D. Y. PATIL COLLEGE OF ENGINEERING & TECHNOLOGY

Kasaba Bawada, Kolhapur

(Approved by AICTE, New Delhi, Govt. of Maharashtra and Affiliated to Shivaji University Kolhapur)

(An Autonomous Institute)

Accredited by NAAC with 'A' Grade

Accredited by NBA

Structure and Curriculum

(As Per National Education Policy 2020)

For

First Year B.Tech.

in

Department of Chemical Engineering

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

PRINCIPAL
D. Y. PATIL College of Engineering
And Technology
Kasaba Bawada, Kolhapur.
(An Autonomous Institute)

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Dept. of First Year Engg.
D. Y. Patil College of Engg. & Tech.
Kasaba Bawada, Kolhapur

D. Y. PATIL COLLEGE OF ENGINEERING & TECHNOLOGY

(An Autonomous Institute)

Department of Chemical Engineering

F. Y. B. Tech. Structure

Scheme of Teaching and Evaluation w. e. f. A. Y. 2024-2025

(As Per National Education Policy 2020)

Semester-I (Chemistry Cycle)

Sr. No	Course Code	Course Type	Name of the Course	Teaching Scheme Per Week			Credits	Total Marks	Evaluation Scheme			
				L	T	P			Type	Max. Marks	Minimum Marks For Passing	
Students Induction Program As Per AICTE Guidelines												
1	241CHBSCL101	BSC	Linear Algebra and Calculus	03	--	--	03	100	ISE	20	20	40
									MSE	30		
									ESE	50	20	
2	241CHBSCL102	BSC	Applied Chemistry for Chemical Engineering	03	--	--	03	100	ISE	20	20	40
									MSE	30		
									ESE	50	20	
3	241CHESCL101	ESC	Generative AI	03	--	--	03	100	ISE	20	20	40
									MSE	30		
									ESE	50	20	
4	241CHAECL101	AEC	Professional Communication	01	--	--	01	25	ISE	25	10	10
5	241CHVSECL101	VSEC	Computer Workshop	01	--	--	01	25	ISE	25	10	10
6	241CHPCCL101	PCC	Chemical Process Instrumentation	02	--	--	02	50	ISE	20	20	20
									MSE	30		
7	241CHBSCT101	BSC	Linear Algebra and Calculus Tutorial	--	01	--	01	25	ISE	25	10	10
8	241CHBSCP102	BSC	Applied Chemistry for Chemical Engineering Laboratory	--	--	02	01	25	ISE	25	10	10
9	241CHESCP101	ESC	Generative AI Laboratory	--	--	02	01	25	ISE	25	10	10
10	241CHAECP101	AEC	Professional Communication Laboratory	--	--	02	01	25	ISE	25	10	10
11	241CHVSECP101	VSEC	Computer Workshop Laboratory	--	--	02	01	25	ISE	25	10	10
12	241CHCCAP101	CCA	Liberal Learning Course	--	--	04	02	50	ISE	50	20	20
			Total	**13**	**01**	**12**	**20**	**575**	--	--	--	--
Non-Credits Mandatory Courses												
1	241DSMCL101	MC	Finishing School Training I	03	--	--	--	50	ISE	50	20	Grade
2	241DSMCP102	MC	Rural/Social Internship	--	--	--	--	50	ISE	50	20	Grade

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F. Y. B. Tech. Structure

Scheme of Teaching and Evaluation w. e. f. A. Y. 2024-2025

(As Per National Education Policy 2020)

Semester-II (Chemistry Cycle)

Sr. No	Course Code	Course Type	Name of the Course	Teaching Scheme Per Week			Credits	Total Marks	Evaluation Scheme			
				L	T	P			Type	Max. Marks	Minimum Marks For Passing	
1	241CHBSCL103	BSC	Differential Equations and Integral Transform	03	--	--	03	100	ISE	20	20	40
									MSE	30		
									ESE	50	20	
2	241CHBSCL104	BSC	Physics for Chemical Engineering	03	--	--	03	100	ISE	20	20	40
									MSE	30		
									ESE	50	20	
3	241CHESCL102	ESC	Computer Programming and Problem Solving	03	--	--	03	100	ISE	20	20	40
									MSE	30		
									ESE	50	20	
4	241CHESCL103	ESC	Mechanical Operations	03	--	--	03	100	ISE	20	20	40
									MSE	30		
									ESE	50	20	
5	241CHVSECL102	VSEC	Design Thinking Through Innovation	01	--	--	01	25	ISE	25	10	10
6	241CH IKS L101	IKS	Historical Places in and Around Kolhapur	02	--	--	02	50	ISE	20	20	20
									MSE	30		
7	241CHBSCT103	BSC	Differential Equations and Integral Transform Tutorial	--	01	--	01	25	ISE	25	10	10
8	241CHBSCP104	BSC	Physics for Chemical Engineering Laboratory	--	--	02	01	25	ISE	25	10	10
9	241CHESCP102	ESC	Computer Programming and Problem Solving Laboratory	--	--	02	01	25	ISE	25	10	10
10	241CHESCP103	ESC	Mechanical Operations Laboratory	--	--	02	01	25	ISE	25	10	10
11	241CHVSECP102	VSEC	Design Thinking Through Innovation Laboratory	--	--	02	01	25	ISE	25	10	10
12	241CHMCL102	CCA	Liberal Learning Course	--	--	04	02	50	ISE	50	20	20
			Total	**15**	**01**	**12**	**22**	**650**	--	--	--	--
Non-Credits Mandatory Courses												
1	241DSMCL103	MC	Finishing School Training II	03	--	--	--	50	ISE	50	20	Grade
2	241DSMCP104	MC	Capstone Project	--	--	--	--	50	ISE	50	20	Grade

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Department of Chemical Engineering

F. Y. B. Tech. Curriculum

w.e.f. A.Y. 2024-2025

Course Title: Linear Algebra and Calculus	
Course Code: 241CHBSCL101	**Semester:** I
Teaching Scheme: L-T-P : 03-00-00	**Credits:** 03
Evaluation Scheme ISE-I/MSE/ISE-II: 10/30/10	**ESE Marks:** 50

Prior Knowledge of:	Matrices, Derivatives, Integrations.

Course Objectives:

1.	To teach mathematical methodology
2.	To develop mathematical skills and enhance logical thinking power of students
3.	To give the knowledge of Linear Algebra and Calculus with an emphasis on the applications of solving Chemical Engineering problems
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: 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 • Numerical Solutions of Linear Equations by Gauss-Elimination method	**07 Hrs**
Unit 2: Linear Algebra –II • Definition of linear combination of vectors • Dependence and independence of vectors • Eigen values and its properties • Eigen vectors and its properties • Cayley-Hamilton Theorem	**07 Hrs**
Unit 3: Partial Differentiation • Introduction	**07 Hrs**

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Course Contents	Duration
• Partial derivatives • Total derivatives • Euler's theorem on homogeneous functions • Jacobian and its properties	
Unit 4: Partial Differential Equations • Definition of partial differential equation. • Standard method to solve first order non-linear partial differential equations of the Form I f(p, q)=0 • Standard method to solve first order non-linear partial differential equations of the Form II f(z,p,q)=0 • Standard method to solve first order non-linear partial differential equations of the Form III f(x, p)=g(y, q) • Lagrange's method to solve first order linear partial differential equations	**07 Hrs**
Unit 5: Vector Calculus • Introduction • Gradient of scalar point function • Divergence of vector point function • Curl of a vector point function • Irrotational, Solenoidal vector field	**07 Hrs**
Unit 6: Integral Calculus • Introduction of improper integral • Gamma function and its properties • Beta function and its properties • Error Function and its properties	**07 Hrs**

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Course Outcomes (CO): 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 system of linear equations
101.2	**Identify** Eigen values & make use of it for finding Eigen vectors
101.3	**Apply** the knowledge of partial differentiation
101.4	**Solve** partial differential equations with different methods
101.5	**Apply** knowledge of vector differentiation to find curl and divergence of vector fields
101.6	**Use** special functions and their properties during their higher learning

Course Articulation Matrix: Mapping of Course Outcomes (CO) with Program Outcomes (PO)

CO \ PO	BTL	1	2	3	4	5	6	7	8	9	10	11	12
101.1	2,3	3	2	--	--	1	---	--	--	--	--	--	1
101.2	2,3	3	2	--	--	1	--	--	--	--	--	--	1
101.3	3	3	2	--	--	--	--	--	--	--	--	--	1
101.4	3	2	2	--	--	--	--	--	--	--	--	--	1
101.5	3	2	2	--	--	1	--	--	--	--	--	--	1
101.6	3	2	2	--	--	--	--	--	--	--	--	--	1

Text Books:

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

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Reference Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1	Advanced Engineering Mathematics	5th	Erwin Kreyszig	India Pvt, Ltd.	2014
2	Higher Engineering Mathematics	6th	B. V. Ramana	Tata M/c Graw Hill Publication	2010
3	Calculus	8th	James Stewart	Cengage Learning	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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F. Y. B. Tech. Curriculum

w.e.f. A.Y. 2024-2025

Course Title: Linear Algebra and Calculus Tutorial	
Course Code: 241CHBSCT101	**Semester:** I
Teaching Scheme: L-T-P : 00-01-00	**Credits:** 01
Evaluation Scheme ISE: 25	**ESE Marks: -**

Prior Knowledge of:	Matrices, Derivatives, Integrations.

Course Objectives:

1.	To teach mathematical methodology
2.	To develop mathematical skills and enhance logical thinking power of students
3.	To give the knowledge of Linear Algebra and Calculus with an emphasis on the applications of solving Chemical Engineering problems
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	**Linear Algebra –I:** Rank of Matrix, Solutions of Non-homogeneous simultaneous linear equations	01 Hr
02	**Linear Algebra –I:** Solutions of simultaneous linear homogeneous equations	01 Hr
03	**Linear Algebra –II:** Dependence and Independence of vectors	01 Hr
04	**Linear Algebra –II:** Eigen values and Eigen vectors of Matrix, Cayley-Hamilton Theorem	01 Hr
05	**Partial Differentiation – I:** Euler's theorem on homogeneous functions.	01 Hr
06	**Partial Differentiation –II:** Partial derivatives, Jacobian and its properties	01 Hr
07	**Partial Differential Equations-I:** Form I f(p, q)=0, Form II f(z,p,q)=0	01 Hr
08	**Partial Differential Equations-II:** Form III f(x, p)=g(y, q), Lagrange's method to solve first order linear partial differential equations.	01 Hr
09	**Integral Calculus-I:** Gamma function and its properties	01 Hr
10	**Integral Calculus-II:** Beta function and its properties, Error function and its properties	01 Hr
11	**Linear Algebra-I using SCILAB/MATLAB**	01 Hr
12	**Linear Algebra-II using SCILAB/MATLAB**	01 Hr

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Course Outcomes (CO): 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 system of linear equations
101.2	**Identify** Eigen values & make use of it for finding Eigen vectors
101.3	**Apply** the knowledge of partial differentiation
101.4	**Solve** partial differential equations with different methods.
101.5	**Apply** knowledge of vector differentiation to find curl and divergence of vector fields.
101.6	**Use** special functions and their properties during their higher learning

Course Articulation Matrix: Mapping of Course Outcomes (CO) with Program Outcomes (PO)

CO \ PO	BTL	1	2	3	4	5	6	7	8	9	10	11	12
101.1	2,3	3	2	--	--	1	---	--	--	--	--	--	1
101.2	2,3	3	2	--	--	1	--	--	--	--	--	--	1
101.3	3	3	2	--	--	--	--	--	--	--	--	--	1
101.4	3	2	2	--	--	--	--	--	--	--	--	--	1
101.5	3	2	2	--	--	1	--	--	--	--	--	--	1
101.6	3	2	2	--	--	--	--	--	--	--	--	--	1

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Text Books:

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

Reference Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1	Advanced Engineering Mathematics	5th	Erwin Kreyszig	India Pvt, Ltd.	2014
2	Higher Engineering Mathematics	6th	B. V. Ramana	Tata M/c Graw Hill Publication	2010
3	Calculus	8th	James Stewart	Cengage Learning	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: Applied Chemistry for Chemical Engineering	
Course Code: 241CHBSCL102	**Semester:** I
Teaching Scheme: L-T-P : 03-00-00	**Credits:** 03
Evaluation Scheme ISE-I/MSE/ISE-II: 10/30/10	**ESE Marks:** 50

Prior Knowledge of:	Properties of solution, Importance of water, Engineering material, Green Chemistry

Course Objectives:

1.	To study the different water-based concepts and its importance
2.	To impart the basic concepts of solutions and properties of solutions
3.	To give the basic knowledge of fuel and some advanced materials and electrochemistry and energy storage systems
4.	To explain battery technology, engineering materials and green 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)	**07 Hrs**
Unit 2: Solutions • Introduction, definition of normality, molarity, molality, mole fraction, ppm • Types of solutions, expression of concentration of solutions of solids in liquids, Solubility of gases in liquids, solid solutions • Raoult's law, colligative properties - relative lowering of vapour pressure • Elevation of boiling point, depression of freezing point, osmotic pressure • Determination of molecular masses using colligative properties, abnormal molecular	**07 Hrs**

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Course Contents	Duration
mass • Van't Hoff factor	
Unit 3: Fuels and Green Chemistry • Introduction to Fuels, classifications of fuel • Calorific values its types and units (calorie, kcal, joules, kilojoules) • Characteristics of Good fuels, Boy's Calorimeter and their numerical • Introduction to Fuel cells, theoretical principle, advantages, disadvantages • Types of Fuel Cells, H_2-O_2 fuel cells (Construction, Working and Applications) **Green Chemistry:** • Introduction, Aims, goals and applications • Twelve principle of green chemistry	**07 Hrs**
Unit 4: Electrochemistry and Energy storage systems: **Electrochemistry** • Introduction, EMF of cell, Free Energy, Single electrode Potential • Derivation of Nernst equation • Introduction, construction, working and applications of types of electrode (Calomel electrode, ion selective electrodes and Glass electrode) • Introduction, construction, working and applications of determination of pH using Glass electrode **Energy storage Systems** • Introduction, Classification of batteries (primary and secondary batteries) • Construction, working, advantages and applications of carbon-zinc cell and Li-ion battery as an electrochemical cell	**07 Hrs**
Unit 5: Chemical Kinetics • Introduction, Rate of reaction, Definition and units of rate constant. • Factors affecting rate of reaction. (Nature of reactant, Concentration, pressure, temperature and catalyst.) • Order and Molecularity of reaction, Zero order reaction, Pseudo-unimolecular reactions with examples • First order reaction, Characteristics of first order reaction,	**07 Hrs**

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Course Contents	Duration
• Second order reaction: Characteristics of Second order reaction • Theories of Reaction Rates: Collision theory and Activated Complex theory of bimolecular reactions • Numerical on rate constant and half-life	
Unit 6: Engineering Materials **Polymers** • Introduction, classifications of polymer • Introduction, synthesis, properties & applications of Bakelite and Urea-formaldehlye resin • Conducting Polymers: Introduction, Synthesis & Mechanism of conduction in polyaniline • Biodegradable polymers: Introduction and their requirements. Synthesis, properties and applications of Polylactic acid **Nanomaterials** • Introduction, Synthesis of nanomaterials (Top down and bottom-up approaches) • Synthesis by Sol-gel, and ball milling method • Nanoscale materials: Fullerenes, Carbon nanotubes and graphenes (Explanation, properties and application)	**07 Hrs**

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

CO	Statements
102.1	**Interpret** the hardness, acidity, alkalinity and chloride content of water and methods For waters of testing
102.2	**Recall** and **apply** the concept of normality, morality and molality for domestic and industrial usage
102.3	**Discuss and assess** fuels and concept of green chemistry with its applications
102.4	**Evaluate** the electrochemical energy storage systems such as lithium batteries and design for usage in electrical and electronic applications
102.5	**Apply** the theoretical aspects for understanding the construction and working of chemical reactions
102.6	**Illustrate** general synthesis and mechanisms of some advanced polymeric Materials and nanomaterials

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Course Articulation Matrix: Mapping of Course Outcomes (CO) with Program Outcomes (PO)

CO \ PO	BTL	1	2	3	4	5	6	7	8	9	10	11	12
102.1	3	3	2	--	--	--	--	--	--	--	--	--	1
102.2	2	3	--	--	--	--	--	--	--	--	--	--	1
102.3	3	3	2	--	--	--	--	--	--	--	--	--	1
102.4	2	3	--	--	--	--	--	--	--	--	--	--	1
102.5	3	3	2	--	--	--	--	--	--	--	--	--	1
102.6	2	3	--	--	--	--	--	--	--	--	--	--	1

Text Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1	A Textbook of Engineering Chemistry	12th	S. S. Dara, S. S. Umare	S. Chand & Company Ltd., New Delhi.	2011
2	A Textbook of Engineering Chemistry	1st	C. P. Murthy, C. V. Agarwal, A. Naidu	BS Publications, Hyderabad,	2012
3	A text book of Engineering Chemistry	1st	S. Chawla	Dhanpat Rai & Co. (Pvt.) Ltd, Delhi	2011
4	Engineering Chemistry	15th	P. C. Jain	Dhanpat Rai & Co. (Pvt.) Ltd, Delhi	2015

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Reference Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1	Chemistry of Engineering Materials	3rd	R. P. Mani, K. N. Mishra	Cengage Learning	2015
2	Engineering Chemistry	3rd	B.Chinnappan, S. Baskar, R. Dhillon	Wiley India	2015
3	Engineering Chemistry	1st	Palanna. O.G.	TataMc-Graw Hill Publishing Limited	2012
4	Instrumental Methods of Chemical Analysis: Analytical Chemistry	6th	Chatwal, Anand	Himalaya Pub. House, Mumbai	2010

Useful Link /Web Resources:

1. https://archive.nptel.ac.in/courses/122/106/122106028/#
2. https://nptel.ac.in/courses/118104008

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Course Title: Applied Chemistry for Chemical Engineering Laboratory	
Course Code :241CHBSCP102	**Semester:** I
Teaching Scheme: L-T-P: 00-00-02	**Credit :** 01
Evaluation Scheme: ISE: 25	**ESE Marks:** 00

Prior Knowledge of:	Experiments based on titration, Handling of Glassware's & Chemicals, Preparation of Solution.

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).	02 Hrs
02	Determination of chloride content of water samples by using Mohr's methods.	02 Hrs
03	Determination of acidity of given water sample using acid-base titration.	02 Hrs
04	Determination of alkalinity of given water sample using acid-base titration.	02 Hrs
05	Estimation of zinc in brass solution.	02 Hrs
06	Estimation of Iron from a solution by colorimetry.	02 Hrs
07	To determine the approximate analysis of coal.	02 Hrs
08	Determination of pH of given samples using pH meter.	02 Hrs
09	To study the hydrolysis of methyl acetate in presence of HCl.	02 Hrs
10	To study the hydrolysis of methyl acetate in presence of H_2SO_4.	02 Hrs
11	Preparation of urea-formaldehyde resin	02 Hrs
12	Preparation of phenol formaldehyde resin.	02 Hrs

Minimum 12 experiments should be conducted

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

CO	Statements
102.1	**Analyze** hardness, acidity, alkalinity and chloride content of water and percentage of elements in some alloys.
102.2	**Produce** various advanced materials and analyze aqueous solutions using instruments.
102.3	**Perform** various experiments by following written instructions.
102.4	**Express** involvement by understanding concepts in applied chemistry.

Course Articulation Matrix: Mapping of Course Outcomes (CO) with Program Outcomes (PO)

CO \ PO	BTL	1	2	3	4	5	6	7	8	9	10	11	12
102.1	3	3	-	-	-	-	-	-	-	1	-	-	1
102.2	3	3	-	-	-	-	-	-	-	1	-	-	1
102.3	3	3	-	-	-	-	-	-	-	1	-	-	1
102.4	3	3	-	-	-	-	-	-	-	1	-	-	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 Publishing company 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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F. Y. B. Tech. Curriculum

W.E.F. A.Y. 2024-2025

Course Title: Generative AI	
Course Code: 241CHESCL101	**Semester:** I
Teaching Scheme L-T-P: 03-00-00	**Credits:** 03
Evaluation Scheme ISE-I/MSE/ISE-II:10/30/10	**ESE Marks:** 50

Prior knowledge of: Basics Knowledge of Computer

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 implications of generative AI technologies

Curriculum Details:

Course Contents	Duration
Unit 1: Introduction to Generative AI • What is AI, History, what is Generative AI • Types of Generative models • AI Prompt Writing? Prompts, Type of Prompts • What is text-to-text Generative AI • General Rules for Prompt Writing • Generative language models • ChatGPT 3.5, ChatGPT4.0, Examples, Google Bard, Ethics in AI	**7 Hrs**
Unit 2: Prompt Engineering - NLP and ML Foundations • Techniques for Prompt Engineering • Benefits of Prompt Engineering, what is NLP • What is ML, and examples • Common NLP Tasks - text Classification, language Translation, • Named Entity Recognition (NER) • Question answering, text Generation, sentiment analysis • Text summarization, recommendation systems	**7 Hrs**

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Course Contents	Duration
Unit 3: Tuning and Optimization Techniques • Fine-tuning prompts • Prompt Tuning • Filtering and post-processing • Reinforcement learning • Use cases and applications • Pre-training • Designing effective prompts	**7 Hrs**
Unit 4: AI for Creative Applications • Presentations gamma.ai • TL draw, AI overpowered tools • Image generation: Exploring tools like DALL-E and their creative applications like, generating concept art • product design ideas • Poem generator, video description • Music generation	**7 Hrs**
Unit 5: AI for Productivity Improvement • Rytr for blog idea and outline, business idea pitch • Cover Letter, Job Description • Reply to reviews, Keyword Extractor, Tagline and Headlines etc • ResumeBuilding.com, Blog writing/ Text Summarization using Copy.ai • Image code - Blackbox	**7 Hrs**
Unit 6: Generative AI tools and Case Studies • Hugging face transformers • OpenAI GPT3 API • Google cloud AI platform, Mid Journey, DALL E-2, Google Bard	**7 Hrs**

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Course Contents	Duration
• Case Studies – Token (API) Key generation on LLM (OpenAI, Google, Hugging face) in Google Colab • Hugging face demonstration of various models – image-to-text, • language translation, summarization • text generation, text-to-image • image-to-text, AI-Powered text and image generator, • Use of AI in word, power point and excel	

Course Outcomes (CO):

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

101.1	**Explain** generative AI within the general history with context
101.2	**Select** appropriate models/tools based on the specific requirements of a given task or application
101.3	**Classify** different types of prompts
101.4	**Generate** creative content using generative AI techniques, including text, images, music etc
101.5	**Develop** the skill to build resume, Blog writing and Text Summarization
101.6	**Develop** strategies for responsibly deploying and managing generative AI systems considering issues like privacy, bias and misinformation

Course Articulation Matrix: Mapping of Course Outcomes (CO) with Program Outcomes (PO):

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

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Reference books:

Sr. No.	Title	Edition	Author	Publisher	Year
1.	Generative AI for everyone	First	Altaf Rehman	Bluerose publishers Pvt.Ltd.	2024
2.	Prompt Engineering for Generative AI	First	Jems Phoenix and mike Taylor	Shroff Publishers and Distributors Pvt. Ltd.	2024
3.	Generative AI For Beginners Playbook	First	Branson Adams	Walking Crow Publishing	2024
4.	Rise of Generative AI and ChatGPT	First	Utpal Chakraborty, Sumit Kumar and Soumyadeep Roy	BPB Publications	2023
5.	Applied Generative AI for Beginners	First	Akshay Kulkarni, Adarsha Shivananda, Anoosh Kulkarni and Dilip Gudivada	Apress	2023

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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D. Y. PATIL COLLEGE OF ENGINEERING & TECHNOLOGY

Kasaba Bawada, Kolhapur

(An Autonomous Institute)

Department of Chemical Engineering

F. Y. B. Tech. Curriculum

W.E.F. A.Y. 2024-2025

Course Title: Generative AI Laboratory	
Course Code: 241CHESCP101	**Semester:** I
Teaching Scheme: L-T-P: 00-00-02	**Credits:** 01
Evaluation Scheme: ISE Marks: 25	**ESE:** 00

Prior knowledge of: Basics Knowledge of Computer

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 implications of generative AI technologies

List of Assignments / Practical's

Sr. No.	Name of Assignment	Duration
1	Suggesting 50 innovative ideas to increase sales and reduce costs (Assume suitable data)	2 Hrs
2	Citing references for an article	2 Hrs
3	Summarizing e mails/documents	2 Hrs
4	Resume generation	2 Hrs
5	Creative idea/Business presentation	2 Hrs
6	Examining the techniques used to construct a website or application	2 Hrs
7	Generate stories on a given prompt	2 Hrs
8	Image-to-text conversion	2 Hrs
9	Text to image	2 Hrs
10	Language Translation	2 Hrs
11	Blog writing	2 Hrs
12	Use of AI in word, Power point, and excel	2 Hrs

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Course Outcomes (CO):

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

101.1	**Explain** generative AI within the general history with context
101.2	**Select** appropriate models/tools based on the specific requirements of a given task or application
101.3	**Classify** different types of prompts
101.4	**Generate** creative content using generative AI techniques, including text, images, music etc
101.5	**Develop** the skill to build resume, Blog writing and Text Summarization
101.6	**Develop** strategies for responsibly deploying and managing generative AI systems considering issues like privacy, bias and misinformation

Course Articulation Matrix: Mapping of Course Outcomes (CO) with Program Outcomes (PO):

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

Reference books:

Sr. No.	Title	Edition	Author	Publisher	Year
1.	Generative AI for everyone	First	Altaf Rehman	Bluerose publishers Pvt.Ltd.	2024
2.	Prompt Engineering for Generative AI	First	Jems Phoenix and mike Taylor	Shroff Publishers and Distributors Pvt. Ltd.	2024
3.	Generative AI For Beginners Playbook	First	Branson Adams	Walking Crow Publishing	2024

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Sr. No.	Title	Edition	Author	Publisher	Year
4.	Rise of Generative AI and ChatGPT	First	Utpal Chakraborty, Sumit Kumar and Soumyadeep Roy	BPB Publications	2023
5.	Applied Generative AI for Beginners	First	Akshay Kulkarni, Adarsha Shivananda, Anoosh Kulkarni and Dilip Gudivada	Apress	2023

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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Department of Chemical Engineering

F. Y. B. Tech. Curriculum

w. e. f. 2024-2025

Course Title: Professional Communication	
Course Code: 241CHAECL101	**Semester:** I
Teaching Scheme L-T-P: 1-0-0	**Credits:** 01
Evaluation Scheme: - ISE: 25	**ESE:** 00

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** their listening, speaking, reading, writing skills
3.	To **facilitate** them to draft office documents effectively
4.	To **enhance** career skills to prepare 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**

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Course Contents	Duration
Unit 3 Professional Correspondence • **Official correspondence** Principles, structure (elements) Layout (complete block, modified block, semi-block), Types (enquiry and reply, order, 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**
Unit 4 Career Skills and Ethics • **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**	**03 Hrs**

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

CO	Statements
101.1	**Implement** verbal and non-verbal codes for effective communication
101.2	**Demonstrate** language learning skills-LSRW (Listening, Speaking, Reading, and Writing)
101.3	**Draft** business documents competently
101.4	**Improve** employability and readiness for industry demand and career advancement

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Course Articulation Matrix: Mapping of Course Outcomes (CO) with Program Outcomes (PO)

CO \ PO	BTL	1	2	3	4	5	6	7	8	9	10	11	12
101.1	3	--	--	--	--	--	--	--	2	3	3	--	1
101.2	3	--	--	--	--	--	--	--	2	3	3	--	1
101.3	3	--	--	--	--	--	--	--	2	3	3	--	1
101.4	3	--	--	--	--	--	--	--	2	3	3	--	1

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

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: 241CHAECP101	**Semester:** I
Teaching Scheme L-T-P: 00-00-02	**Credit:** 01
Evaluation Scheme: ISE Marks: 25	**ESE Marks:** 00

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	**02 Hrs**
02	**Phonetics** Introduction to phonetics - consonants, vowels and diphthongs, stress, intonation in English with video samples	**02 Hrs**
03	**Remedial English** Vocabulary-building games and identifying errors revising rules of English grammar	**02 Hrs**
04	**Listening Practice** Listening comprehension, strategies for effective listening with audio/video samples	**02 Hrs**
05	**Reading Practice** Improving Comprehension Skills, Techniques for good comprehension	**02 Hrs**
06	**Technical Writing Practice** Paragraph writing, writing notices, agenda minutes of the meeting, email writing	**02 Hrs**
07	**Public Speaking** Practicing extempore and prepared speeches	**02 Hrs**
08	**Group discussion** Group discussions on current topics	**02 Hrs**
09	**Mock Meetings** Purposes, preparation, and procedure for conducting effective meetings	**02 Hrs**

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Session No	Title of Activities	Duration
10	**Mock Interviews** Preparing for FAQs and facing mock interviews	**02 Hrs**
11	**Creative Writing** Blog Writing	**02 Hrs**
12	**Film/Book Appreciation** Showing short films and appreciation of them. Reading novels or short stories and critical analysis of them.	**02 Hrs**

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

CO	Statements
101.1	**Demonstrate** effective LSRW skills
101.2	**Articulate** words accurately and prepare grammatically correct sentences
101.3	**Deliver** speeches and participate in GDs, business meetings, and mock interviews effectively
101.4	**Draft** business documents and blogs by following writing ethics

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

CO \ PO	BTL	1	`2	3	4	5	6	7	8	9	10	11	12
101.1	3	--	--	--	--	--	--	--	2	3	3	--	1
101.2	3	--	--	--	--	--	--	--	2	3	3	--	1
101.3	3	--	--	--	--	--	--	--	2	3	3	--	1
101.4	3	--	--	--	--	--	--	--	2	3	3	--	1

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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: Computer Workshop	
Course Code: 241CHVSECL101	**Semester:** I
Teaching Scheme: L-T-P: 01-00-00	**Credits:** 01
Evaluation Scheme: ISE: 25	**ESE Marks:** 00

Prior Knowledge of:	Basic computer knowledge

Course Objectives:

1.	To get familiar with various hardware, software, operating systems and networking
2.	To identify and rectify the onboard computer hardware, software and network related problems
3.	To understand the hardware specifications that are required to run operating system and various application programs

Course Content:

Content	Duration
Unit 1: Computer Architecture **Assembly of Computer** • Introduction to hardware peripherals like RAM, ROM, keyboard, Mouse, processors, etc. • Generation of processors • Working of SMPS • Study of various ports • Steps and precautions to assemble compute **Computer Network Tools** r • Introduction to computer network • Study of various topologies • Preparing the network cable using crimping tools and connectors • Study of various network environments	**07 Hrs**

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Content	Duration
Unit 2: Operating System, Server and Internet **Operating System and Software Installations** • Introduction to operating system • Types of operating system (Windows and Linux). • Window:-Evolution of operating system • Introduction to software. Types of software (MS office, VLC media player, Win RAR), etc. • Linux: Evolution of operating system • Introduction to software • Types of software (open office, web browser, etc.) • Case study of Installations step for operating system and application software's **Server** • Introduction to server • Difference between server and normal desktop • Evolution of servers • Study of various servers like Email, data, domain, etc. **Internet** • Introduction and evolution of internet • Study of various internet-based services like Email, social network, chat • Introduction to cyber security and cyber laws **Driver software installation**	**07 Hrs**

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

CO	Statements
101.1	**Understand** the basic concept and structure of computer hardware and networking
101.2	**Identify** the existing configuration of the computer and various restore operations on computer and update application software

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Course Articulation Matrix: Mapping of course outcomes (CO) with program outcomes (PO)

CO \ PO	BTL	1	2	3	4	5	6	7	8	9	10	11	12
101.1	1	--	--	--	--	1	--	--	--	1	--	--	1
101.2	2	--	--	--	--	2	--	--	--	1	--	--	1

Text Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1.	Hardware and Software of Personal Computers	1st	Sanjay K. Bose	New Age International Private Limited	2014
2.	Fundamentals of Computers	6th	V. Raja Raman	PHI Learning	2014
3.	Hardware Bible	6th	Winn L. Rosch	QUE	2003

Reference Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1.	Introduction to Information Technology	2nd	ITL Education Solutions limited	Pearson Education India	2012
2.	PC Hardware and A +Handbook	1st	Kate Chase, Wiley Dreamtech	Microsoft Press US	2004
3.	Complete computer upgrade and Repair book	3rd	Cheryl A Schmidt	Wiley Dreamtech	2002
4.	Introduction to Computers with MS-Office 2000	1st	Alexis Leon & Mathews Leon	McGraw Hill Education	2001

Useful Link /Web Resources:

1. https://turbofuture.com/computers/Dissassembling-and-Assembling-the-computer-system
2. https://www.computerhope.com/jargon/c/computer.html
3. https://www.pluralsight.com/blog/tutorials/troubleshooting-hardware
4. http://business.toshiba.com/downloads/KB/f1Ulds/14047/SoftwareTrouble_EN_(EBN)_Ver01F.pdf
5. https://oer.nios.ac.in/wiki/index.php/TYPES_OF_INTERNET_CONNECTIONS

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Department of Chemical Engineering
F. Y. B.Tech. Curriculum
w.e.f. A. Y. 2024-2025

Course Title: Computer Workshop Laboratory	
Course Code: 241CHVSECP101	**Semester:** I
Teaching Scheme: L-T-P: 00-00-01	**Credit:** 01
Evaluation Scheme: ISE: 25	**ESE Marks:** 00

Prior Knowledge of:	Basic computer knowledge

Course Objectives:

1.	To get familiar with various hardware, software, operating systems and networking
2.	To identify and rectify the onboard computer hardware, software and network related problems.
3.	To understand the hardware specifications that are required to run operating system and various application programs.

List of Experiments

Sr. No.	Title of Experiments	Duration
01	Desktop/laptop/server type identification and its specification.	**02 Hrs**
02	Introduction of computer architecture and components.	**02 Hrs**
03	Study of peripherals of a computer, components in a CPU and its functions.	**02 Hrs**
04	Study and demonstration of storage devices.	**02 Hrs**
05	A case study on Power Supply Unit (PSU) and its components.	**02 Hrs**
06	Introduction to basics of networking.	**02 Hrs**
07	Study of computer assembly and configuration.	**02 Hrs**
08	Assembling and disassembling of PC.	**02 Hrs**
09	Introduction to Operating System.	**02 Hrs**
10	Installation of Operating Systems – Windows.	**02 Hrs**
11	Installation of Operating Systems –LINUX.	**02 Hrs**
12	Installation of local and network printer.	**02 Hrs**
13	Configuring firewalls and installation of Antivirus software.	**02 Hrs**

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Sr. No.	Title of Experiments	Duration
14	Introduction to office automation software like MS Word, MS Excel, MS Power Point.	02 Hrs

Minimum 12 Experiments shall be conducted from above list.

Course Outcomes (CO): At the end of the course, the student should be able to

CO	Statements
101.1	Understand the basic concept and structure of computer hardware and networking
101.2	Identify the existing configuration of the computer and various restore operations on computer and update application software

Course Articulation Matrix: Mapping of course outcomes (CO) with program outcomes (PO)

CO \ PO	BTL	1	2	3	4	5	6	7	8	9	10	11	12
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101.2	2	--	--	--	--	2	--	--	--	1	--	--	1

Suggested Learning Resources:

Text Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
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2.	Fundamentals of Computers	6th	V. Raja Raman	PHI Learning	2014
3.	Hardware Bible	6th	Winn L. Rosch	QUE	2003

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Reference Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1.	Introduction to Information Technology	2nd	ITL Education Solutions limited	Pearson Education, India	2012
2.	PC Hardware and A +Handbook	1st	Kate Chase, Wiley Dreamtech	Microsoft Press, US	2004
3.	Complete computer upgrade and Repair book	3rd	Cheryl A Schmidt	Wiley Dreamtech	2002
4.	Introduction to Computers with MS-Office 2000	1st	Alexis Leon & Mathews Leon	McGraw Hill Education	2001

Useful Link /Web Resources:

6. https://turbofuture.com/computers/Dissassembling-and-Assembling-the-computer-system
7. https://www.computerhope.com/jargon/c/computer.html
8. https://www.pluralsight.com/blog/tutorials/troubleshooting-hardware
9. http://business.toshiba.com/downloads/KB/f1Ulds/14047/SoftwareTrouble_EN_(EBN)_Ver01F.pdf
10. https://oer.nios.ac.in/wiki/index.php/TYPES_OF_INTERNET_CONNECTIONS

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Course Title: Chemical Process Instrumentation	
Course Code:241CHPCCL101	**Semester:** I
Teaching Scheme:L-T-P:2-0-0	**Credits:** 02
Evaluation Scheme ISE-I/MSE/ISE-II: 10/30/10	**ESE:**00

Prerequisites	Analytical Chemistry

Course Objectives:

1.	To understand importance of different process variables.
2.	To understand basic principle of temperature and level measurement and their applicability in chemical processes.
3.	To understand different pressure measuring instruments and their applications.
4.	To understand the qualitative analysis methods.
5.	To understand various quantitative analysis methods used in process industries.

Curriculum Details:

Course Contents	Duration
Unit 1:Measurement of Important Process Variables • Measurement principles of temperature, pressure, level and flow measuring instruments • General considerations for instrument mounting- calibration principles for temperature and pressure • Transmitters- Semiconductor transducers for temperature, pressure, vacuum, level and flow	**06 Hrs**
Unit 2: Measurement of Temperature & Level • Temperature scales, Methods of temperature measurement, • Thermocouples, Bimetallic thermometers, Liquid-in-glass, Pressure thermometer • Semiconductor sensors, Digital thermometers, • Pyrometers, float type, displacement type, diaphragm box, bubbler system, electrical methods, radiation method	**06 Hrs**

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Unit 3: Measurement of Pressure & Vacuum • Manometers – diaphragm gauges, bellow gauges, Baurden gauges, absolute pressure gauges, • Mc load gauges pirani gauge, piezo resistance and piezo electric transducers, • Methods of pressure measurement, Mechanical pressure elements, • Measurement of vacuum, • Electrical pressure elements, • Force-balance pressure transmitters, and Differential pressure transmitters	**06 Hrs**
Unit 4: Qualitative Analysis Methods • Understand the measuring instrument for viscosity, specific gravity, Viscosity—Ostwald-continuous viscometer Sp. • Gravity- Displacement meter, hydrometer, pH- significance- scale-liquids, • Electrodes- glass, calomel, pH meter- principle-sensing elements-immersed type, TDS, Turbidity.	**06 Hrs**
Unit 6: Quantitative Analysis Methods • Spectroscopy, spectrophotometer-IR-UV-flame photometer-mass • Spectrophotometer AAS, SEE, TEM, XRD, FTIR &TGA, • Chromatographic analysis – TLC, GC, GLC, HPLC- working principle • Construction advantages and applications.	**06 Hrs**

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

CO	Statements
101.1	**Identify** the different process variable used in analysis
101.2	**Explain** the basic principles and applications of temperature and level measurement instruments
101.3	**Understand** different pressure measuring instruments and their applications.
101.4	**Explain** the qualitative analysis methods used in chemical process industry
101.5	**Understand** various quantitative analysis methods used in process industries

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Course Articulation Matrix

Mapping of Course Outcomes (COs) with Program Outcomes (POs) & Program Specific Outcome (PSO)

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

Text Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1	Mechanical& Industrial Measurements	4th	R.K Jain	Khanna Publishers	2017
2	Chemical Process Instrumentation and Control	3rd	Mrs. PRATIBHA D. KULKARNI	Nirali Prakashan	2015

Reference Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1	Outlines of chemical instrumentation & Process control	3rd	Dr. A. Sooryanarayana	Khanna Publication	2008

Useful Link /Web Resources:

Swayam NPTEL: https://archive.nptel.ac.in/courses/103/105/103105130/

1. A.C. Shrivastav "Techniques in Instrumentation", New Delhi, 1984.
2. W.Boltan, "Instrumentation and Process Measurement", Orient Longman Ltd, Hyderabad, 1st Edition, 1993.
3. Ray Choudhuriand RayChoudhuri "Process Instrumentation, Dynamics and control for Engineers", 1st Edition, Asian Books Pvt Ltd, New Delhi, 2003.
4. Willard H.H, "Instrumental methods of analysis", 6th Edition, CBS Publication New Delhi 1986

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Department of Chemical Engineering

F. Y. B. Tech. Curriculum

w.e.f. A.Y. 2024-2025

Course Title : Liberal Learning Course	
Course Code: 241CHCCAP101 & 241CHCCAP102	**Semester:** I / II
Teaching Scheme L-T-P : 00-00-04	**Credits :** 02
Evaluation Scheme ISE: 50	**ESE Marks :**00

- Liberal Learning Through Students Clubs and particular areas is a Two-credit course run for First Year B.Tech .
- Students are required to go through the list of liberal learning courses and rank their preferences through google form/JUNO software provided by department at the beginning of semester.
- They will be allocated one area from the list. Experts from particular areas (club) conduct sessions once a week for each area on campus through activities, discussions, presentations, and lecture methods and evaluation out of 50 per area is done for each area throughout the semester.
- Evaluation pattern may differ according to the nature of each area (Club).
- Although there is no pre-defined syllabus, there is an outline which experts normally develop and follow for the sessions.
- However, students may approach the faculty to cover certain topics of their interest in that area during sessions based on students' interest and experts'.
- List of liberal learning courses will get display at the beginning of odd semester.

List of Liberal Learning Courses

Sr. No	Name of the Course
1.	Coding & Programming Club
2.	Photography Club
3.	Art, Craft and Culture Club
4.	German Language Club

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Sr. No	Name of the Course
5.	Yoga
6.	Meditation
7.	Adventure Club
8.	Interior Design
9.	Guitar
10.	Film Making
11.	Music
12.	Painting
13.	Dance
14.	Agriculture Club
15.	Corporate Culture Club
16.	Hotel Management Club
17.	Medical Club
18.	Art of Living Club
19.	Drama
20.	LinguLeads
21.	NCC/NSS
22.	Microsoft Club
23.	Robotics Club
24.	Health & Fitness Club
25.	Bookfast Club (Reading Club)
26.	Media Club
27.	Ted Club-GD, Public Speaking, Debate

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Course Title: Finishing School Training-I	
Course Code: 241CHMCL101	**Semester:** I
Teaching Scheme: L-T-P :3-0-0	**Credits:** 00
Evaluation Scheme ISE: 50	**ESE Marks:** 00

Curriculum Details

Course Contents	Duration
UNIT-I: Learning Basic Aptitude Module-1: Percentage Module-2: Average & Its Applications	**04 Hrs**
UNIT-II: Series Completion Module-1: Number Series Module-2: Letter Series Module-3: Alphanumeric Series	**04 Hrs**
UNIT-III: LSRW-I Module-1. Listening Introduction & Activities Module- 2. Speaking Introduction & Activities Module-3. Reading Introduction & Activities Module-4. Writing Introduction	**05 Hrs**
UNIT-IV: Career Management-1 Module-1: SWOT Analysis Module-2: Goal Setting(Why & How of SMART goals) Module-3: Personality Traits & Self-Assessment Module-4: Competency Mapping	**05 Hrs**
UNIT-V: Interpersonal Skills Module-1: Team Management Module-2: Attitude Building Module-3: Time Management	**05 Hrs**
UNIT VI: Technical Training Module-1: Introduction to C Language Module-2: Identifiers & Data types,Operations Module-3: Control Instructions, Function, Recursion Module-4: Array, Strings, Pointers Module-5: Structure & Union Module-6: Memory Allocation Module-7: Enumeration, Pre-processor Module-8:Command Line Arguments	**18 Hrs**

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F. Y. B. Tech. Curriculum

w.e.f. A.Y. 2024-2025

Course Title: Rural/Social Internship	
Course Code: 241CHMCP102	**Semester:** I
Teaching Scheme: L-T-P :0-0-0	**Credits:** Grade (Mandatory Course)
Evaluation Scheme ISE: 50	**ESE Marks:** 00

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 first semester of B. Tech. program. During internship students are required to be visit village/ward/small industry/organization etc

For following activities

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

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F. Y. B. Tech. Curriculum

w.e.f. A.Y. 2024-2025

Course Title: Differential Equations and Integral Transform	
Course Code: 241CHBSCL103	**Semester:** II
Teaching Scheme: L-T-P : 03-00-00	**Credits:** 03
Evaluation Scheme ISE-I/MSE/ISE-II: 10/30/10	**ESE Marks:** 50

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

Course Objectives:

1.	To teach mathematical methodology.
2.	To develop mathematical skills and enhance logical thinking power of students.
3.	To give the knowledge of Differential Equations and Integral Transform with an emphasis on the applications of solving Chemical Engineering problems.
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 of First Order and First Degree • Introduction of variable separable form • Orthogonal trajectories. (Cartesian form) • Applications to the electrical circuits • Newton's law of cooling • Rate of decay and growth	**07 Hrs**
Unit 3: Numerical methods to solve Ordinary Differential Equations of First Order and First Degree • Introduction	**07 Hrs**

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Course Contents	Duration
• Picard's method • Taylor's series method • Euler's method • Runge - Kutta's method.(Fourth order)	
Unit 4: Numerical Differentiation • Introduction • Newton's forward difference formula • Newton's backward difference formula • Stirling's central difference formula • Lagrange's interpolation formula	**07 Hrs**
Unit 5: Laplace Transform • Laplace transforms of elementary functions • Properties of Laplace transforms (First Shifting ,Change of scale property, Multiplication & Division by t) • Inverse Laplace transforms by partial fraction	**07 Hrs**
Unit 6: Fourier Transforms • Introduction: Fourier Transforms • Fourier Sine Transform • Fourier Cosine Transforms • Complex form of Fourier Integral	**07 Hrs**

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

CO	Statements
103.1	**Solve** ordinary differential equations of first order and first degree
103.2	**Apply** the knowledge of ordinary differential equation of first order and first degree
103.3	**Use** the numerical methods to solve ordinary differential equations
103.4	**Calculate** the derivative using interpolation formulae
103.5	**Understand** the definition of Laplace transforms and its properties
103.6	**Calculate** Fourier transforms of given functions

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Course Articulation Matrix: Mapping of Course Outcomes (CO) with Program Outcomes (PO)

CO \ PO	BTL	1	2	3	4	5	6	7	8	9	10	11	12
103.1	2,3	3	2	--	--	1	---	--	--	--	--	--	1
103.2	3	3	2	--	--	--	--	--	--	--	--	--	1
103.3	2,3	3	2	--	--	1	--	--	--	--	--	--	1
103.4	3	2	2	--	--	--	--	--	--	--	--	--	1
103.5	2	2	2	--	--	1	--	--	--	--	--	--	1
103.6	3	2	2	--	--	--	--	--	--	--	--	--	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	1st	H. K. Dass	S. Chand Publication, New Delhi	2011
3	A Text Book of Applied Mathematics	7th	P. N. Wartikar, J. N. Wartikar	Vidyarthi Griha Prakashan, Pune	2006
4	Higher Engineering Mathematics	36th	B. S. Grewal	Khanna Publishers	2001

Reference Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1	Advanced Engineering Mathematics	5th	Erwin Kreyszig	India Pvt, Ltd.	2014
2	Higher Engineering Mathematics	6th	B. V. Ramana	Tata M/c Graw Hill Publication	2010
3	Numerical Methods for Scientific and Engineering Computation	5th	M. K. Jain	New Age International Pvt. Ltd New Delhi	2007
4	A Textbook of Engineering Mathematics	6th	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/resultssearch_query=Dr+Navneet+Sangle

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Course Title: Differential Equations and Integral Transform	
Course Code: 241CHBSCT103	**Semester:** II
Teaching Scheme: L-T-P : 00-01-00	**Credits:** 01
Evaluation Scheme ISE: 25	**ESE Marks:** 00

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

Course Objectives:

1.	To teach mathematical methodology.
2.	To develop mathematical skills and enhance logical thinking power of students.
3.	To give the knowledge of Differential Equations and Integral Transform with an emphasis on the applications of solving Chemical Engineering problems.
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.	**01 Hr**
02	**Ordinary Differential Equations:** Linear and non-linear differential equations.	**01 Hr**
03	**Applications of Ordinary Differential Equations:** Orthogonal Trajectories. (Cartesian curves), Applications to Electrical Circuits.	**01 Hr**
04	**Applications of Ordinary Differential Equations:** Newton's law of cooling, Rate of Decay and growth.	**01 Hr**
05	**Numerical Solution of Ordinary Differential Equations of First Order and First Degree:** Picard's method, Taylor's series method.	**01 Hr**
06	**Numerical Solution of Ordinary Differential Equations of First Order and First Degree:** Euler's method, Runge-Kutta method.	**01 Hr**
07	**Numerical Differentiation:** Newton's forward difference formula, Newton's backward difference formula	**01 Hr**
08	**Numerical Differentiation:** Stirling's Central difference formula, Lagrange's	**01 Hr**

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Tut. No	Title of Tutorial	Duration
	interpolation formula.	
09	**Laplace Transform:** First Shifting, change of scale property, Multiplication & Division by t, Inverse Laplace transforms by partial fraction	**01 Hr**
10	**Fourier Transform:** Fourier Sine Transform, Fourier Cosine Transforms	01 Hr
11	**Numerical Techniques-I using SCILAB/MATLAB**	01 Hr
12	**Numerical Techniques-II using SCILAB/MATLAB**	01 Hr

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

CO	Statements
103.1	**Solve** ordinary differential equations of first order and first degree
103.2	**Apply** the knowledge of ordinary differential equation of first order and first degree
103.3	**Use** the numerical methods to solve ordinary differential equations
103.4	**Calculate** the derivative using interpolation formulae
103.5	**Understand** the definition of Laplace transforms and its properties
103.6	**Calculate** Fourier transforms of given functions

Course Articulation Matrix: Mapping of Course Outcomes (CO) with Program Outcomes (PO)

CO \ PO	BTL	1	2	3	4	5	6	7	8	9	10	11	12
103.1	2,3	3	2	--	--	1	---	--	--	--	--	--	1
103.2	3	3	2	--	--	--	--	--	--	--	--	--	1
103.3	2,3	3	2	--	--	1	--	--	--	--	--	--	1
103.4	3	2	2	--	--	--	--	--	--	--	--	--	1
103.5	2	2	2	--	--	1	--	--	--	--	--	--	1
103.6	3	2	2	--	--	--	--	--	--	--	--	--	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	1st	H. K. Dass	S. Chand Publication, New Delhi	2011
3	A Text Book of Applied Mathematics	7th	P. N. Wartikar, J. N. Wartikar	Vidyarthi Griha Prakashan, Pune	2006
4	Higher Engineering Mathematics	36th	B. S. Grewal	Khanna Publishers	2001

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2	Higher Engineering Mathematics	6th	B. V. Ramana	Tata M/c Graw Hill Publication	2010
3	Numerical Methods for Scientific and Engineering Computation	5th	M. K. Jain	New Age International Pvt. Ltd New Delhi	2007
4	A Textbook of Engineering Mathematics	6th	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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Department of Chemical Engineering

F. Y. B. Tech. Curriculum

w.e.f. A.Y. 2024-2025

Course Title: Physics for Chemical Engineering	
Course Code: 241CHBSCL104	**Semester:** II
Teaching Scheme: L-T-P :03-00-00	**Credits:** 03
Evaluation Scheme ISE-I/MSE/ISE-II: 10/30/10	**ESE Marks:** 50

Prior Knowledge of:	Fundamentals of optics, classical, fluid and thermodynamical mechanics of system

Course Objectives:

1.	To provide basic concept of Classical mechanics and optics
2.	To expose electronic properties of materials for semiconductors from quantum mechanical point of view
3.	To perceive the concepts elastic properties and fluid flow process
4.	To make the students grasp the fundamentals of thermodynamics and nano materials synthesis

Curriculum Details

Course Contents	Duration
Unit 1: Force and Motion • Representation of vector, Types of vector, addition and subtraction, • Triangle and Parallelogram Law (Statement only) • Scalar and vector product. Force, Momentum, • Conservation of Linear momentum (derivation) • Circular Motion (Uniform, non-uniform), Conical pendulum, Time period of conical pendulum, Numerical • Central force, expansion and application of centripetal and centrifugal force with examples • Principal of centrifuge, Application of various forces in lifts system	**07 Hrs**
Unit 2: Modern Optics & Oscillations • Introduction: interference, diffraction, review of geometric path, optical path • Plane diffraction grating, resolving power of plane diffraction grating • Newton's ring: Experimental arrangement	**07 Hrs**

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Course Contents	Duration
• Diameter of bright and dark ring • Ultrasonic: Production of ultrasonic waves by Magnetostriction Oscillator • Theory of forced oscillations (Qualitative), Resonance and sharpness of resonance • Introduction to LASER for engineering field	
Unit 3: Elastic properties of materials • **Elasticity:** Stress strain curve • Different moduli of elasticity • Hooks law and its physical significance, Numerical • **Surface Tension (S.T.)**: Definition, Capillary action • Determination of S.T. using capillary rise method • Applications of S.T • Effect of impurity, Numerical	**07 Hrs**
Unit 4: Fluid Mechanics • Definition of Fluid, concept of continuum • Classification of fluids, Fluid Properties • Newton's Law of viscosity, Absolute and Kinematic viscosity • Terminal velocity (expression) • Stokes law • Concept of flow: Streamline, Turbulent, Path line • Reynolds number, Numerical	**07 Hrs**
Unit 5: Fundamentals of Thermodynamics • Difference between heat and temperature, • Modes of transfer of heat • Isothermal and adiabatic process, • Zeroth, First law of thermodynamics • Second law of thermodynamics • Heat engine (construction and working) • Applications of thermometry in refrigeration and air conditioning, Numerical	**07 Hrs**

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Course Contents	Duration
Unit 6: Synthesis of Nano Materials • Introduction to nanotechnology, nanoscience, nanomaterials, • Synthesis Method-Top-down Process • Ball milling method for synthesis of nanomaterials • Bottom-up Approach • Colloidal method for synthesis of nanomaterials • Properties of nanoparticles • Applications of nanomaterials	**07 Hrs**

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

CO	Statements
104.1	**Apply** the formal theory of solid mechanics for mechanics of system
104.2	**Determine** the frequency of ultrasonic & explain the solution of damped wave equation in applied physics
104.3	**Explain** elastical analysis of materials and understand surface tension compressible liquids
104.4	**Apply** the fluid flow mechanics for liquids
104.5	**Illustrate** the thermodynamics system for materials
104.6	**Explain** the need of nanomaterials in science and technology

Course Articulation Matrix: Mapping of Course Outcomes (CO) with Program Outcomes (PO)

PO / CO	BTL	1	2	3	4	5	6	7	8	9	10	11	12
104.1	2,3	3	2	-	-	-	-	-	-	-	-	-	1
104.2	2,3	3	2	-	-	-	-	-	-	-	-	-	1
104.3	2,3	3	2	-	-	-	-	-	-	-	-	-	1
104.4	3	3	2	-	-	-	-	-	-	-	-	-	1
104.5	3	3	-	-	-	-	-	-	-	1	-	-	1
104.6	2	3	-	-	-	-	-	-	-	1	-	-	1

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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

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	Nanotechnology- Principles & Practices	3rd	Sulabha K. Kulkarni	Capital Publication Co. New Delhi	2014
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

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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Department of Chemical Engineering

F. Y. B. Tech. Curriculum

w.e.f. A.Y. 2024-2025

Course Title: Physics for Chemical Engineering Laboratory	
Course Code : 241CHBSCP104	**Semester:** II
Teaching Scheme: L-T-P: 00-00-02	**Credit:** 01
Evaluation Scheme: ISE: 25	**ESE Marks:** 00

Prior Knowledge of:	Optics, Mechanics, nano materials, 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 forces acting on bodies in classical mechanics

List of Experiments-

Exp. No	Title of Experiments	Duration
1	To determine Resolving power of diffraction grating	02 Hrs
2	To calculate radius of curvature of Plano convex lens using Newton's ring	02 Hrs
3	To compute diameter of cylindrical obstacle using mono chromatic Source	02 Hrs
4	To determine wavelength of LASER using diffraction grating	02 Hrs
5	To calculate the Resolving power of telescope	02 Hrs
6	To determine the velocity of the ultrasonic wave in water using ultrasonic Interferometer	02 Hrs
7	Hooks law Experiment	02 Hrs
8	To determine Coefficient of Viscosity	02 Hrs
9	To study Viscosity by using Capillary action Flow Method	02 Hrs
10	Reynolds experiments	02 Hrs
11	Heat transfer by Conduction, Convention and radiation-Assignment	02 Hrs
12	Assignment on bending and shear stress	02 Hrs

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

CO	Statements
104.1	**Interpret** knowledge related to optics to use for suitable purposes in applied physics
104.2	**Explain** ultrasonic interferometer to study velocity of ultrasound in given Liquid
104.3	**Interpret** knowledge related to LASER for suitable purposes in applied physics
104.4	**Explain** knowledge related to classical mechanics

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

CO \ PO	BTL	1	`2	3	4	5	6	7	8	9	10	11	12
104.1	2	3	--	--	--	1	--	--	--	--	--	--	1
104.2	2	3	--	--	--	1	--	--	--	--	--	--	1
104.3	2	3	--	--	--	1	--	--	--	--	--	--	1
104.4	2	3	--	--	--	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 Mechanics	3rd	S.S. Bhavikatti	New Age International (P) Ltd.	2010
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	Nanotechnology- Principles & Practices	3rd	Sulabha K. Kulkarni	Capital Publication Co. New Delhi	2014
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

Useful Link /Web Resources:

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

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D. Y. PATIL COLLEGE OF ENGINEERING & TECHNOLOGY
Kasaba Bawada, Kolhapur
(An Autonomous Institute)
Department of Chemical Engineering
F. Y. B. Tech. Curriculum
w.e.f. A.Y. 2024-2025

Course Title: Computer Programming and Problem Solving	
Course Code:241CHESCL102	**Semester:** II
Teaching Scheme: L-T-P : 03-00-00	**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 syntax of C programming language to solve basic science and engineering problems.
3.	Select appropriate programming constructs, data structures and functions to build solutions to 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. • **Variables**-Local and Global variables, rules for defining a variable name, variableInitialization-Run time and compile time, variable declaration. • **Constants**-Defining Constant by using preprocessor directive and keyword const. • **Operators-** Arithmetic operators, Relational operators, Logical Operators, Assignmentoperators, Increment and Decrement operators, Conditional operators, Bit-wiseoperators, Special operators. Operator precedence and Associativity.	**07 Hrs**
Unit 2: Programming Constructs: • **Need of Decision-making statements-** 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	**07 Hrs**

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• **Need of looping statements**: The 'for','while','do-while' loop with examples	
Unit 3: Arrays& Strings: • **Arrays**-Types of arrays, declaration arrays, initializing 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 terminal and writing strings to screen, String handling Functions-strcpy(),strcmp(),strlen(),strcat().	**07 Hrs**
Unit 4: Structures and Unions: • **Structures**-Elements of Structure: Structure definition, declaring structure variables,Structureinitialization. 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.	**07 Hrs**
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 return value, No Argument and with return value, With Argument and No return value, No Argument and No return value.Storage classes (Automatic, Static, Extern, and Register). Passing arrays toa function, Structures and Functions. **Recursion.**	**07 Hrs**
Unit 6: Pointers: • Introduction to Pointers, accessing a value of variable by using Pointers-Declaration ofPointer variable, Initialization of pointer variables, Dereference operator. • Pointers as function arguments-Call by value and call by reference. • Pointers Expression, • Pointersand Arrays, Pointers and Strings, Pointers to Functions, Pointers and structures	**07 Hrs**

Self-learning topics: Recent trends in IT.

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

CO	Statements
102.1	**Describe** the basic structure of C program and use of different data type.
102.2	**Develop** conditional and Loop statements to write C programs.
102.3	**Explain** the concept of arrays and strings to store homogeneous data.
102.4	**Use** functions to break programs into small module.
102.5	**Explain** concept of structures and union.
102.6	**Use** pointers to access memory location.

Course Articulation Matrix: Mapping of Course Outcomes (CO) with Program Outcomes (PO)

CO \ PO	BTL	1	2	3	4	5	6	7	8	9	10	11	12
102.1	2	3	3	2	--	--	--	--	--	--	--	--	1
102.2	2	3	3	2	--	--	--	--	--	--	--	--	1
102.3	2	3	3	2	--	--	--	--	--	--	--	--	1
102.4	2	3	3	2	--	--	--	--	--	--	--	--	1
102.5	2	3	3	2	--	--	--	--	--	--	--	--	1
102.6	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

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Reference Books:

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

Useful Link /Web Resources:

1. https://nptel.ac.in/courses/1061041282
2. https://www.udemy.com/courses
3. https://www.coursera.org

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Course Title: Computer Programming and Problem Solving Laboratory	
Course Code :241CHESCP102	**Semester:** II
Teaching Scheme: L-T-P: 00-00-02	**Credit :** 01
Evaluation Scheme: ISE: 25	**ESE Marks:** 00

Prior Knowledge of:	Basic knowledge of computers.

Course Objectives:

1.	To Develop the ability to analyze a problem, develop an algorithm to solve it
2.	To Understand the concept of a program in a high-level language how it is being translated by a compiler into machine language and then executed
3.	To impart concept like looping, array, functions, structure and unions

List of Experiments:

Exp. No	Title of Experiments	Duration
01	Study different IDE's used for C programming	**02 Hrs**
02	Write C Program/s to explore data types.	**02 Hrs**
03	Write C Program/s to explore constants and variables.	**02 Hrs**
04	Write C Program to perform arithmetic, logical and relational operators.	**02 Hrs**
05	Write C Program using simple control statements: If-else, Do-while.	**02 Hrs**
06	Write C Program using loops statement.	**02 Hrs**
07	Write C Program using switch statement.	**02 Hrs**
08	Write C Program using arrays: Declare and initialization of arrays.	**02 Hrs**
09	Write C Program to demonstrate User defined Functions.	**02 Hrs**
10	Write C Program to demonstrate structures.	**02 Hrs**
11	Write C Program to demonstrate unions.	**02 Hrs**
12	Write C Program to demonstrate use of Pointers.	**02 Hrs**

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

CO	Statements
102.1	Understand the logic for given problem and provide the solution.
102.2	Explain syntax and construction of C programming.
102.3	Describe the methods of iteration or looping and branching.
102.4	Make use of different data structures like Arrays, Structures, and Unions.

Course Articulation Matrix: Mapping of Course Outcomes (CO) with Program Outcomes PO)

PO / CO	BTL	1	2	3	4	5	6	7	8	9	10	11	12
102.1	2	1	1	1	--	--	--	--	--	--	--	--	1
102.2	2	1	1	1	--	--	--	--	--	--	--	--	1
102.3	2	1	1	1	--	--	--	--	--	--	--	--	1
102.4	2	1	1	1	--	--	--	--	--	--	--	--	1

Suggested Learning Resources

Text Books:

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

Reference Books:

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

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Department of Chemical Engineering

F. Y. B. Tech. Curriculum

w.e.f. A.Y. 2024-2025

Course Title: Mechanical Operations	
Course Code: 241CHESCL103	**Semester:** II
Teaching Scheme: L-T-P :03-00-00	**Credits:** 03
Evaluation Scheme ISE-I/MSE/ISE-II: 10/30/10	**ESE Marks:** 50

Prior Knowledge of:	Basics Physics

Course Objectives:

1.	To develop the fundamental/basics of solid phase.
2.	To develop the knowledge of Size reduction of solid and screening of solids.
3.	To study the mixing and blending of solid-liquid & solid-solid.
4.	To study the filtration and sedimentation for solid-liquid separation.
5.	To calculate the terminal settling velocity.

Curriculum Details

Course Contents	**Duration**
Unit 1: Properties and handling of particulate solids • Particle characterization • Particle size measuring technologies • Particle size distribution, Mean particle size • Mixed particle sizes and size analysis • Specific surface of mixture • Average particle size • Number of particles in mixture • Properties of solid masses • Storageofsolids(BulkandBin) • Angle of repose and angle of friction, Introduction to conveying of solids.	**07 Hrs**
Unit 2: Size reductions and Screening • Necessity of size reduction • Energy for size reduction • Crushing laws, Methods of operating crushers	**07 Hrs**

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Course Contents	Duration
• Classification of size reduction equipment's • Types of crushing equipment • Screening: Size measurements with fine particles, • Standard test screens, Standards of screen, Screen effectiveness • Comparison of ideal and actual screens, Industrial screening equipment.	
Unit 3: Mixing of Solids • The degree of mixing • Rate of mixing • Criteria for mixer effectiveness • Solid-liquid mixing, Solid-Solid mixing.	**07 Hrs**
Unit 4: Filtration and Sedimentation • Classification of filtration • Types of filtrations, Pressure drop through filter cake, Filter medium resistance, • Specific cake resistance, Washing of cake • Filter media and selection • Preliminary treatment of slurries before filtration • Filtration equipment: Pressure filters, Vacuum filters, Centrifugal filters. • Sedimentation: Basic principles, Flocculation, Thickeners, Batch sedimentation test.	**07 Hrs**
Unit 5: Particle Dynamics • Motion of particle in a fluid • Terminal settling velocity, Free settling • Hindered settling • Stoke's law and Newton's law of settling	**07 Hrs**
Unit 6: Gas Cleaning • Introduction • Gas cleaning equipment • Gravity separators, Centrifugal separators, Momentum separators	**07 Hrs**

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Course Contents	Duration
• Fabric filters • Agglomeration and Coal essence.	

Self-learning topics: (If Any)

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

CO	Statements
103.1	**Explain** fundamentals of solids and calculate the surface area and number of particles in mixture.
103.2	**Describe** the basics of size reduction, size reduction equipment's and explain the basics of screening.
103.3	**Describe** basics of mixing, blending and mixing equipment's.
103.4	**Describe** the details of filtration and sedimentation.
103.5	**Calculate** the terminal settling velocity.
103.6	**Explain** the equipment's used for separation of solid-gas.

Course Articulation Matrix: Mapping of Course Outcomes (CO) with Program Outcomes (PO)

PO / CO	BTL	1	2	3	4	5	6	7	8	9	10	11	12
103.1	2	2	1	1	-	-	-	-	-	-	-	-	-
103.2	2	2	1	1	-	-	-	-	-	-	-	-	-
103.3	2	2	1	1	-	-	-	-	-	-	-	-	-
103.4	2	2	1	1	-	-	-	-	-	-	-	-	-
103.5	2	2	1	1	-	-	-	-	-	-	-	-	-
103.6	2	1	1	1	-	-	-	-	-	-	-	-	-

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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

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	Nanotechnology- Principles & Practices	3rd	Sulabha K. Kulkarni	Capital Publication Co. New Delhi	2014
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

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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Department of Chemical Engineering

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w.e.f. A.Y. 2024-2025

Course Title: Mechanical Operations Laboratory	
Course Code : 241CHBSCP103	**Semester:** II
Teaching Scheme: L-T-P: 00-00-02	**Credit:** 01
Evaluation Scheme: ISE: 25	**ESE Marks:** 00

Prior Knowledge of:	Basics Physics

Course Objectives:

1	Calculate particle size & particle size distribution of a given material.
2	Determine the efficiency of a given screen, cyclone separator & critical speed of ball mill.
3	Calculate the area of thickener and study the solid-liquid separation equipments
4	Demonstrate working of solid-solid separation equipments

List of Experiments-

Exp. No	Title of Experiments	Duration
1	**Sieve Analysis:** To determine mean particle size, surface area of mixture, and number of particles in mixture.	**02 Hrs**
2	**Screen Effectiveness:** To determine the efficiency of screen.	**02 Hrs**
3	**Jaw Crusher:** To determine the particle size distribution of material.	**02 Hrs**
4	**Ball Mill:** To determine critical speed & size reduction ratio of ball mill.	**02 Hrs**
5	**Batch Sedimentation:** To determine area of thickener by concentrating a feed of 4% at a rate of 200 tons/day to give an underflow concentration of 55% by carrying out batch sedimentation.	**02 Hrs**
6	**Filter Press:** To study batch filtration in plate & frame filter press.	**02 Hrs**
7	**Leaf Filter:** To find out the resistance offered by cake & filter medium.	**02 Hrs**
8	**Cyclone Separator:** To find the efficiency of cyclone separator.	**02 Hrs**
9	**Beaker Decantation:** To determine the amount of given sample in the sub sieve range using beaker decantation method.	**02 Hrs**
10	To study the principle, construction, working of Riffled Table.	**02 Hrs**
11	To study the principle, construction, working of Mineral Jig.	**02 Hrs**
12	To study the principle, construction, working of Gravity Separator.	**02 Hrs**

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

CO	Statements
103.1	Calculate particle size & particle size distribution of a given material.
103.2	Determine the efficiency of a given screen, cyclone separator & critical speed of ball mill.
103.3	Calculate the area of thickener and study the solid-liquid separation equipments
103.4	Demonstrate working of solid-solid separation equipments

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

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

Text Books:

1	McCabe W. L. & Smith J. C. and Peter Harriott, Unit Operations of Chemical Engg. 5th ed.McGraw Hill International.
2	C.M.Narayanan,B.C.Bhattacharyya,MechanicalOperationsforChemicalEngineers, Computer Aided Analysis, Khanna Publishers.
3	J.F. Richardson & J. H. HarkerwithJ. R. Backhurst, Coulson & Richardson's, Chemical Engineering,vol2,1st ed., Pergamon Press.

Reference Books:

1	Foust A. G. et.a- Principles of Unit Operations, 3nd ed. John, Wiley & Sons, New York 1979.
2	G. C. Sekhar, unit Operations in Chemical Engineering, Pearson education (Singapore) Pte. Ltd.

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Course Title: Design Thinking Through Innovation	
Course Code: 241CHVSECL102	**Semester:** II
Teaching Scheme: L-T-P: 01-00-00	**Credits:** 01
Evaluation Scheme: ISE: 25	**ESE Marks:** 00

Prior Knowledge of	Understanding, user-centric mindset, collaboration and teamwork, curiosity and open-mindedness, effective communication skills, learning orientation, risk tolerance

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 prototypes and the techniques used for prototyping

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**
Unit II: Prototyping and tools for design - Innovation • Prototyping: introduction, need, process, types, fidelity for prototypes,	**07 Hrs**

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Content	Duration
minimum usable prototype [mup] – concept, challenges, etc., • Prototyping for digital & physical products: concept, what is unique in digital and physical prototypes? • Digital and 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), spanners, allen key & wrench (flat, ring, adjustable), solder gun, component cutter, tweezer, multi meter, glue gun, hex saw, cutter, wire stripper	

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

CO	Statements
102.1	**Learn** structured approach of engineering design and the relevance of design and design thinking in engineering & **Understand** idea generation techniques to find out solutions to the problems
102.2	**Understand** the various types of prototypes and **Inculcate** the techniques used for prototyping

Course Articulation Matrix: Mapping of course outcomes (CO) with program outcomes (PO)

PO / CO	BTL	1	2	3	4	5	6	7	8	9	10	11	12
102.1	1	2	--	--	--	--	--	--	--	--	--	--	1
102.2	2	2	1	--	--	--	--	--	1	--	--	1	1

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Suggested Learning Resources:

Text Books:

Sr. No	Title	Edition	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
4.	"Design thinking: Understand – improve– apply"	--	Hasso Plattner, Christoph Meine and Larry Leifer (eds)	Springer	2011

Reference Books:

Sr. No	Title	Edition	Authors	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

Useful Link /Web Resources:

1. https://www.ideou.com/pages/design-thinking
2. https://dschool.stanford.edu/
3. https://www.designthinkersacademy.com/usa/
4. https://www.ibm.com/design/thinking/page/toolkit
5. https://hbr.org/2018/09/design-thinking-is-fundamentally-conservative-and preserves-the-status-quo

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w.e.f. A. Y. 2024-2025

Course Title: Design Thinking Through Innovation Laboratory	
Course Code: 241CHVSECP102	**Semester:** II
Teaching Scheme: L-T-P: 00-00-01	**Credit:** 01
Evaluation Scheme: ISE: 25	**ESE Marks:** 00

Prior Knowledge of:	Understanding, user-centric mindset, collaboration and teamwork, curiosity and open-mindedness, effective communication skills, learning orientation, risk tolerance

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

List of Experiments

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	**02 Hrs**
07	Recent development and innovation in chemical engineering field	**02 Hrs**
08	Micro project: group formation and idea generation	**02 Hrs**
09	Creation of prototype and innovative solution	**02 Hrs**

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Sr. No.	Title of Experiments/Assignment List	Duration
10	Test and evaluation of prototype	02 Hrs
11	Report drafting - instructions & practices	02 Hrs
12	Presentation & exhibition	02 Hrs

Course Outcomes (CO):

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

CO	Statements
102.1	**Learn** structured approach of engineering design and the relevance of design and design thinking in engineering & **Understand** idea generation techniques to find out solutions to the problems
102.2	**Understand** the various types of prototypes and **Inculcate** the techniques used for prototyping

Course Articulation Matrix: Mapping of course outcomes (CO) with program outcomes (PO)

CO \ PO	BTL	1	2	3	4	5	6	7	8	9	10	11	12
102.1	1	2	--	--	--	--	--	--	--	--	--	--	1
102.2	2	2	1	--	--	--	--	--	1	--	--	1	1

Suggested Learning Resources

Text Books:

Sr. No	Title	Edition	Authors	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

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4.	"Design thinking: Understand – improve– apply"	--	Hasso Plattner, Christoph Meine and Larry Leifer (eds)	Springer	2011

Reference Books:

Sr. No.	Title	Edition	Authors	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

Useful Link /Web Resources:

1. https://www.ideou.com/pages/design-thinking
2. https://dschool.stanford.edu/
3. https://www.designthinkersacademy.com/usa/
4. https://www.ibm.com/design/thinking/page/toolkit
5. https://hbr.org/2018/09/design-thinking-is-fundamentally-conservative-and preserves-the status-quo

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Department of Chemical Engineering

F. Y. B. Tech. Curriculum

w.e.f. A.Y. 2024-2025

Course Title: Historical Places in and Around Kolhapur District	
Course Code : 241CHIKSL101	**Semester**: II
Teaching Scheme L-T-P : 02-00-00	**Credits:** 02
Evaluation Scheme ISE-I, MSE, ISE-II: 20/30/00	**ESE Marks:** 00

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 19th Century • Development in Education • Social Reservation and equality • Agriculture • Industry • Initiation for Radhanagai 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	**07 Hrs**

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Contents	Duration
• Teen Darwaja, Raj Darwaja • Rajdindi Bastion • Journey from Panhalgad to Pawankhind by Chhatrapati Shivaji Raje	
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: Finishing School Training-II	
Course Code: 241CHMCL103	**Semester:** II
Teaching Scheme: L-T-P :3-0-0	**Credits:** 00
Evaluation Scheme ISE: 50 Grade	**ESE Marks:** 00

Curriculum Details

Course Contents	Duration
UNIT-I: Learning Basic Aptitude Module-1: Ratio & Proportion Module-2: Mixture & Alligation Module-3: HCF & LCM	**06 Hrs**
UNIT-II: Logical Reasoning Module-1: Blood Relations Module-2: Seating Arrangement Module-3: Pattern Completion	**06Hrs**
UNIT-III: Functional English Module-1: Spotting Errors, Sentence Correction/ Sentence Improvement Module-2: Sentence completion Module-3: Sentence Formation/ Ordering of words Module-4: One word Substitution Module-5: Para jumbles	**10 Hrs**
UNIT-IV: Attitude Building-I Module-1. Focus & Discipline Module-2. ASK Model- Corporate Expectations Module-3. Change Management (Changing & Developing habits)	**06 Hrs**
UNIT-V: Technical Training Module-1: C++ Introduction-History of C++,C++ specifications and keywords, Data type and its type, type modifiers and qualifiers,Structure in C/C++, access specifier, Memory Allocation Functions-simple programs. Module-2: Creating Classes and Objects-Access Specifiers,Constructor,Types of Functions Member Functions-Internally Defined, Externally Defined,Inline Function,Friend Function Virtual Function Introduction,Nesting of Member Functions Module-3 - Functions-Function Arguments- Call by Value, Call by Reference,Object as Function Argument, Array of Objects Module-4-Constructor and Destructor Constructor Types-Default, Parameterized, Copy Constructor,Destructor,Concept of Pointers Shallow Copy,Deep Copy Module-5- Exception Handling-Static members,Static functions,Exception Handling	**14 Hrs**

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F. Y. B. Tech. Curriculum

w.e.f. A.Y. 2024-2025

Course Title: Capstone Project	
Course Code: 241CHMCL104	**Semester:** II
Teaching Scheme: L-T-P: 0-0-0	**Credits:** 00
Evaluation Scheme ISE: 50 Grade	**ESE Marks:** 00

Course Objectives:

1	To inculcate independent learning by problem solving with social context.
2	To engages students in rich and authentic learning experiences.
3	To emphasizes 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 curriculum, students will be allowed to do capstone project during second semester of B. Tech. program.

Topics:

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

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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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