rechargeable batteries

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

POs / Cos	BTL	1	2	3	4	5	6	7	8	9	10	11	12
105.1	3	3	2	-	-	-	-	-	-	-	-	-	1
105.2	2	3	2	-	-	-	-	-	-	-	-	-	1
105.3	3	3	2	-	-	-	-	-	-	-	-	-	1
105.4	2	3	2	-	-	-	-	-	-	-	-	-	1
105.5	2	3	2	-	-	-	-	-	-	1	-	-	1
105.6	3	3	2	-	-	-	-	-	-	1	-	-	1

Text Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1	Engineering Physics	1st	H. K. Malik	Tata McGraw Hill Education	2019
2	A Text Book of Engineering Physics	Revised	M. N. Avadhanulu, P. G. Kshirasagar	S. Chand Publications	2018
3	Engineering Physics	Revised	L.N. Singh	Synergy Knowledge Ware	2016
4	Engineering Physics	Revised	V. Rajendran	Tata McGraw Hill Education	2010
5	Engineering Physics	1st	R.K. Gaur, S.L. Gupta	Dhanpat Rai Publications	1993

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Reference Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1	Fundamentals of Physics	Revised	J. Walker, D. Halliday, R. Resnick	Wiley Publications	2018
2	Engineering Physics	1st	B.K. Pandey and Chaturvedi	Cengage learning Publications	2017
3	Battery Technology Handbook	2nd	H. A. Kiehne	Marcel Dekker, Inc., New York	2003
4	Introduction to Solid State Physics	8th	Charles Kittel	John Willey and Sons Inc.	2009
5	Solid State Physics	6th	S.O.Pillai	New edge Internationals	2009
6	Digital Fundamentals	8th	T. L. Floyd	Pearson Education Inc., New Delhi	2003

Useful Link /Web Resources:

1. http://hyperphysics.phy-astr.gsu.edu/hbase/index.html
2. https://en.wikipedia.org/wiki/Wave_interference
3. https://en.wikipedia.org/wiki/Introduction_to_quantum_mechanics

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Course Title: Applied Physics Laboratory	
Course Code: 241DSEBSCP106	**Semester:** I/II
Teaching Scheme: L-T-P: 0-0-2	**Credits: 01**
Evaluation Scheme: ISE: 25	**ESE Marks:**

Prior Knowledge of:	Optics, magnetic materials, semiconductor basics, graph plotting, slope calculation

Course Objectives:

1	To make the students understand the concept of physics for the effective application in the field of engineering and technology.
2	To use the knowledge of electron transport in semiconductors.
3	To summarize the factors affecting the capacitance of the supercapacitors.

List of Experiments-

Exp. No	Title of Experiments	Duration
01	To compute diameter of cylindrical obstacle using mono chromatic Source	02 Hrs
02	To calculate radius of curvature of Plano convex lens using Newton's ring	02 Hrs
03	To determine the velocity of the ultrasonic wave in water using ultrasonic Interferometer	02 Hrs
04	To determine wavelength of LASER using diffraction grating	02 Hrs
05	To decide band gap energy of P-N junction diode	02 Hrs
06	To determine divergence of LASER beam	02 Hrs
07	To determine resolving power of diffraction grating	02 Hrs
08	To recognize carrier concentration of semiconductor using Hall effect	02 Hrs
09	To Determine wavelength of light using plane diffraction grating	02 Hrs
10	To study physical significance of wave function quantum mechanics	02 Hrs
11	To calculate the resolving power of telescope	02 Hrs
12	To prove De Morgan's theorem	
13	To calculate the performance parameters of a given supercapacitor device using the data recorded on an electrochemical work-station	02 Hrs

Minimum 10 Experiments should be conducted from above list.

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Course Outcomes (COs): After successful completion of the course, students will be able to

CO	Statements
106.1	**Implement** knowledge related to optics to use for suitable purposes in applied physics
106.2	**Examine** the properties of LASER for suitable applications in applied physics
106.3	**Apply** the theory of semiconductors to estimate band gap energy and carrier concentration
106.4	**Determine** the performance parameters of a supercapacitor device using a modern electrochemical workstation

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

POs / COs	BTL	1	2	3	4	5	6	7	8	9	10	11	12
106.1	3	3	-	-	-	-	-	-	-	-	-	-	1
106.2	3	3	-	-	-	-	-	-	-	-	-	-	1
106.3	3	3	-	-	-	-	-	-	-	-	-	-	1
106.4	3	3	-	-	-	1	-	-	-	-	-	-	1

Suggested Learning Resources: Text Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1	Engineering Physics	1st	H.K. Malik	Tata McGraw Hill Education	2019
2	A Text Book of EngineeringPhysics	Revised	M. N. Avadhanulu, P. G. Kshirasagar	S. Chand Publications	2018
3	Engineering Physics	Revised	L. N. Singh	Synergy Knowledge Ware	2016
4	Engineering Physics	Revised	V. Rajendran	Tata McGraw Hill Education	2010
5	Engineering Physics	1st	R.K. Gaur, S.L. Gupta	Dhanpat Rai Publications	1993

Reference Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1	Fundamentals of Physics	Revised	J.Walker, D.Halliday, R.Resnick	Wiley Publication	2018
2	Engineering Physics	1st	B.K. Pandey and Chaturvedi	Cengage Learning Publications	2017
3	Battery Technology Handbook	2nd	H. A. Kiehne	Marcel Dekker, Inc., New York	2003
4	Introduction to Solid State Physics	8th	C.Kittel	John Willey and Sons Inc.	2009
5	Solid State Physics	6th	S.O.Pillai	New edge Internationals,	2009
6	Digital Fundamentals	8th	T. L. Floyd	Pearson Education Inc., New Delhi	2003

Useful Link /Web Resources:

1. https://vlab.amrita.edu/?sub=1
2. http://vlabs.iitb.ac.in/vlab/labsps.html

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Course Title: Problem-Solving Through Programming	
Course Code: 241DSEESCL101	**Semester:** I
Teaching Scheme: L-T-P: 3 – 0 – 0	**Credits:** 03
Evaluation Scheme ISE-I, MSE, ISE-II:10/30/10	**ESE Marks:** 50

Prior Knowledge of:	Basic knowledge of computers.

Course Objectives:

1.	Acquire basic principles of problem-solving using computers.
2.	Learn and use the syntax of C programming language to solve basic science and engineeringproblems.
3.	Select appropriate programming constructs, data structures, and functions to build solutionsto a variety of problems.

Curriculum Details:

Course Contents	Duration
Unit 1: Introduction to C programming: Fundamentals of algorithms, flowcharts. **Getting started with C**- Basic structure of C program, features of C language,Character set, C tokens, Keywords and Identifiers, Data types and Format Specifier. Managing Input and Output operations. **Variable**s-Local and Global variables, rules for defining a variable name, variable initialization-Run time and compile time, variable declaration. **Constants**-Defining Constant by using preprocessor directive and keyword const. **Operators:** Arithmetic operators, Relational operators, Logical Operators, Assignment operators, Increment and Decrement operators, Conditional operators, Bit-wiseoperators, Special operators. Operator precedence and Associativity.	**07Hrs**
Unit 2: Programming Constructs: **Need of Decision-making statements**- 'if' statement, Simple 'if' statement, the 'if…else' statement, nesting of 'if…else' statements, The 'else if' ladder, The 'switch' statement, break statement, The 'go to' statement. **Need of looping statements**: The 'for',' while', and' do-while statements with examples.	**08 Hrs**
Unit 3: Arrays& Strings: **Arrays**-Types of arrays, Declaration arrays, initializing dimensional arrays (One-Dimensional and Two-Dimensional Array)-Run time Initialization and Compile time Initialization with examples. **Character Arrays and Strings**: Declaration and Initialization- Run time Initialization and Compile time Initialization with examples, reading string from the terminal and writing strings to screen, String handling Functions - strcpy(), strcmp(), strlen(), strcat().	**07Hrs**

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Unit 4: Structures and Unions: **Structures**-Elements of Structure –Structure definition, declaring structure variables, Structure initialization. Accessing structure members by using '.' Operator, Arrays of structure, Arrays within structures. **Unions**: Elements of Union–Union definition, declaring union variables, Union initialization, Comparison of Structure and Unions.	**07Hrs**
Unit 5: Functions: Need for Functions, Types of functions (User Defined and Built–In). **User-defined Function**-Elements of UDF-Function Definition, Function declaration, Function call. Actual Parameters, Formal Parameters. **Categories of functions**- With Argument and with the return value, No Argument and with a return value, With Argument and No return value, No Argument, and No return value. Storage classes (Automatic, Static, Extern, and Register). Passing arrays to function, Structures, and Functions. **Recursion.**	**07Hrs**
Unit 6: Pointers: Introduction to Pointers, accessing a value of variable by using Pointers-Declaration of Pointer variable, Initialization of pointer variables, Dereference operator. Pointers as function arguments-Call by value and call by reference. Pointers Expression, Pointers and Arrays, Pointers and Strings, Pointers to Functions, Pointers and Structures.	**06Hrs**

Self-learning topics: Recent trends in IT.

Course Outcomes (COs): After successful completion of the course, students will be able to:

CO	Statements
101.1	Describe the basic structure of C program and use of different data type.
101.2	Develop conditional and Loop statements to write C programs.
101.3	Explain the concept of arrays and strings to store homogeneous data.
101.4	Use functions to break programs into small module.
101.5	Explain the concept of structures and unions.
101.6	Use pointers to access memory location.

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Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes(POs)

POs / Cos	BTL	1	2	3	4	5	6	7	8	9	10	11	12
101.1	2	3	3	2	-	-	-	-	-	-	-	-	1
101.2	2	3	3	2	-	-	-	-	-	-	-	-	1
101.3	2	3	3	2	-	-	-	-	-	-	-	-	1
101.4	2	3	3	2	-	-	-	-	-	-	-	-	1
101.5	2	3	3	2	-	-	-	-	-	-	-	-	1
101.6	2	2	2	2	-	-	-	-	-	-	-	-	1

Text Books:

Sr.No	Title	Edition	Author(s)	Publisher	Year
1	Programming in ANSI C	8th	E. Balagurusamy	McGraw Hill Education	2019
2	Let Us C	16th	Yashwant Kanetkar	BPB Publication	2017

Reference Books:

Sr.No	Title	Edition	Author(s)	Publisher	Year
1	Programming with ANSI And Turbo C	-	Ashok Kamthane	Pearson Education	2002
2	Programming in C	2nd	J.B Dixit	Firewal Media	2011
3	The Complete Reference Edition	4th	Herbert Schildt	McGraw-Hill Education	2017

Useful Link /Web Resources:

https://nptel.ac.in/courses/1061041282.

https://www.udemy.com/courses

https://www.coursera.org

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Course Title: Problem-Solving Through Programming Laboratory	
Course Code: 241DSEESCP102	**Semester:** I
Teaching Scheme: L-T-P: 0 – 0 – 2	**Credits:** 01
Evaluation Scheme ISE:25	**ESE Marks:** 25

Prior Knowledge of:	Basic understanding of computer operations and familiarity with mathematical concepts

Course Objectives:

1.	Acquire basic principles of problem-solving using computers.
2.	Learn and use the syntax of C programming language to solve basic science and engineeringproblems.
3.	Select appropriate programming constructs, data structures and functions to build solutions to variety of problems.

Details:

Exp. No	Title of Experiments	Duration
01	To Study basic Linux commands and different IDEs used for programming.	02 Hrs
02	Basic C Programming	02 Hrs
03	C Programs based on Data Types and Operators	02 Hrs
04	C Programs based on Control Structures-conditional statements	02 Hrs
05	C Programs based on Control Structures-loops	02 Hrs
06	C Programs based on Functions	02 Hrs
07	C Programs based on array and string manipulation.	02 Hrs
08	C Programs based on Structures	02 Hrs
09	C Programs based on Pointers	02 Hrs
10	C Programs based on File Handling	02 Hrs

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Course Outcomes (COs): After successful completion of the course, students will be able to:

CO	Statements
102.1	Develop problem-solving strategies and computational thinking.
102.2	Design and implement algorithms using the C programming language.
102.3	Write, test, and debug C programs effectively.
102.4	Apply problem-solving techniques to a variety of programming challenges.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes(POs)

POs / Cos	BTL	1	2	3	4	5	6	7	8	9	10	11	12
102.1	2	1				1							2
102.2	2		2					1		1			2
102.3	2	1	2		3			1		1			2
102.4	2	2	2		3	1		1		1	1	1	2

Text Books:

Sr.No	Title	Edition	Author(s)	Publisher	Year
1.	Let Us C	16th Edition	Yashavant Kanetkar	BPB Publication.	2017
2.	Computer Fundamentals	4th Edition	P. K. Sinha,	BPB Publications.	2011
3.	How to Solve it by Computer		R.G. Dromey	Pearson Education India	
4.	The Complete	4th Edition	Herbert Schildt	McGraw-Hill Education	

Reference Books:

Sr.No	Title	Edition	Author(s)	Publisher	Year
1.	The C Programming Language	2nd Edition	Brian W. Kernighan, Dennis Ritchie	Pearson Education India	2019
2.	C How to Program	7th Edition	Deitel	Pearson Education India	2017

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Course Title: Digital Logic Design	
Course Code:241DSEESCL103	**Semester:** I
Teaching Scheme: L-T-P:3-0-0	**Credits:**3
Evaluation Scheme ISE-I, MSE, ISE-II**:**10/30/10	**ESE Marks:**50

Course Prerequisites:	Basic algebra and understanding of logic

Course Objectives:

1.	To understand the basic concepts of digital systems, including binary number systems, Boolean algebra, and logic gates.
2.	To apply and simplify Boolean expressions and logic circuits using Karnaugh maps and Boolean algebra.
3.	To construct digital circuits using basic components like multiplexers, decoders, encoders, and flip-flops.
4.	To artculate the concepts of Processing unit and memory subsystem.

Course Description:

Digital Logic Design focuses on essential concepts in digital systems, including Boolean algebra, logic gates, and both combinational and sequential circuits. The course emphasizes hands-on learning of Sequential and Combinational Circuit designs through hands-on practical's using simulators. By the end, students are equipped to apply digital logic design concepts in computer engineering and related fields.

Curriculum Details:

Course Contents	Duration
Unit 1: Introduction to Digital System and Number System Digital Systems, Number System, Number system conversions, Logic Gates, minimization: Representation of truth-table, SOP form, POS form, Simplification of logical functions, Minimization of SOP and POS forms, don't care conditions Reduction techniques: K-Maps up to 4 variables.	**05Hrs**
Unit 2: Combinational Logic Design BCD, Excess-3, Gray code, Binary Code. Half- Adder, Full Adder, Half Subtractor, Full Subtractor, Multiplexers (MUX), Demultiplexers (DEMUX)	**07 Hrs**
Unit 3: Sequential Logic Design & Synchronous and Asynchronous Circuits Latches and Flip-Flops, Flip-Flop: SR, J-K, D, T; Preset & Clear, Truth Tables, and Excitation tables, Conversion of Flop- Flop, Registers: SISO, SIPO, PISO, PIPO, Asynchronous Counter, Synchronous Counter, BCD Counter	**08Hrs**

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Unit 4: Introduction to Computer Organization Function and structure of a computer Functional components, interconnection of components, Bus Structures. Processing Unit: Organization of a processor - Registers, ALU and Control unit, Instruction cycle	**07Hrs**
Unit 5: Input/output Subsystem Access of I/O devices, I/O ports, I/O interfaces - Serial port, Parallel port, PCI bus, I/O peripherals - Input devices, Output devices, Secondary storage devices.	**07Hrs**
Unit 6: Memory Subsystem Memory Hierarchy, RAM (Random Access Memory), Read Only Memory (ROM), Types of ROM, Cache Memory.	**08 Hrs**

Course Outcomes (COs): After successful completion of the course, students will be able to:

CO	Statements
103.1	Describe the working of basic digital components.
103.2	Solve Boolean expressions for designing digital circuits using K-Maps.
103.3	Design Combinational digital circuits & Sequential circuits.
103.4	Demonstrate basics of Computer organization and Memory

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes(POs)

POs / Cos	BTL	1	2	3	4	5	6	7	8	9	10	11	12
103.1	2	1	-	-	-	-	-	-	-	-	-	-	-
103.2	2	1	1	-	-	2	-	-	-	-	-	-	-
103.3	2	2	2	2	2	3	-	-	-	1	2	-	-
103.4	2	1	-	-	1		-	-	-	-	-	-	-

Text Books:

1. R.P.Jain, “Modern Digital Electronics”, Tata McGraw-Hill, 4th Edition,2010 ISBN 978-0-07-06691-16
2. Moris Mano, “Digital Logic and Computer Design”, 2017, Pearson, ISBN 978-93-325-4252-5
3. W. Stallings, “Computer Organization & Architecture: Designing for performance”, 10th Edition, 2016, Pearson Education/ Prentice Hall of India, ISBN-10: 0-13-410161-8 | ISBN-13: 978-0-13-410161-3

Reference Books:

1. John Yarbrough, “Digital Logic applications and Design”, Cengage Learning, 2006, ISBN 13:978-81-315-0058-3
2. Norman B & Bradley, “Digital Logic and Design Principles”, Wiley India Ltd, 2000, ISBN 978-81-265-1258-4.

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Course Title: Digital Logic Design Lab	
Course Code: 241DSEESCP104	**Semester:** I / II
Teaching Scheme: L-T-P: 0-0-2	**Credit:** 01
Evaluation Scheme: ISE: 25	**ESE Marks:**

Course Description:
Digital Logic Design This subject covers practical details of the subject Digital Logic Design and Memory organization in computers.

Course Objectives	
1	To provide hands on experience on construction of basic digital logic circuits
2	To get practical experience on Demorgan's theorem, SOP and POS forms.
3	To demonstrate verification of Full Adders, Subtractors, Gray to binary converters and vice versa
4	To verify working of Flip-flops, Counters and Shift registers

Sr. No	**Experiment**
1	Realization of functions using basic and universal gates (SOP and POS forms).
2	Study of Boolean algebra & De Morgan's theorem.(Verification of Theorem with truth table)
3	Realization of 4/5 variable K-maps.
4	Design and Realization of half /full adder and subtractor using basic gates and universal gates.
5	Design and Realization of Multiplexers and Demultiplexers.
6	Study of Flip-Flops: J-K, D, T, S-R.
7	Study of Registers and Counters.
8	Study of Bus Structure and Instruction Cycle.
9	Interfacing counter circuit with seven segment display.
10	Hand- on -constructin of various combinational circuits using CircuitVerse Simulator.

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Course Outcomes (COs): After successful completion of the course, students will be able to:

CO	Statements
104.1	Construct the truth table of various Logic Gates and combination circuits using logic gates.
104.2	Design, test, and evaluate various combinational circuits such as adders, subtractors, multiplexers, demultiplexers, decoders, etc.
104.3	construct flip-flops, counters, and shift registers
104.4	Simulate various combinational circuits using Circuit Verse Simulator.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes(POs)

POs / Cos	BTL	1	2	3	4	5	6	7	8	9	10	11	12
104.1	2	1								2			
104.2	2	1	1			2				2			
104.3	2	2	2			3				2	2		1
104.4	2	1			1					2			

Text Books:

1. R.P.Jain, “Modern Digital Electronics”, Tata McGraw-Hill, 4th Edition,2010 ISBN 978-0-07-06691-16
2. Moris Mano, “Digital Logic and Computer Design”, 2017, Pearson, ISBN 978-93-325-4252-5
3. W. Stallings, “Computer Organization & Architecture: Designing for performance”, 10th Edition, 2016, Pearson Education/ Prentice Hall of India, ISBN-10: 0-13-410161-8 | ISBN-13: 978-0-13-410161-3

Reference Books:

1. John Yarbrough, “Digital Logic applications and Design”, Cengage Learning, 2006, ISBN 13:978-81-315-0058-3
2. Norman B & Bradley, “Digital Logic and Design Principles”, Wiley India Ltd, 2000, ISBN 978-81-265-1258-4.

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Course Title: Design Thinking Through Innovation	
Course Code: 241DSEVSECL101	**Semester:** I/II
Teaching Scheme: L-T-P: 1-0-0	**Credits:** 01
Evaluation Scheme: ISE: 25	**ESE Marks:**

Prerequisites: Understanding, User-Centric Mindset, Collaboration and Teamwork, Curiosity and Open-Mindedness, Effective Communication Skills, Learning Orientation, and Risk Tolerance.

Course Description:

The Design Thinking & Innovations subject aims to provide students with the tools and exposure to address problems using the design thinking process. The curriculum for "Design Thinking through Innovations" structured in such a way students learn to acquire both knowledge of design and practice of skills required to develop an attitude towards design. Being of the exemplary kinds, it focuses more on hands-on knowledge, learned by doing and acting upon challenges discovered within the community and surroundings.

Course Objectives:

1.	To Familiarize with Engineering Design Process and The basics of Design Thinking
2.	To Bring Awareness on Idea Generation to Solve the Problems
3.	To Familiarize with the various types of prototype and the techniques used for prototyping.

Course Outcomes (COs): At the end of the course, the students should be able to:

CO	Statements	BTL
101.1	**Learn the** Structured Approach of Engineering Design and the Relevance of Design and Design Thinking in Engineering & **Understand** Idea Generation Techniques to find solutions to Problems.	**1**
101.2	**Understand** the various types of prototypes and **Inculcate** the techniques used for prototyping.	**2**

Course Content:

Content	Duration
Unit I: Engineering Design, Design Thinking and Idea Generation • Introduction, Key Concepts of Design, A Simplified Process of Engineering Design • What is Design Thinking? - Its Importance, Socio-Economical Relevance, Principles, Origin, Process of Design Thinking, Relevance of Design and Design Thinking in Engineering • Introduction to Idea Generation, Idea Generation Techniques, Processes, Define the Problem, Needs v/s Wants, Identify Philosophy, Problem Solving Tools, Case Studies • Critical thinking: Fundamentals, Characteristics, Critical v/s Ordinary Thinking. • Critical thinking skills- linking ideas, structuring arguments, five pillars of critical thinking.	**07 Hrs**

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Unit II: Prototyping and Tools for Design - Innovation • Prototyping: Introduction, Need, Process, Types, Fidelity for prototypes, Minimum Usable Prototype [MUP] – Concept, challenges, etc. • Prototyping for Digital & Physical products: Concept, What is unique in Digital and Physical Prototypes? • Digital & Physical prototypes: Preparation; testing prototypes with users. • Introduction to Different tools used for design and Innovation, such as Hand Saw (Wood, PVC, CPVC and Steel), Component cutter, Spanners, Allen key & Wrench (Flat, Ring, Adjustable), Solder Gun, Component cutter, Tweezer, Multi meter, Glue Gun, Hex saw, Cutter, Wire Stripper.	**07 Hrs**

Text Books:

Sr. No	Title	Author(s)	Publisher	Year
1.	Introduction to Design Thinking	S.Salivahanan, S.Suresh Kumar, D.Praveen Sam	Tata Mc Graw Hill, First Edition	2019
2.	The Design Thinking Playbook	Michael Lewrick	Wiley	2019
3.	Prototyping for Designers: Developing the best Digital and Physical Products	Kathryn McElroy	O'Reilly	2017

Reference Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1.	Design Thinking – New Product Essentials from PDMA	1st	Michael G. Luchs, Scott Swan , Abbie Griffin	Wiley	2015
2.	101 Design Methods: A Structured Approach for Driving Innovation in Your Organization	1st	Vijay Kumar	Wiley	2012

Online Resources:

Sr. No.	Online Resource Link	Source
1	Introduction to Design Thinking - Course (swayam2.ac.in) Design Thinking Full Course | Design Thinking Process | Design Thinking For Beginners | Simplilearn - YouTube	Swayam (NPTEL) &YouTube
2	Thinking at IDEO - Insight, innovation, & a healthy dose of play	IDEO
3	INTRO (youtube.com)	YouTube
4	The Power of an Entrepreneurial Mindset | Bill Roche | TEDxLangleyED (youtube.com)	YouTube
5	https://www.ideou.com/pages/design-thinking	IDEO U
6	https://dschool.stanford.edu/	Stanford D school
7	https://www.designthinkersacademy.com/usa/	Design Thinking Institute
8	https://www.ibm.com/design/thinking/page/toolkit	Design thinking ToolKit
9	https://hbr.org/2018/09/design-thinking-is-fundamentally-conservative-and-preserves-the-status-quo	

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Course Title: Design Thinking Through Innovation Lab	
Course Code: 241DSEVSECP102	**Semester:** I / II
Teaching Scheme: L-T-P: 0-0-1	**Credit:** 01
Evaluation Scheme: ISE: 25	**ESE Marks:**

Prerequisites: Understanding, User-Centric Mindset, Collaboration and Teamwork, Curiosity and Open-Mindedness, Effective Communication Skills, Learning Orientation, and Risk Tolerance.

Course Description:

The Design Thinking & Innovations subject aim at providing students with the tools and exposure to be able to address problems using the design thinking process. Design Thinking & Innovations is designed in such a way students learn to acquire both knowledge of design and practice of skills required to develop an attitude towards design. Being of the exemplary kinds, it focuses more on hands-on knowledge, learned by doing and acting upon challenges discovered within the community and surroundings.

Course Objectives:

1.	To Discuss Various Techniques of Idea Generation.
2.	To Explain the Various Tools Used for Innovation.
3.	To Discuss the Methods of Implementing Design Thinking in The Real World.
4.	To Discuss the Implementation of Creativity and Innovation.

Course Outcomes (COs):

At the end of the course, the student should be able to:

CO	Statements	BTL
105.1	**Learn the** Structured Approach of Engineering Design and the Relevance of Design and Design Thinking in Engineering & **Understand** Idea Generation Techniques to find out solutions to Problems.	**1**
105.2	**Understand** the various types of prototypes and **Incorporate** the techniques used for prototyping.	**2**

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Course Content

Sr. No.	Title of Experiments/Assignment List	Duration
01	Overview of Design Thinking: Ethical Design and Critiques, Generation of "IDEA", Problem Identification and Exercises.	02 Hrs
02	Brainstorming Sessions to Find out Solution for Identified Problems	02 Hrs
03	Prototyping and Modelling Challenge, Various Tools and Methodology Used for the Prototyping.	02 Hrs
04	Hands-On Demonstration of Different Tools used for Design & Innovation.	02 Hrs
05	Hands-On Demonstration of Soldering Machine, Function and Purpose of Soldering Machine.	02 Hrs
06	Explanation and Usage of Joining & Insulation Tools and Technics.	04 Hrs
07	Assembly and Disassembly of Two Wheel Drive Robot Based Vehicle.	02 Hrs
08	Micro Project: Group Formation and Idea Generation.	02 Hrs
09	Creation of Prototype and Innovative Solution.	02 Hrs
10	Test and Evaluation of Prototype.	02 Hrs
11	Report Drafting - Instructions & Practices.	02 Hrs
12	Presentation & Exhibition.	02 Hrs

Suggested Learning Resources: --

Reference Books:

Sr. no.	Name of Book	Author	Year
1.	Design Thinking: Understand-Improve-Apply	S. G. Blank	2007
2.	Design Thinking for Innovation Research and Practice	Walter Brenner, Falk Uebernickel, Springer	2016
3.	Business Design Thinking and Doing: Frameworks, Strategies and Techniques for Sustainable Innovation	Angele M. Beausoleil	2022

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Course Title: Historical Places in and Around Kolhapur District	
Course Code:241DSEIKSL101	**Semester:** I/II
Teaching Scheme L-T-P :2-0-0	**Credits:**02
Evaluation Scheme ISE-I, MSE, ISE-II:10/30/10	**ESE Marks:**

Curriculum Contents	Duration
Unit 01: Chhatrapati Shahu Maharaj: A King for Society • Introduction • Life History • Contribution of Rajarshi Shahu Maharaj in various fields as a modern Social Reformer as Women Empowerment in the 19th Century • Development in Education • Social Reservation and equality • Agriculture • Industry • Initiation for Radhanagari Village and Dam	07 Hrs
Unit 02: A Study of Khidrapur- Kopeshwar • Life History of Khidrapur Kopeshwar Temple • The Wonder of Khidrapur Kopeshwar Temple • Swarga Mandap in Kopeshwar Temple • Sabha Mandap, Antaral Kaksha of Kopeshwar Temple • Beauty of Exterior Architecture of Kopeshwar Temple • Mystery of Black stone • Measures Suggested to Development of Khidrapur	07 Hrs
Unit 03: A Study of Panhala Fort and Pawankhind • History of Panhala Fort • Major Features: Andhar Bawadi • Major Features: Kalavanticha Mahal, Ambarkhana • Major Features: Dharma Koti, Sajja Koti • Teen Darwaja, Raj Darwaja • Rajdindi Bastion • Journey from Panhalgad to Pawankhind by Chhatrapati Shivaji Raje	07 Hrs
Unit 04: A Study of Mahalaxmi Temple • History and construction of Temple • The Main Shrines Doorway • Darshan and Kurma Mandap • Ganapati Chowk, Garud Mandap • Boundary wall, Entrances and complex • Mahalaxmi Temple Timings • Kiranostav Celebrations	07 Hrs

References:

1. Social Movements in India: A Review of Literature – Ghanshy am ShahISBN 0761995145 New Delhi ; Thousand Oaks : Sage Publications, 2004
2. Rajarshi Shahu Maharaj – Jeevan Vakarya, editor – Ramesh Patnage.
3. Shahu Chhatrapati - Royal Revolutionary – DhananjayKeer
4. Samajik SanshodhanPadnativaTantre – Dr. Pradeep Aaglave.
5. Kalasekar. T. L : Khidrapur: Khojurao of Maharashtra.
6. Chothe R.G : Temples of Khidrapur, A heritage of India.
7. Kulkarni A. B : Kopeshwar temple of Khidrapur.
8. Gazetteer of Kolhapur District.
9. Eaton, Richard Maxwell (2005). The New Cambridge History of India
10. "Translations of Panhala inscriptions". Government of Maharashtra. Retrieved 19 March 2009.
11. "Mahalakshmi Temple - Jewel Among Kolhapur Temples
12. "Inside Temples". mahalaxmikolhapur.com.

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Course Title: Differential Equations Numerical Technique	
Course Code: 241DSEBSCL103	**Semester: II**
Teaching Scheme: L-T-P: 3-0-0	**Credits:** 3
Evaluation Scheme ISE-I/MSE/ISE-II:10/30/10	**ESE Marks:** 50

Prior Knowledge of:	Formulae of Derivatives and Integration, Differential Equation, Statistics.

Course Objectives:

1.	To teach mathematical methodology.
2.	To develop mathematical skills and enhance logical thinking power of students.
3.	To provide students with skills in differential equations and numerical techniques.
4.	To imbibe graduates with mathematical knowledge, computational skills and the ability to deploy these skills effectively in solution of engineering problems.

Curriculum Details

Course Contents	Duration
Unit 1: Ordinary Differential Equations of First Order and First Degree • Definition of differential equation, order and degree of differential equation • Exact differential equations • Non - exact differential equations • Linear differential equations • Bernoulli's differential equations	**07 Hrs**
Unit 2: Applications of Ordinary Differential Equations • Introduction of variable separable form. • Orthogonal trajectories. (Cartesian form) • Applications to simple electrical circuits • Newton's law of cooling • Rate of decay and growth	**07 Hrs**
Unit 3 Numerical methods to solve Ordinary Differential Equations • Introduction • Picard's method • Taylor's series method • Euler's method • Runge - Kutta's method (Fourth order)	**07 Hrs**

Unit 4: Numerical Solutions of Algebraic & Transcendental equations • Introduction of Algebraic and Transcendental equations • Bisection method • Newton-Raphson method • Regula-Falsi method • Secant method	**07 Hrs**
Unit 5: Correlation and Regression • Introduction, Types of correlation, Karl Pearson's coefficient of correlation • Interpretation of the coefficients of corrections • Computation of coefficient of correlation for ungroup data • Lines of regression • Calculations of equations of the lines of regression	**07 Hrs**
Unit 6: Frequency distribution and measure of central Tendency • Frequency distribution, Continuous frequency distribution • Graphical representation of a Frequency distribution- Histogram, frequency polygon • Measure of central tendency- Arithmetic mean, median and mode • Range, Quartile deviation • Mean deviation, Standard deviation	**07 Hrs**

Course Outcomes (COs): After successful completion of the course, students will be able to:

CO	Statements
1	**Solve** ordinary differential equations of first order and first degree.
2	**Apply** the knowledge of ordinary differential equation of first order and first degree.
3	**Use** the numerical methods to solve ordinary differential equations.
4	**Apply** the numerical techniques to solve algebraic &transcendental equations.
5	**Describe** the statistical data numerically by using correlation, regression and curve fittings.
6	**Apply** the knowledge to study the data given with respect to dispersion and measure of central tendency.

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Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

POs / COs	BTL	1	2	3	4	5	6	7	8	9	10	11	12
1	2, 3	3	2	--	--	--	--	--	--	--	--	--	1
2	3	3	2	--	--	--	--	--	--	--	--	--	1
3	2,3	3	2	--	--	1	--	--	--	--	--	--	1
4	3	2	2	--	--	1	--	--	--	--	--	--	1
5	3	2	2	--	--	1	--	--	--	--	--	--	1
6	3	2	2	--	--	1	--	--	--	--	--	--	1

Text Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1	Advanced Engineering Mathematics	7^{th}	Peter V.O'Neil	Cengage Learning	2012
2	Advanced Engineering Mathematics	1^{st}	H.K. Dass	S. Chand Publications, New Delhi	2011
3	A Text Book of Applied Mathematics	7^{th}	P.N.Wartikar, J.N.Wartikar	Vidyarthi Griha Prakashan, Pune.	2006
4	Higher Engineering Mathematics	36^{th}	B.S. Grewal	Khanna Publishers	2001

Reference Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1	Advanced Engineering Mathematics	5^{th}	Erwin Kreyszig	India Pvt, Ltd.	2014
2	Higher Engineering Mathematics	6^{th}	B.V.Ramana	Tata M/c Graw-Hill Publication	2010
3	Numerical Methods for Scientific and Engineering Computation	5^{th}	M.K.Jain	New Age International Pvt. Ltd New Delhi	2007
4	A Textbook of Engineering Mathematics	6^{th}	N.P.Bali, Iyengar	Laxmi Publication	2004

Useful Link /Web Resources:

1. DELNET- http://www.delnet.in
2. NDL-http://ndl.iitkgp.ac.in
3. N-LIST- http://www.nlist.inflib.ac.in
4. https://www.youtube.com/results?search_query=Dr+Navneet+Sangle

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Course Title: Differential Equations Numerical Technique Tutorial	
Course Code: 241DSBSCP104	**Semester: II**
Teaching Scheme: L-T-P: 0-0-1	**Credits:** 1
Evaluation Scheme ISE: 25	**ESE Marks:** 50

Prior Knowledge of:	Formulae of Derivatives and Integration, Differential Equation, Statistics.

Course Objectives:

1.	To teach mathematical methodology.
2.	To develop mathematical skills and enhance logical thinking power of students.
3.	To provide students with skills in differential equations and numerical techniques.
4.	To imbibe graduates with mathematical knowledge, computational skills and the ability to deploy these skills effectively in solution of engineering problems.

List of Tutorials

Tut. No.	Title of Tutorial	Duration
01	**Ordinary Differential Equations:** Exact and non-exact differential equations.	01Hr
02	**Ordinary Differential Equations:** Linear and non-linear differential equations.	01Hr
03	**Applications of Ordinary Differential Equations:** Orthogonal Trajectories. (Cartesian curves), Applications to Simple Electrical Circuits.	01Hr
04	**Applications of Ordinary Differential Equations:** Newton's law of cooling, Rate of Decay, and growth	01Hr
05	**Numerical Solution of Ordinary Differentia Equations First Order and First Degree:** Picard's method, Taylor's series method.	01Hr
06	**Numerical Solution of Ordinary Differential Equations of First Order and First Degree:** Euler's method, Runge-Kutta's method.	01Hr
07	**Numerical Solutions of Algebraic & Transcendental Equations:** Bisection method, Newton-Raphson method.	01Hr
08	**Numerical Solutions of Algebraic & Transcendental Equations:** Regula-Falsi method, Secant method.	01Hr

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09	**Numerical Solutions**: Numerical Solutions using SCILAB/MATLAB	01Hr
10	**Correlation and Regression:** Computation of Correlation, Lines of regression	01Hr
11	**Frequency distribution and measure of central Tendency:** Measure of central tendency- Arithmetic mean, median and mode, Range, Quartile deviation, Mean deviation, Standard deviation	01Hr
12	**Measure of central Tendency:** Measure of central Tendency using SCILAB/MATLAB	01Hr

Text Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1	Advanced Engineering Mathematics	7^{th}	Peter V.O'Neil	Cengage Learning	2012
2	Advanced Engineering Mathematics	1^{st}	H.K. Dass	S. Chand Publications, New Delhi	2011
3	A Text Book of Applied Mathematics	7^{th}	P.N.Wartikar, J.N.Wartikar	Vidyarthi Griha Prakashan, Pune.	2006
4	Higher Engineering Mathematics	36^{th}	B.S. Grewal	Khanna Publishers	2001

Reference Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1	Advanced Engineering Mathematics	5^{th}	Erwin Kreyszig	India Pvt, Ltd.	2014
2	Higher Engineering Mathematics	6^{th}	B.V.Ramana	Tata M/c Graw-Hill Publication	2010
3	Numerical Methods for Scientific and Engineering Computation	5^{th}	M.K.Jain	New Age International Pvt. Ltd New Delhi	2007
4	A Textbook of Engineering Mathematics	6^{th}	N.P.Bali, Iyengar	Laxmi Publication	2004

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Course Title: Applied Chemistry	
Course Code: 241DSEBSCL107	**Semesters:** I and II
Teaching Scheme: L-T-P: 3 – 0 - 0	**Credits: 3**
Evaluation Scheme ISE-I/MSE/ISE-II: 50	**ESE Marks: 50**

Prior Knowledge of:	Periodic properties of elements, Basics of organic, inorganic, physical, and analytical chemistry

Course Objectives:

1.	**Understand** the principles and applications of sensors.
2.	**Discuss** the Basic concepts of electronic memory and display Systems
3.	**Illustrate** general synthesis and mechanisms of some advanced polymeric Materials and nanomaterials
4.	**Evaluate** the electrochemical energy storage systems such as lithium batteries and design for usage in electrical and electronic applications
5.	**Interpret** of extraction of metal from e-waste.
6.	**Apply** the theoretical aspects for understanding the water chemistry

Curriculum Details

Course Contents	Duration
Unit 1: Water Chemistry • Introduction, Types of impurities in natural water. • Water quality parameters total solids, acidity, alkalinity, chlorides, COD and BOD. (definition, causes, significance) • Hardness of water, types of hardness, units of hardness, numerical on hardness. • Ill effects of hard water in steam generation in boilers (scale & sludge formation, caustic embrittlement and boiler corrosion) • Treatment of hard water (Ion exchange and reverse osmosis process) • Biosensors for glucose detection.	**07 Hrs**
Unit 2: Sensors • Introduction, working, principle and applications of conductometric sensors, electrochemical sensors, thermometric sensors (Flame photometry) and optical sensors (colorimetry). • Hydrated gel sensor (P^H meter). • Sensors for the measurement of dissolved oxygen (DO). • Electrochemical gas sensors for SOx and NOx. • Disposable sensors (DS): Introduction, principle, characteristics of disposable sensors, Advantages of DS over Classical sensors.	**07 Hrs**

Unit 3: Materials for Memory and Display Systems **Memory Devices**: • Introduction, basic concepts of electronic memory, Classification of electronic memory devices (organic, polymeric and hybrid material). • Manufacturing of semiconducting chips. • Green computing: Bio-composite based memory devices **Display Systems**: • Nanomaterials and organic materials for display technology (Light absorbing and emitting materials) used in optoelectronic devices. • Liquid crystals display (LC's) –Introduction, classification, properties and application in Liquid Crystal Displays (LCD's). • Properties and application of Organic Light Emitting Diodes (OLED's) and light-emitting electrochemical cells	**07 Hrs**
Unit 4: Energy System and Battery Technology • Introduction, Classification of batteries (primary and secondary batteries). • Construction, working, advantages, and applications of the carbon-zinc cell, Ni-Cd, and Li-ion battery as an electrochemical cell. • Principle, Properties, and applications of Quantum dots sensitized solar cells (QDSSC's). • Fuel cells**:** Concept, types of fuel cells and merits. • Construction, working and applications of phosphoric acid fuel cells and Hydrogen-oxygen fuel cell	**07 Hrs**
Unit 5: **Sustainable Chemistry and E-waste management:** • Introduction, sources of e-waste, Composition, Characteristics, and Need of e-waste management. • Toxic materials used in manufacturing electronic and electrical products, health hazards due to exposure to e-waste. • Recycling and Recovery: Different approaches of recycling (separation, thermal treatments, hydrometallurgical extraction, direct recycling). • Extraction of Metal from E-waste. Role of stakeholders in environmental management of e-waste (producers, consumers, recyclers, and statutory bodies).	**07 Hrs**
Unit 6: Engineering Advanced materials and Green Chemistry • Introduction, and classifications of polymer. • Introduction, synthesis, properties & applications of Bakelite and Urea-formaldehyde resin. • Conducting Polymers: Introduction, Synthesis & Mechanism of conduction in polyaniline. • Biodegradable polymers: Introduction and their requirements. Synthesis, properties and applications of Polylactic acid. **Green Chemistry:** • Introduction, Aims, goals and applications. • Twelve principle of green chemistry. • Green Fuels: Introduction, construction and working of solar photovoltaic cell, advantages, and disadvantages.	**07 Hrs**

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Course Outcomes (COs): After successful completion of the course, students will be able to:

CO	Statements
107.1	**Understand** the principles and applications of sensors.
107.2	**Discuss and assess** the Basic concepts of electronic memory and display Systems
107.3	**Illustrate** general synthesis and mechanisms of some advanced polymeric Materials and nanomaterials
107.4	**Evaluate** the electrochemical energy storage systems such as lithium batteries and design for usage in electrical and electronic applications
107.5	**Interpret** the extraction of metal from e-waste and the role of stakeholders in the environmental management of e-waste.
107.6	**Apply** the theoretical aspects for understanding water chemistry

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

POs / Cos	BTL	1	2	3	4	5	6	7	8	9	10	11	12
107.1	3	3	-	-	-	-	-	-	-	-	-	-	1
107.2	2	3	-	-	-	-	-	-	-	-	-	-	1
107.3	2	3	-	-	-	-	-	-	-	-	-	-	1
107.4	2	3	-	-	-	-	-	-	-	-	-	-	1
107.5	3	3	-	-	-	-	-	-	-	-	-	-	1
107.6	3	3	-	-	-	-	-	-	-	-	-	-	1

Text Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1	Functional and smart materials,	--	Chander Prakash, Sunpreet Singh, J. Paulo Davim	CRC Press, ISBN: 978-036-727-510	2020,
2	A Textbook of Engineering Chemistry	12th	S. S. Dara, S. S. Umare	S. Chand & Company Ltd., New Delhi.	2011
3	A Text Book of Engineering Chemistry	--	Shashi Chawla	Dhanpat Rai & Co.	2017
4	A textbook of Engineering Chemistry	--	Jain and Jain,	Dhanpatrai Publication.	2015

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Reference Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1	Energy storage and conversion devices: Supercapacitors, batteries, and hydroelectric cells,	1st edition, I	Anurag Gaur, A. L. Sharma, Anil Arya.	CRC Press, SBN: 978-1-003-14176-1	2021
2	E-waste recycling and management: present scenarios and environmental issues	Vol. 33.	Khan, Anish, and Abdullah M. Asiri.	Springer, ISBN: 978-3-030-14186-8.	2019
3	Functional and smart materials,	--	Chander Prakash, Sunpreet Singh, J. Paulo Davim	CRC Press, ISBN: 978-036-727-510	2020,
4	A Textbook of Engineering Chemistry	12th	S. S. Dara, S. S. Umare	S. Chand & Company Ltd., New Delhi.	2011

Useful Link /Web Resources:

1. https://ndl.iitkgp.ac.in/
2. https://www.youtube.com/watch?v=faESCxAWR9k

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Course Title: Applied Chemistry Laboratory	
Course Code:241DSEBSCP108	**Semesters:** I & II
Teaching Scheme: L-T-P: 0-0-2	**Credit:** 1
Evaluation Scheme: ISE: 25	**ESE Marks:**

Prior Knowledge of:	Experiments based on titration, Handling of Glassware & Chemicals, and Preparation of Solutions.

Course Objectives:

1.	To test water quality parameters using various titration analysis methods
2.	To synthesize simple advanced materials and estimate concentration of elements in material's
3.	To know handling of glassware's and simple equipment's for chemical analysis.

List of Experiments-

Exp. No	Title of Experiments	Duration
01	Determination of total hardness of water sample by EDTA method (Complex metric Titration).	02Hrs
02	To determine the normality of given strong acid by titrating against strong alkali solution by conduct meter	02Hrs
03	To determine the normality of given weak acid by titrating against strong alkali solution by conductometer.	02Hrs
04	Determination pH of given solutions by pH meter.	02Hrs
05	Estimation of Iron from a solution by calorimetry.	02Hrs
06	Estimation of Nickel from a solution by calorimetry	02Hrs
07	To determine the approximate analysis of coal.	02Hrs
08	To study the Construction and working of Galvanic cell	02Hrs
09	To estimate amount of calcium from waste chalk.	02Hrs
10	Estimation of zinc metal from brass solution.	02Hrs
11	Preparation of urea-formaldehyde resin.	02Hrs
12	Preparation of phenol formaldehyde resin.	02Hrs

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Course Outcomes (COs): After successful completion of the course, students will be able to:

CO	Statements
108.1	**Analyse** hardness, acidity, alkalinity, and chloride content of water and percentage of elements in some alloys.
108.2	**Produce** various advanced materials and analyse aqueous solutions using instruments.
108.3	**Perform** various experiments by following written instructions.
108.4	**Express** involvement by understanding concepts in applied chemistry.

Course Articulation Matrix: Mapping of Course Outcomes (Cos) with Program Outcomes (PO's)

PO's / Cos	BTL	1	2	3	4	5	6	7	8	9	10	11	12
108.1	3	3	-	-	-	-	-	-	-	-	-	-	1
108.2	3	3	-	-	-	-	-	-	-	-	-	-	1
108.3	3	3	-	-	-	-	-	-	-	-	-	-	1
108.4	3	3	-	-	-	-	-	-	-	-	-	-	1

Reference Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1	Laboratory manual on engineering chemistry	1st	S. K. Bashin, Dr.Sudha Rani	Dhanpat Rai Publishingcompany Ltd.,New Delhi	2012
2	Engineering Chemistry	15th	P. C. Jain,	Dhanpat Rai Publishing Company Ltd., New Delhi	2014

Useful Link /Web Resources:

1. https://www.vlab.co.in/broad-area-chemical-science

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Course Title: Generative AI	
Course Code: 241DSEESCL105	**Semester:** II
Teaching Scheme: L-T-P: 3 – 0 - 0	**Credits:** 3
Evaluation Scheme: ISE-MSE Marks: 50	**ESE Marks:** 50

Course Description: Students will explore the basic principles of machine learning and neural networks, gaining insights into how AI systems learn from data to generate novel outputs. The course covers key areas of AI application, including natural language processing and computer vision, providing students with a broad perspective on the field's capabilities and potential.

Course Objectives:

1. To Explain the basic principles of Machine Learning.
2. To Describe the core concepts of neural networks and deep learning
3. To Distinguish between different generative models (e.g., GANs, VAEs)

Course Outcomes (COs):

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

C105.1	Understand and explain the fundamentals of AI and generative AI
C105.2	Develop proficiency in prompt engineering and apply effective techniques for text generation
C105.3	Analyze and compare different types of generative models, including their capabilities.
C105.4	Evaluate the ethical implications, societal impact, and future potential of generative AI

Content	Hours
Unit 1: Introduction to AI and Generative AI Definitions of AI and generative AI. Brief history and types of AI.	5
Unit 2: Fundamentals of Generative AI "Neural networks, machine learning, deep learning. How generative AI ""learns""?"	7
Unit 3: Prompt Engineering and Text Generation "What is prompt engineering? Importance of prompts in generative AI. Techniques for effective prompt writing. How do text generation models work? Applications in writing, chatbots, and education."	7
Unit 4: Introduction to Generative Models What are generative models? Overview of different types (GANs, VAEs, etc.) Simple examples of content generation Generating simple images or melodies	7

Unit 5: Image and Art Generation Image generation techniques. Role of prompts in image generation	6
Unit 6: Ethical Considerations and Future of Generative AI Potential applications and impact on society Ethical considerations (bias, misinformation, etc.) Privacy and security concerns Discussing the future of AI	8

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	Pos											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
C205.1	1				1							1
C205.2	1		2		1							
C205.3	1	2		1	1							
C205.4						3	2	3				1

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Course Title: Generative AI Laboratory	
Course Code: 241DSEESCP106	**Semester:** II
Teaching Scheme: L-T-P: 0 – 0 - 2	**Credits:** 1
Evaluation Scheme: ISE Marks: 25	**ESE-**

Course Description: This course provides an introduction to generative artificial intelligence (AI), covering fundamental concepts, Models, AI tools and applications. Students will learn about various generative models and tools used in creating content such as images, text, music, prompt engineering concepts and ethics.

Course Objectives:

1. To study basic principles of generative AI.
2. To study different types of generative models and their applications.
3. To give hands-on experiences with existing generative models and tools.
4. To explore ethical considerations and societal implifications of generative AI technologies.

Course Outcomes (COs):

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

C205.1	Understand and explain the fundamentals of AI and generative AI
C205.2	Develop proficiency in prompt engineering and apply effective techniques for text generation
C205.3	Analyze and compare different types of generative models, including their capabilities.
C205.4	Evaluate the ethical implications, societal impact, and future potential of generative AI

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	**Pos**											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
C205.1	1				1							1
C205.2	1		2		1							
C205.3	1	2		1	1							
C205.4						3	2	3				1

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List of Assignments		
Ass. No.	**Name of Assignment**	**Hours**
1	Use AIweirdness.com to explore simple text generation. (https://www.aiweirdness.com/)	2
2	Use Teachable Machine by Google to create a simple image classifier. (https://teachablemachine.withgoogle.com)	2
3	Use Neural Network playground to visualize how neural networks make decisions. (https://playground.tensorflow.org/)	2
4	Use GPT-3 playground or a similar tool to generate text. (https://studio.ai21.com/)	2
5	Create a simple chatbot using Dialogflow or Botpress.	2
6	Use DALL-E mini or Midjourney to create AI-generated art	2
7	Experiment with DeepArt.io to apply artistic styles to photos	2
8	Use Mubert to generate AI music .	2
9	Experiment with Google's Magenta studio for music creation	2
10	Use the What-If Tool by Google to explore machine learning models and dataset bias	2

Online Resources:

1. https://www.deeplearning.ai/courses/generative-ai-for-everyone/
2. https://www.coursera.org/learn/introduction-to-generative-ai
3. https://www.w3schools.com/gen_ai/gen_ai_prompt_intro.php
4. https://www.tutorialspoint.com/prompt_engineering/prompt_engineering_introduction.htm
5. https://www.youtube.com/@AI.Overpowered

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Course Title: Professional Communication	
Course Code: 241DSEACEL102	**Semester:** I/II
Teaching Scheme L-T-P: 1-0-0	**Credits:** 01
Evaluation Scheme: - ISE: 25	**ESE: --**

Prior knowledge of:	Basic English grammar, Basics of communication

Course Objectives:

1.	To **make** students learn important communicative situations, the basics of communication, and its significance in the corporate sector
2.	To **sharpen** listening, speaking, reading, and writing skills
3.	To **facilitate** them to draft office documents effectively
4.	To **enhance** career skills to make students industry-ready

Curriculum Details

Course Contents	Duration
Unit 1 Language and Communication • Need for effective communication • The process and levels of communication • Professional communication • Communication networks/ flows • Forms and methods (verbal and non-verbal) of communication • Barriers to communication and solutions	**04 Hrs**
Unit 2 Introduction to LSRW • **Listening Skills:** Hearing and listening, Listening as an active skill; Types of Listening; Barriers to effective listening skills • **Speaking Skills**: Importance, Various oral business contexts/situations, Group communication, Preparing effective public speeches (Impromptu and Prepared) • **Reading Skills**: Benefits of effective reading, Types of reading (Skimming; Scanning, Intensive reading, Extensive reading) Overcoming common obstacles, Reading comprehension • **Writing Skills:** Importance, Paragraph writing techniques	**03Hrs**
Unit 3 Professional Correspondence • **Official correspondence** Principles, structure (elements) Layout (complete block, modified block, semi-block), Types (enquiry and reply, claim and adjustment) • **Office drafting** Writing notice, agenda, and minutes of the meeting • **Email writing** Advantages and limitations Style, structure, and content Email etiquette	**04 Hrs**

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Unit 4 Career Skills and Ethics	**03 Hrs**
• **Resume and cover letter writing** Types of resume Important features of selling resume Cover letter writing • **Job Interviews** Interview preparation FAQs (Frequently Asked Questions) • **Guidance for IELTS, TOFEL and GRE** • **Corporate etiquette and ethics**	

Course Outcomes (COs): After successful completion of the course, students will be able to:

CO	Statements
102.1	**Implement** verbal and non-verbal codes for effective communication
102.2	**Demonstrate** language learning skills- LSRW (Listening, Speaking, Reading, and Writing)
102.3	**Compose** business documents competently
102.4	**Enhance** employability and readiness for industry demand and career advancement

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

POs / COs	BTL	1	2	3	4	5	6	7	8	9	10	11	12
CO1	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**3**	**-**	**1**
CO2	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**3**	**-**	**1**
CO3	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**3**	**-**	**1**
CO4	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**3**	**-**	**1**

Suggested Learning Resources:
Text Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1	Technical Communication: Principles and Practice	4th	Meenakshi Raman & Sangita Sharma	Oxford University Press	2022
2	Personality Development and Soft- Skills	2nd	Barun K. Mitra	Oxford University Press	2016
3	Communication Skills	2nd	Sanjay Kumar & Pushp Lata	Oxford University Press	2015
4	Communication Skills	3rd	Meenakshi Raman & Sangeeta Sharma	Oxford University Press	2013

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Reference Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1	Business Communication	2nd	Urmila Rai and S.M. Rai	Himalaya Publishing House Pvt. Ltd.	2014
2	A University Grammar of English	1st	Randolph Quirk and S Greenbaum	Pearson	2007
3	Effective Technical Communication	2nd	B. K.Mitra	Oxford University Press	2006
4	Effective Technical Communication	2nd	M.Ashraf Rizvi	McGraw Hill Education	2005

Useful Links/Web Resources:

1. **https://www.skillsyouneed.com**
2. **https://www.psychologytoday.com**
3. **https://www.britishcouncil.in**
4. **https://www.udemy.com**
5. **https://www.englishclub.com**

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Course Title: Professional Communication Laboratory	
Course Code: 241DSEVSECP103	**Semester:** I/II
Teaching Scheme L-T-P: 0-0-2	**Credit:**01
Evaluation Scheme: ISE Marks: 25	**ESE Marks: --**

Prior knowledge of:	Basic language learning and people skills

Course Objectives:

1.	To **familiarize** students with English phonology and improve their pronunciation
2.	To **improve** language learning skills (LSRW) by providing ample practice
3.	To **develop** students' verbal and non-verbal communication
4.	To **cultivate** creative thinking and workplace skills

List of Lab Sessions

Session No	Title of Activities	Duration
01	**Icebreaking: Introducing self and others** Different ways of introducing self and others: demonstration	02Hrs
02	**Phonetics** Introduction to phonetics - consonants, vowels and diphthongs, stress, intonation in English with video samples	02Hrs
03	**Remedial English** Vocabulary-building games and identifying errors revising rules of English grammar	02Hrs
04	**Listening Practice** Listening comprehension, strategies for effective listening with audio/video samples	02Hrs
05	**Reading Practice** Improving Comprehension Skills, Techniques for good comprehension	02Hrs
06	**Technical Writing Practice** Paragraph writing, writing notices, agenda minutes of the meeting, email writing	02Hrs
07	**Public Speaking** Practicing extempore and prepared speeches	02Hrs
08	**Group discussion** Group discussions on current topics	02Hrs
09	**Mock Meetings** Purposes, preparation, and procedure for conducting effective meetings	02Hrs
10	**Mock Interviews** Preparing for FAQs and facing mock interviews	02Hrs
11	**Creative Writing** Blog Writing	02Hrs
12	**Film/Book Appreciation** Showing short films and appreciation of them. Reading novels or short stories and critical analysis of them.	02Hrs

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Course Outcomes (COs): After successful completion of the course, students will be able to:

CO	Statements
103.1	**Demonstrate** effective LSRW skills
103.2	**Articulate** words accurately and create grammatically correct sentences
103.3	**Deliver** speeches and participate in GDs, business meetings, and mock interviews effectively
103.4	**Draft** business documents and blogs by following writing ethics

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

POs / COs	BTL	1	`2	3	4	5	6	7	8	9	10	11	12
103.1	**3**	-	-	-	-	-	-	-	**2**	**3**	**3**	-	**1**
103.2	**3**	-	-	-	-	-	-	-	**2**	**3**	**3**	-	**1**
103.3	**3**	-	-	-	-	-	-	-	**2**	**3**	**3**	-	**1**
103.4	**3**	-	-	-	-	-	-	-	**2**	**3**	**3**	-	**1**

Suggested Learning Resources:

Text Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1	A Practical Course in Spoken English	1st	J.K. Gangaj	PHI Learning Pvt. Ltd	2014
2	English Language Laboratories	2nd	Nira Konar	PHI Learning Pvt. Ltd	2014
3	Better English Pronunciation	2nd	J.D.O Connor	Cambridge University Press,	1980

Reference Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1	Communication Skills	2nd	Sanjay Kumar & Pushp Lata	Oxford University Press	2015
2	Technical Communication: Principles and Practice	2nd	Meenakshi Raman & Sangita Sharma	Oxford University Press	2011

Useful Links /Web Resources:

1. **https://www.indiabix.com**
2. **https://www.skillsyouneed.com**
3. **https://interviewbuddy.in**
4. **https://learnenglish.britishcouncil.org**
5. **https://www.fluentu.com**

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Course Title: Data Analytics with Spreadsheet	
Course Code: 241DSEPCCL101	**Semester:** II
Teaching Scheme L-T-P: 2 – 0 - 0	**Credits:** 02
Evaluation Scheme: - ISE:	**ESE: - 50**

Prior knowledge of:	Fundamental knowledge of mathematics and computers.

Course Objectives:

1	Understand the fundamental concepts of data organization within a spreadsheet, including the use of tables and ranges.
2	Learn to apply statistical functions within a spreadsheet to calculate means, medians, modes, standard deviations, and other relevant statistics.
3	Learn to create various types of charts (e.g., bar charts, line charts, pie charts) within a spreadsheet to represent data visually.

Curriculum Details

Course Contents	Duration
Unit 1 Introduction to Spreadsheet and Data Analytics Introduction to the user interface, Basic operations: entering data, formatting cells, and basic arithmetic operations, understanding rows, columns, and worksheets, what is Data Analytics. Importance of Data Analytics in various fields, Role of Spreadsheet in Data Analytics	**04 Hrs**
Unit 2 Data Management Data types: Text, numbers, dates, etc., Data validation and cleaning, Sorting and filtering data, removing duplicates, Creating and formatting Spreadsheet tables, Using structured references, Introduction to formulas and functions, Basic functions: SUM, AVERAGE, COUNT, MIN, MAX, Using logical functions: IF, AND, OR	**05Hrs**
Unit 3 Data Analysis Techniques Basic statistical concepts: mean, median, mode; Using Spreadsheet functions for statistical analysis, Descriptive statistics using Spreadsheets; Introduction to data visualization, creating basic charts: Line, Bars, Column, Pie, Customizing charts: Titles, labels, colors, and styles Creating combo charts, Sparklines and data bars, Introduction to Pivot Charts, Introduction to PivotTables, Creating and customizing PivotTables, Analysing data with PivotTables	**06 Hrs**
Unit 4 Advanced Spreadsheet Functions for Data Analysis VLOOKUP, HLOOKUP, and XLOOKUP functions, INDEX and MATCH functions, Nested functions and their applications, Installing and using the Analysis Tool pack, Performing regression analysis, Using the Histogram and Descriptive Statistics tools, Using conditional formatting to highlight data trends, Setting up custom data validation rules, creating dynamic data visualizations using conditional formatting.	**06 Hrs**

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Course Outcomes (COs): After successful completion of the course, students will be able to:

CO	Statements
101.1	Efficiently manage and manipulate datasets in spreadsheet, utilizing tables, formulas, and functions to organize and clean data.
101.2	Perform basic statistical analysis of real-world dataset and draw meaningful insight.
1013	Apply data visualization techniques using spreadsheets' charting and PivotTable features.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

POs / COs	BTL	1	2	3	4	5	6	7	8	9	10	11	12
101.1	2	1		1	2				1			1	2
101.2	2	1	1	2	3				1				2
1013	2	1	1	1	2				1	2		1	2

Books:

1. "Mastering Google Sheets: A Beginner to Advanced Guide" by Mark Dascano
2. "Data Analysis with Microsoft Excel: Updated for Office 2007" by Kenneth N. Berk and Patrick Carey
3. "Microsoft Excel Data Analysis and Business Modeling" by Wayne L. Winston
4. "Google Sheets: The Complete Beginner to Expert Guide" by William S. Bauer

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Course Title: Python Programming	
Course Code: 241DSEVSECL103	**Semester:** I/II
Teaching Scheme L-T-P: 1 – 2 - 0	**Credits:** 02
Evaluation Scheme: - ISE: -25	**POE:** - 25

Prior knowledge of:	Basic Knowledge of computers

Course Description:
This subject covers basic principles of programming and programming ethics through the python programming language.

Course Objectives:

1.	
2.	
3.	

Curriculum Details

Course Contents	Duration
Unit 1 Introduction to Python and Decision Structures Input, Processing, and Output: Introduction to programming and Python, Basic syntax, Displaying Output with the print Function, Comments, Variables, Operators, Reading Input from the Keyboard, Performing Calculations Decision Structures: The if Statement, The if-else Statement, Comparing Strings, Nested Decision Structures and the if-elif-else Statement	**04 Hrs**
Unit 2 Repetition Structures and Functions Repetition Structures: Introduction to Repetition Structures, The while Loop: A Condition Controlled Loop, The for Loop: A Count-Controlled Loop, Calculating a Running Total, Sentinels, Input Validation Loops, Nested Loops Functions: Introduction to Functions, Defining and Calling a Void Function, Designing a Program to Use Functions, Local Variables, Passing Arguments to Functions, Global Variables and Global Constants, Introduction to Value-Returning Functions.	**03Hrs**
Unit 3 Python Data structures and String **Lists and Tuples:** Sequences, Introduction to Lists, List Slicing, Finding Items in Lists with the in Operator, List Methods and Useful Built-in Functions, Copying Lists, Processing Lists, Two Dimensional Lists, Tuples, **Dictionaries and Sets**: Operations and use. **Strings:** Basic String Operations, String Slicing, Testing, Searching, and Manipulating Strings.	**04 Hrs**
Unit 4 Modules and File Handling **Modules:** Writing Your Own Value-Returning Functions, The math Module, Storing Functions in Modules **Files:** Introduction to File Input and Output Using Loops to Process Files, Processing Records, Exceptions.	**03 Hrs**

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Course Outcomes (COs): After successful completion of the course, students will be able to:

CO	Statements
103.1	Demonstrate use of decision and repetition structure in order to solve specific problem
103.2	Model a given big problem statement in to smaller parts to provide modular approach.
103.3	Choose proper data structure like list, touples, dictionaries etc. for solving given problem

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

POs / COs	BTL	1	2	3	4	5	6	7	8	9	10	11	12
103.1	1	-	-	-	2	-	-	1	-	-	-	-	1
103.2	1	-	-	-	2			1	-	-	-	-	1
103.3	1	-	-	-	2			1	-	-	-	-	1

Text Books:

1. Ethics for the Information Age 6th edition Michael J. Quinn
2. Starting Out with Python 5th Tony Gaddis Pearson March 17th 2021
Core Python Programming 3rd R. Nageswara Rao Dreamtech Press 1 Jan 2018

Reference Books:

1. Python: The Complete Reference Indian Edition Martin C. Brown MGH March 2018

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Course Title: Python Programming Laboratory	
Course Code: 241DSEVSEC104	**Semester:** I/II
Teaching Scheme L-T-P: 0 – 0 - 2	**Credits:** 01
Evaluation Scheme: - ISE: -25	

Prior knowledge of:	Basic Knowledge of computers

Course Description:
This subject covers basic principles of programming and programming ethics through the python programming language.

Course Objectives:

1.	
2.	
3.	

List of Experiment

Session No	Title of Activities	Duration
01	Program based on the decision structures (if, If else, nested if else, if elif else)	02Hrs
02	Program to demonstrate use of different types of looping statements.	02Hrs
03	1. Program to write and use different types of user defined function	02Hrs
04	Programs to demonstrate the use of various built-in functions in Python,	02Hrs
05	Program demonstrating operations and use of List and Touple	02Hrs
06	Program demonstrating operations and use of Dictionary and set.	02Hrs
07	Program to demonstrate modules	02Hrs
08	Program to perform CURD operations in a file using file handling.	02Hrs
09	Implement stack operations	02Hrs
10	Implement Queue operations	02Hrs

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Course Outcomes (COs): After successful completion of the course, students will be able to:

CO	Statements
104.1	Demonstrate use of decision and repetition structure in order to solve specific problem
104.2	Model a given big problem statement in to smaller parts to provide modular approach.
104.3	Choose proper data structure like list, touples, dictionaries etc. for solving given problem

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

POs / COs	BTL	1	2	3	4	5	6	7	8	9	10	11	12
104.1	1				2			1					1
104.2	1				2			1					1
104.3	1				2			1					1

Text Books:

1. Ethics for the Information Age 6th edition Michael J. Quinn
2. Starting Out with Python 5th Tony Gaddis Pearson March 17th 2021
Core Python Programming 3rd R. Nageswara Rao Dreamtech Press 1 Jan 2018

Reference Books:

2. Python: The Complete Reference Indian Edition Martin C. Brown MGH March 2018

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Course Title: Liberal Learning Course (LLC)	
Course Code: 241DSECCA101	**Semester:** I/II
Teaching Scheme: L-T-P :0 – 0 – 4	**Credits:** 02
Evaluation Scheme ISE-50	**ISE Marks:** 50

Syllabus Contents (All Clubs)	Duration
1. PAINTING • Memory Drawing - Human sketching, Object Drawing Perspective Memory • 2D Drawing - Basic Drawing Elements Principles, Compositions, Colour Scheme/Texture • 3D Drawing - 3D Basic Forms,3D Sketching, Light effect (shade/shadow)	**30 Hrs**
2. DANCE • Hip-Hop. • Information about elements. • Old School- New School steps. • Variations in old school new school steps. • How to use old-school steps in dance. • Choreography on 2 songs	**30 Hrs**
3. YOGA & MEDITATION • Breathing practices and pranayama • Sectional Breathing • Yoga deep Breathing • Concept of bandha and mudra • Rictation of pranava mantra • Anter Maun • Breath Mediation • Om dhayna	**30 Hrs**
4. Music • Introduction of Music • Taal • Practical Raag (Harmonium Swar) • Group Song • Presentation	**30 Hrs**
5. GUITAR • Introduction of Guitar • Guitar Tuning • Open strings Exercise • Finger Exercise • Scales and Intervals • Major Scale • Minor Scale • Strumming Pattern • Lead	**30 Hrs**

6. INTERIOR DESIGN **6.1 Primary elements in Architecture** • Elements of design such as point, line, shape, form, mass, space, color and texture patterns, light and shade; understanding the relations between them. **6.2 Principles in Architectural Design** • Principles of design such as harmony (unity), proportions, contrast, scale, balance (symmetric & asymmetric), rhythm (pattern), emphasis, scale proportion Finger Exercise **6.3 Color Theory** • Properties of color, color schemes, color value, intensity, Color texture, psychological effect of color. • Apply the knowledge of color theory and rendering techniques for Interior design assignments and portfolio Scales and Intervals • Introduction to Architectural lettering, size, and notation of drawing, symbolic representation of building elements and material, and other features as per standard practice. • Assignments included for Sketch plan measure drawing lettering and architectural symbols.	**30 Hrs**
7. ADVENTURE **7.1 Introduction to Adventure Activities** • Introduction • Benefits of adventure activities. • how to plan an adventure activity and prepare for safety.	
7.2 Safety Protocols, Risk Management and Basic First Aid for Adventure Activities • Equipment safety check • Emergency response procedure • Risk assessment and mitigation strategies. • Common injuries and ailments in adventure settings • Wound care and basic treatments • Heat and cold-related illnesses	
7.3 Adventure Cycling and Trekking Equipment Safety Check • Basic cycle/bike maintenance and repair • Cycling activity • Long-distance trekking and camping (One Day in Nature) • Route planning and logistics	**08 Hrs**
7.4 Environmental Stewardship and study of Wildlife • Leave No Trace principles • Environmental impact of adventure activities • Sustainability practices and conservation efforts • Habitat requirements and preferences of different species. • Interactions between wildlife and their environment. • Conservation strategies for maintaining viable populations. • Visit to Sanctuary -Dajipur, Radhanagari, Kolhapur,Jungle safari.	**08 Hrs**

7.5 Adventure Sports: Self-defense and Personal Development, Leadership. • Benefits of Self-Defense Sports • Physical fitness and conditioning • Improved self-confidence and self-esteem • Enhanced coordination, agility, and reflexes • Stress relief and mental discipline • Practical self-defense skills and situational awareness • Example:- Wrestling, boxing, Karate, Martial arts, taekwondo, lathikati • Building resilience and mental toughness • Teamwork and collaboration in challenging environments • Leadership skills and decision-making under pressure	**4Hrs**
7.6 Study of Historical Monuments • Historical background and evolution of Indian Culture. • History of Maratha Empire. • Visit Forts, temples, Palace, etc • **VISIT TO VERTICAL ADVENTURE PARK, MASAI PATHAR-JEUR** • Zipline • Zorbing ball • Bungee Ejection • High rope course • Rappelling • Parasailing • Sports Climbing • Slack Line • Rock climbing	**4Hrs**
8. Foreign Language-German • Introducing self and others • Grammar: WH questions, personal pronouns, simple sentences, verb conjugation • Themes: hobbies, the week, numbers, the alphabet, months, seasons • Grammar: articles, plural, the verbs to have and to be basic directions / • Grammar: definite and indefinite articles; negation - kein and nicht; • Form Filling Can understand and use familiar, everyday expressions and very simple sentences, which relate to the satisfying of concrete needs. Can introduce him/herself and others as well as ask others about themselves – e.g. where they live, who they know and what they own – and can respond to questions of this nature. Can communicate in a simple manner if the person they are speaking to speaks slowly and clearly and is willing to help.	**28 Hrs**
9. Photography. **9.1 Introduction to Digital Photography** • Understanding film and paper photography. • Learning about the digital revolution. • How photos are used today.	**30 Hrs**

9.2 Digital Basics • Digital image method of storing and processing digital image: Raster and Vector method Doodling. • Representation of digital image: Resolution – Pixel Depth **9.3 Digital Basics** • Windows Operating System • Concept of Internet • Image transportation through floppy, CD, zip and Internet. **9.4 Image Editing** • Image editing through image editing • Software like Adobe Photoshop – Adjustment of Brightness, Contrast, Tonal and Colour Values – • Experimenting with Level and Curve.	
10. Art & Craft **10.1 Craft Skills** • Cutting and Pasting Techniques - collage. • Paper folding Techniques -Origami.	**4 Hrs**
10.2 D.I.Y Project • Craft project using recycled material • Doodling.	**4 Hrs**
10.3 Field Trip • Cultural visit • Outdoor sketching • Visit to the exhibition and museum	**8 Hrs**
10.4 Workshop • Pottery Making • Lantern Making	**6 Hrs**
10.5 Cultural Activities • Drama, • skit, • Open Mic, • Singing, Dancing, etc.	**6 Hrs**
11. Film Making • Introduction of filmmaking • Short videos, Reels • Visit to Film Industry Kolhapur, • Information regarding instrument used in film industry	**30 Hrs**
12.Coding Club • Basics of C programming • Introduction • Datatypes • Operators • Keywords	**6 Hrs**

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Control Structure • If • If Else • Else If • For • While • Switch	**6 Hrs**
Functions • Types of Functions • Overloading & Overriding • Examples	**4 Hrs**
Arrays • Basics of Arrays • One Dimensional Array • Two-Dimensional Array	**4 Hrs** **4 Hrs**
Practice Problems	**4 Hrs**

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Course Title: Capstone Project	
Course Code: 241DSEMC104	**Semester:** II
Teaching Scheme: L-T-P:0-0-0	**Credits:** Grade (Mandatory Course)
Evaluation Scheme ISE: 50	**ESE Marks:** --

Course Objectives:

1	To inculcate independent learning by problem-solving in a social context.
2	To engage students in rich and authentic learning experiences.
3	To emphasize learning activities that are long-term, interdisciplinary, and student-centric.
4	To provide every student the opportunity to get involved either individually or as a group so as to develop team skills and learn professionalism.

Curriculum Details
As per the approved structure of the curriculum, students will be allowed to do capstone projects during the second semester of B. Tech. program.

Topics:

A Capstone Project may be a theoretical analysis, modeling & simulation, experimentation & analysis, prototype design, new equipment fabrication, correlation and analysis of data, software development, or a combination of these.

Group Structure:

Working in supervisor/mentor-monitored groups; the students plan, manage, and complete a task/project/activity which addresses the stated problem.

1. There should be a team/group of 4 -5 students
2. A supervisor/mentor teacher assigned to individual groups

Selection of Project:

The project demo model for learning is recommended. The model begins with the identifying of a problem, often growing out of a question or “wondering”. This formulated problem then stands as the starting point for learning. Students design and analyze the problem within an articulated interdisciplinary or subject frame or based on Rural/Social internship.

A problem can be theoretical, practical, social, technical, symbolic, cultural, and/or scientific and grows out of students’ wondering within different disciplines and professional environments. A chosen problem has to be exemplary. The problem may involve an interdisciplinary approach in both the analysis and solving phases.

By exemplarity, a problem needs to refer back to a particular practical, scientific, social and/or technical domain. The problem should stand as one specific example or manifestation of more general learning outcomes related to knowledge and/or modes of inquiry.

There are no commonly shared criteria for what constitutes an acceptable project. Projects vary greatly in the depth of the questions explored, the clarity of the learning goals, the content, and structure of the activity.

1. A few hands-on activities that may or may not be multidisciplinary.

2. Use of technology in meaningful ways to help them investigate, collaborate, analyze, synthesize, and present their learning.

3. Activities may include- Solving real life problem, investigation, /study and Writing reports of in-depth study, fieldwork.

Recommended Guidelines and phases:

Capstone project is learning through activity. One of the teachers can be appointed as guide for capstone project group. Following are the recommended guidelines that will work as an initiator and facilitator in process of completion of Capstone project.

1. In first week of commencement of 2nd semester, let the guide create awareness about capstone project (what, why, and how) among the students. Convey students expected outcomes, assessment process and evaluation criteria.
2. Get groups of students registered preferably 4-5 students per group.
3. Assign guide to each group.
4. Provide guidelines for title identification (Problem can be some real-life situation that needs technology solutions. This situation can be identified by rural/social internship, by meeting people around, visiting various industries, society, and institutes. The solution can be prototype, model, convertible solutions, survey and analysis, simulation, and similar).

5. Let students submit the problem identified in prescribed format (Problem Statement, Initial Survey for topic finalization, Abstract, Software, Hardware required, Title)

6. Guide can approve the problem statements based on feasibility and learning outcomes expected for first year engineering students
7. Guide is to monitor progress of the task during phases of project work. Broadly phases may include- requirements gathering, preparing a solution, technology design for the solution.
8. Weekly monitoring and continuous assessment record are to be maintained by guide.
9. Get the report submitted at the end of semester.

Student is required to prepare a capstone project and file containing documentary proofs of the activities done by him. The evaluation will be done by expert committee constituted by HoD/Departmental capstone project In-charge/ faculty mentor.

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Course Title: Rural/Social Internship	
Course Code: 241DSEMC102	**Semester:** I
Teaching Scheme: L-T-P :0-0-0	**Credits:** Grade (Mandatory Course)
Evaluation Scheme ISE: 50	**ESE Marks:** --

Course Objectives:

1	To provide possible opportunities to learn, understand and sharpen the real time technical / managerial skills required at the job.
2	To exposure to the current technological developments relevant to the subject area of training.
3	To expose students to the engineer's responsibilities and ethics.
4	To understand the social, economic and administrative considerations that influence the working environment of industrial organizations
5	To gain experience in writing technical reports/projects.
6	To understand the social, economic, and administrative considerations that influence the working environment of industrial organizations

Curriculum Details

As per the approved structure of curriculum, students will be allowed to do internship during the first semester of B. Tech. program. During the internship, students are required to visit villages/wards/small industries/organizations etc

For following activities

1. Prepare and implement a plan to create local job opportunities.
2. Prepare and implement a plan to improve education quality in the village.
3. Preparing an actionable DPR for Doubling the village Income.
4. Developing a Sustainable Water Management system.
5. Prepare and improve a plan to improve the health parameters of villagers.
6. Developing and implementing Low-Cost Sanitation facilities
7. Prepare and implement a plan to promote Local Tourism through Innovative Approaches
8. Implement/Develop Technology solutions that will improve quality of life.
9. Prepare and implement solutions for energy conservation.
10. Prepare and implement a plan to Skill village youth and provide employment.
11. Develop localized techniques for Reduction in construction Costs.
12. Prepare and implement a plan for sustainable growth of the village.
13. Setting of Information imparting club for women leading to contribution to social and economic issues.
14. Developing and managing an Efficient garbage disposable system.
15. Contribution to any national-level initiative of the Government of India. For eg. Digital India/ Skill India/ Swachh Bharat Internship etc

Every student is required to prepare a file containing documentary proofs of the activities done by him. The evaluation will be done by an expert committee constituted by the HoD/Departmental Internship In-charge/ faculty mentor.