Scheme & Syllabus of
III & IV Semesters (2021 Scheme)
(AS PER NEP-2020 GUIDELINES)

BACHELOR OF ENGINEERING (B.E)
IN
CHEMICAL ENGINEERING

(ACADEMIC YEAR 2022-2023)

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DEPARTMENT VISION

Imparting quality technical education in Chemical Engineering to promote leadership in research, innovation and sustainable technology through team work.

Department Mission

- Impart quality education in basic and applied areas of Chemical Engineering.
- .Enable students and faculty to achieve proficiency in Chemical Engineering through innovative teaching and state of the art laboratories.
- Encourage faculty and students to make career in research through development of novel process and products.
- Develop inclusive technologies with a focus on sustainability.
- Collaborate with industries and research institute to cater social needs.
- Inculcate leadership qualities, entrepreneurial skills, societal and ethical vaues in students and faculty.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO 1: Exhibit knowledge of basic sciences, concepts and principles of Chemical Engineering.

PEO 2: Comprehend, analyze, design and implement engineering systems with a focus on research, innovation and sustainability.

PEO 3: Work in multidisciplinary team and cater to the needs of process industries with appropriate safety, health and environmental regulations.

PEO 4: Demonstrate effective communication skills, leadership qualities and develop into successful entrepreneurs.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO	Description
PSO1	Gain knowledge of Chemical Engineering fundamentals and demonstrate problem formulation capabilities
PSO2	Analyse and solve engineering problems with a focus on environment and sustainability
PSO3	Contribute to multidisciplinary research using relevant Chemical Engineering tools

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ABBREVIATIONS

Sl. No.	Abbreviation	Meaning
1.	VTU	Visvesvaraya Technological University
2.	BS	Basic Sciences
3.	CIE	Continuous Internal Evaluation
4.	SEE	Semester End Examination
5.	PE	Professional Core Elective
6.	GE	Global Elective
7.	HSS	Humanities and Social Sciences
8.	PY	Physics
9.	CY	Chemistry
10.	MA	Mathematics
11.	AS	Aerospace Engineering
12.	AI & ML	Artificial Intelligence & Machine Learning
13.	BT	Biotechnology
14.	CH	Chemical Engineering
15.	CS	Computer Science & Engineering
16.	CV	Civil Engineering
17.	EC	Electronics & Communication Engineering
18.	EE	Electrical & Electronics Engineering
19.	EI	Electronics & Instrumentation Engineering
20.	ET	Electronics & Telecommunication Engineering
21.	IM	Industrial Engineering & Management
22.	IS	Information Science & Engineering
23.	ME	Mechanical Engineering

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Bachelor of Engineering in
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Sl. No.	Course Code	Course Title	Credit Allocation				BoS	Category	CIE Duration (H)	Max Marks CIE		SEE Duration (H)	Max Marks SEE	
			L	T	P	Total				Theory	Lab		Theory	Lab
1	21MA31C*	Integral transforms, Optimization and Numerical Techniques	3	1	0	4	MA	Theory	1.5	100	****	3	100	****
2	21ME32**	Engineering Materials	2	0	0	2	ME	Theory	1	50	****	2	50	****
3	21CH33	Momentum Transfer	3	0	1	4	CH	Theory + Lab	1.5	100	50	3	100	50
4	21CH34	Particulate Technology	3	0	1	4	CH	Theory + Lab	1.5	100	50	3	100	50
5	21CH35	Chemical Process Calculations	3	1	0	4	CH	Theory	1.5	100	****	3	100	****
6	21CH36	Industrial chemistry	2	0	0	2	CH	Theory	1	50	****	2	50	****
7	21DMA37***	Bridge course: Mathematics	2(A)	0	0	Audit	MA	Theory	1.5	100	****	****	****	****
8	21CH39	Design Thinking Lab	0	0	2	2	CH	Lab	1	****	50	2	****	50
9	21CH310	Summer Internship- I	0	0	1	1	CH	Internship	1	****	50	2	****	50
						23								

III SEMESTER

* Summer Internship-1 will be done after the II sem for 03 Weeks

*ENGINEERING MATHEMATICS – III		
COURSE TITLE	**COURSE CODE**	**BRANCHES**
Linear algebra, Integral transforms, and Number theory	21MA31A	CS and IS
Linear algebra, Integral transforms, and Fourier series	21MA31B	AS, EC, EE, EI, ET
Integral transforms, Optimization and Numerical Techniques	21MA31C	BT, CH, CV, IM, ME
Mathematics for AI & ML	21MA31D	AI & ML

** MANDATORY COURSES			
Sl.No	**COURSE TITLE**	**COURSE CODE**	**BRANCHES**
1	Environmental Technology	21BT32A	AI, BT, CV, CS, EC, EE, EI, ET, & IS Branches
2	Biology for Engineers	21BT32B	BT
3	Engineering Materials	21ME32	AS, CH & ME

*** BRIDGE COURSE: AUDIT COURSE FOR LATERAL ENTRY DIPLOMA STUDENTS (ONLY CIE AND NO SEE)			
Sl.No	**COURSE TITLE**	**COURSE CODE**	**BRANCHES**
1	Bridge Course: Mathematics	21DMA37	AS, BT, CH, CV, EC, EE, EI, IM, ME & TE
2	Bridge Course: C Programming	21DCS37	CS, IS & AI

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IV SEMESTER													
Sl. No.	Course Code	Course Title	Credit Allocation				BoS	Category	CIE Duration (H)	Max Marks CIE		SEE Duration (H)	Max Marks SEE	
			L	T	P	Total				Theory	Lab		Theory	Lab
1	21MA41*	Statistics and Probability for Data Science	2	1	0	3	MA	Theory	1.5	100	****	3	100	****
2	21BT42**	Environmental Technology	2	0	0	2	BT	Theory	1	50	****	2	50	****
3	21CH43	Process Heat Transfer	3	0	1	4	CH	Theory+Lab	1.5	100	50	3	100	50
4	21CH44	Chemical Reaction Engineering	3	0	1	4	CH	Theory+Lab	1.5	100	50	3	100	50
5	21CH45	Chemical Engineering Thermodynamics	3	1	0	4	CH	Theory	1.5	100	****	3	100	****
6	21CH4AX#	Professional Core Elective - Group A	2	0	0	2	CH	MOOC	1.5	50	****	2	50	****
7	21HS46A/21HS46V	Kannada Course: AADALITHA KANNADA/VYAVAHARIKA KANNADA	1	0	0	1	HSS	Theory	1	50	****	2	50	****
	21HSAE46A /B/C/D/E ##	Ability Enhancement Course	0	0	1	1	HSS	Lab	1	****	50	2	****	50
8	21DCS47***	Bridge Course: C Programming	2 (A)	1	0	Audit	CS	Theory	1.5	50	****	****	50	****
9	21HSU48	Universal Human Values and Professional Ethics	2	0	0	2	HSS	Theory	1	50	****	2	50	****
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* Summer Internship-II will be done after the IV sem for 04 Weeks

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*ENGINEERING MATHEMATICS – IV			
Sl.No	**COURSE TITLE**	**COURSE CODE**	**BRANCHES**
1	Statistics and Probability for Data Science	21MA41	Common for all Programs
** MANDATORY COURSES			
Sl.No	**COURSE TITLE**	**COURSE CODE**	**BRANCHES**
1	Materials for Electronics Engineering	21EC42	EC, EE, EI, & TE
2	Environmental Technology	21BT42A	AS, BT, CH, IM &ME
3	Civil Engineering Materials	21CV42	CV
4	Bio-inspired Engineering	21BT42	AI, CS & IS
*** BRIDGE COURSE: AUDIT COURSE FOR LATERAL ENTRY DIPLOMA STUDENTS (ONLY CIE AND NO SEE)			
Sl.No	**COURSE TITLE**	**COURSE CODE**	**BRANCHES**
1	Bridge Course Mathematics	21DMA47	CS, IS & AI
2	Bridge Course C Programming	21DCS47	AS, BT, CH, CV, EC, EE, EI, IM, ME & TE

# GROUP A: PROFESSIONAL CORE ELECTIVES (MOOC COURSES)			
Sl. No.	**Course Code**	**Course Title**	**Duration**
1.	21CH4A1	Technologies For Clean and Renewable Energy Production	8 Weeks
2.	21CH4A2	Colloids and Surfaces	8 Weeks
3.	21CH4A3	Natural Gas Engineering	8 Weeks
4.	21CH4A4	Application of Spectroscopic Methods in Molecular Structure Determination	8 Weeks
5.	21CH4A5	Introduction to Polymer Science	8 Weeks

## ABILITY ENHANCEMENT COURSES			
Sl. No.	**Course Code**	**Course Title**	**Branches**
1.	21HSAE46A	National Service Scheme (NSS)	Common to all Branches. Minimum one course under any vertical is mandatory, more than one also permitted.
2.	21HSAE46B	National Cadet Corps (NCC)	
3.	21HSAE46C	Physical Education	
4.	21HSAE46D1/2/3	Music/Dance/Theatre	
5.	21HSAE46E1/2	Art work/ Photography & Film making	

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Semester: III				
INTEGRAL TRANSFORMS, OPTIMIZATION AND NUMERICAL TECHNIQUES **(Theory)** **(Common to BT, CH, CV, IM,& ME)**				
Course Code	:	**21MA31C**	**CIE Marks**	:	**100**
Credits: L:T:P	:	**3:1:0**	**SEE Marks**	:	**100**
Total Hours	:	**45L+15T**	**SEE Duration**	:	**3 Hours**

Unit-I	**09 Hrs**
Laplace Transform: Existence and uniqueness of Laplace Transform (LT), transform of elementary functions, region of convergence. Properties - Linearity, scaling, s-domain shift, differentiation in the s-domain, division by t, differentiation and integration in the time domain. Transform of unit impulse function and periodic functions (square wave, saw-tooth wave, triangular wave, full and half wave rectifier).	
Unit – II	**09 Hrs**
Inverse Laplace Transform and solution to differential equations: Inverse Laplace transforms – properties, evaluation using different methods. Convolution theorem (without proof), problems. Applications to solve ordinary linear differential equations.	
Unit –III	**09 Hrs**
Fourier Series: Periodic function, even and odd functions. Dirichlet's conditions, Euler's formulae for Fourier series, problems on time periodic signals (square wave, half wave rectifier, saw-tooth wave and triangular wave), Fourier sine series, Fourier cosine series.	
Unit –IV	**09 Hrs**
Linear Programming: Mathematical formulation of Linear Programming Problem (LPP). Solving LPP using Graphical, Simplex and Big M methods.	
Unit –V	**09 Hrs**
Numerical Methods: Numerical solutions to partial differential equations – Finite difference approximation to derivatives, solution of Laplace equation in two-dimension, heat, and wave equations in one dimension (explicit methods).	

Course Outcomes: After completing the course, the students will be able to	
CO1:	Illustrate the fundamental concepts of Laplace and inverse Laplace transforms, Fourier series, linear programming and numerical methods.
CO2:	Apply the acquired knowledge of Laplace and inverse Laplace transforms, Fourier series, linear programming and numerical methods to solve the problems of engineering applications.
CO3:	Analyze the solution of the problems using appropriate techniques of Laplace and inverse Laplace transforms, Fourier series, linear programming and numerical methods to the real world problems arising in many practical situations.
CO4:	Interpret the overall knowledge of integral transforms Fourier series, linear programming and numerical methods gained to engage in life-long learning.

Reference Books		
1	Higher Engineering Mathematics, B.S. Grewal, 44th Edition, 2015, Khanna Publishers, ISBN: 978-81-933284-9-1.	
2	Higher Engineering Mathematics, B.V. Ramana, 11th Edition, 2010, Tata McGraw-Hill, ISBN: 13-978-07-063419-0; ISBN: 10-0-07-063419-X.	
3	Advanced Engineering Mathematics, E. Kreyszig, 10th Edition (Reprint), 2016. John Wiley & Sons, ISBN: 978-0470458365.	
4	Numerical Methods for Engineers, Steven C Chapra and Raymond P Canale, McGraw Hill Publishing Co., 8th edition, 2021, ISBN: 978-9-35-460136-1.	

ASSESSMENT AND EVALUATION PATTERN		
	CIE	**SEE**
WEIGHTAGE	**50%**	**50%**
QUIZZES		
Quiz-I	Each quiz is evaluated for 10 marks adding up to **20 MARKS**	
Quiz-II		
THEORY COURSE (Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating)		
Test – I	Each test will be conducted for 50 Marks adding upto 100 marks. Final test marks will be reduced to **40 MARKS**	
Test – II		
EXPERIENTIAL LEARNING	**40**	
MATLAB	**20**	
Model presentation/ case study/ video preparation	**20**	
MAXIMUM MARKS FOR THE THEORY	**100 MARKS**	**100 MARKS**

Semester III					
ENGINEERING MATERIALS					
(Theory)					
Course Code	:	21ME32		CIE Marks	:	50
Credits: L:T:P	:	2:0:0		SEE Marks	:	50
Total Hours	:	30L		SEE Duration	:	90 min

Unit - I	08 Hrs
Mechanical Properties of Materials: Review of mechanical properties – strength, hardness, toughness, impact strength, brittleness, malleability, ductility, Plastic deformation by twinning and slip, Movement of dislocations, Critical shear stress, Strengthening mechanism, Fatigue and Creep.	
Unit - II	**11 Hrs**
Phase Diagram and Fe-C equilibrium diagram: Phase, Gibbs phase rule, Solid solutions, Hume Rothery Rules, Isomorphous alloy system, Iron-Iron carbide phase diagram- Invariant reactions, Development of microstructure in iron carbon alloys (Slow cooling of steels). Steel & Cast Iron- composition, properties, and applications. **Phase transformation in steel:** TTT diagram of plain carbon steel, annealing, normalizing, hardening and tempering of plain carbon steel. Nucleation: Homogeneous and Heterogeneous Nucleation, Dendritic growth and Cast metal structure.	
Unit - III	**11 Hrs**
Industrial Materials: Stainless Steels: Ferritic, austenitic, and martensitic stainless steels. Magnesium alloys Titanium alloys and Nickel alloys, Intermetallics, shape memory alloys and Amorphous metals, sensors and actuators, piezoelectric and functional materials. **Environmental Degradation of Materials**: Different forms of environmental degradation, forms of corrosion - Galvanic, Intergranular, pitting, stress related corrosion. Corrosion control - Materials selection, protective coating.	

Course Outcomes: After completing the course, the students will be able to	
CO1:	Understand the mechanical properties of materials
CO2:	Analyse the different phases and phase transformation and study the relationship between microstructure and properties
CO3:	Classify advanced materials, their properties and applications
CO4:	Visualize the degradation of materials and its prevention

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Reference Books	
1	William D Callister, "Material Science and Engineering", John Wiley and Sons, 1997 10th edition, ISBN ISBN-13: 9781119321590
2	Sydney H Avner, "Introduction to Physical Metallurgy" Mc Graw Hill Book Company, 1994, ISBN 0-07-Y85018-6
3	William F Smith, "Material Science and Engineering", Mc Graw Hill Book Company, 2008, 4th edition, ISBN0-07-066717-9

ASSESSMENT AND EVALUATION PATTERN		
	CIE	**SEE**
WEIGHTAGE	**50%**	**50%**
QUIZZES		
Quiz-I	Each quiz is evaluated for 10 marks adding up to **20 MARKS.** Reduced to **10**	*****
Quiz-II		
THEORY COURSE (Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating)		
Test – I	Each test will be conducted for 25 Marks adding up to 50 marks. Final test marks will be reduced to **20 MARKS**	*****
Test – II		
(Maximum of 20 Marks)		*****
Determination of as-cast and heat-treated material properties	**15**	
Assignment	**05**	
MAXIMUM MARKS FOR THE THEORY	**50 MARKS**	**50 MARKS**
TOTAL MARKS FOR THE COURSE	**50**	**50**

Semester: III					
MOMENTUM TRANSFER					
(Theory and Practice)					
Course Code	:	21CH33		**CIE Marks**	:	100 + 50
Credits: L:T:P	:	3:0:1		**SEE Marks**	:	100 + 50
Total Hours	:	45L+30P		**SEE Duration**	:	3 Hours

Unit-I	**09 Hrs**
Fluid statics and its applications: Variation of pressure with height –hydrostatic equilibrium, Barometric equation, Measurement of fluid pressure – manometers. Continuous gravity decanter **Fluid flow phenomena:** Types of fluids –Newtonian and non – Newtonian fluids, Types of flow – laminar and turbulent flow. Reynolds number, Boundary layer separation and wake formation.	
Unit – II	**09 Hrs**
Basic Equations of Fluid Flow: Continuity equation, Bernoulli equations, Modified equations with correction factors. **Flow of Incompressible Fluids in Conduits and Thin Layer**: Laminar flow through circular pipes, Darcy's law, Hagen Poiseuille equation. Friction factor charts, Pump work using Bernoulli equation	
Unit –III	**09 Hrs**
Flow of Fluids Past Immersed Bodies: Pressure drop studies in packed bed –Ergun, Kozeny-Carman and Blake-Plummer Equations, Fluidization, types of fluidization, minimum fluidization velocity, Applications of fluidization	
Unit –IV	**09 Hrs**
Transportation and Metering of Fluids: Measurement of flow rates by Pitot tube, Orifice meter, Venturi meter and Rotameter. Flow through open channels–weirs and notches. Performance characteristics of pumps–positive displacement and centrifugal pumps	
Unit –V	**09 Hrs**
Dimensional Analysis: Dimensional homogeneity, Rayleigh's and Buckingham π– methods. Significance of dimensionless numbers. **Flow of Compressible Fluids:** Concept of Mach number. Basic equations of compressible flow, velocity of sound for isothermal process and adiabatic process. Area-velocity relationship. Flow of compressible fluid through orifices and nozzles.	

LABORATORY EXPERIMENTS
1. Flow through circular pipes   2. Flow through helical coils   3. Flow measurement using Venturi meter   4. Flow measurement using Orifice meter   5. Flow over notches   6. Determination of Hydraulic coefficients   7. Flow through Packed bed   8. Flow through Fluidized bed   9. Performance study of centrifugal pump   10. Flow through pipe fittings   11. Flow through non circular pipes

Course Outcomes: After completing the course, the students will be able to	
CO 1	Understand the concepts of fluid statics and dynamics.
CO 2	Apply the fundamental equations of fluid flow.
CO 3	Analyse the flow behaviour in various geometries and packed columns
CO 4	Evaluate flow rates and energy losses.

Reference Books	
1	Unit Operations of Chemical Engineering, McCabe and Smith W.L., 7th Edition, 2017, McGraw Hill, New York. ISBN 13: 9789339213237
2	Chemical Engineering, Coulson J.M. and Richardson J.F., Vol.2, 5th Edition, 2003, Asian Books (P) Ltd., New Delhi. ISBN 10: 0080379575
3	A Textbook of Fluid Mechanics and Hydraulic Machines, R K Bansal, January 2018, Laxmi publication, New Delhi, ISBN:9788131808153
4	Engineering Fluid Mechanics, Kumar K.I., 3rd Edition, 2009, Eurasia Publishing House (P) Ltd., New Delhi. ISBN 8121901006

ASSESSMENT AND EVALUATION PATTERN		
	CIE	SEE
WEIGHTAGE	50%	50%
QUIZZES		
Quiz-I	Each quiz is evaluated for 10 marks adding up to **20 MARKS.**	
Quiz-II		
THEORY COURSE (Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing,Evaluating, and Creating)		
Test – I	Each test will be conducted for 50 Marks adding upto 100 marks. Final test marks will be reduced to **40 MARKS**	
Test – II		
EXPERIENTIAL LEARNING	40	
In-depth study and delivery of outcomes in the following topics: Pumps, compressors, boiler operation, cold and hot insulations, air coolers, cooling towers.	20	
Model preparation/case study/video preparation, etc.	20	
MAXIMUM MARKS FOR THE THRORY	100 MARKS	100 MARKS

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Semester: III					
PARTICULATE TECHNOLOGY (Theory and Practice)					
Course Code	:	21CH34	CIE Marks	:	100+50
Credits: L:T:P	:	3:0:1	SEE Marks	:	100+50
Total Hours	:	45L+30P	SEE Duration	:	3Hrs

UNIT-I	09 Hrs
Particle Technology: Particle shape and size, shape factor and sphericity. Standard screens, differential and cumulative sieve analysis, Number of particles and specific surface of mixture of particles, Ideal and actual screens, Effectiveness of screen **Sub sieve analysis –** Air permeability method and elutriation methods	

UNIT-II	09 Hrs
Size Reduction: Forces and criteria for communition, characteristics of comminuted products. Laws of size reduction, Work Index. Methods of operating crushers – Free crushing, Choke feeding, Open circuit grinding, closed circuit grinding, Wet and dry grinding, **Equipments for size reduction** – Blake jaw crusher, Gyratory crusher, Smooth roll crusher, Impactor, Attrition mill, Ball mill- Critical speed of ball mill	

UNIT-III	09 Hrs
Motion of Particles through Fluids: Mechanics of particle motion, equation for one dimensional motion of particles through a fluid in gravitational and centrifugal field. Terminal velocity, Drag coefficient, Motion of spherical particles in Stoke's region, Newton's region and Intermediate region, Criterion for settling regime, Hindered settling, Modification of equation for hindered settling	

UNIT-IV	09 Hrs
Filtration: Classification of filtration, Batch and continuous filtration, pressure and vacuum filtration Constant rate, constant pressure, filtration characteristics of filter media **Industrial filters:** Plate and Frame filter press, leaf filter, Filter aids, Principles of cake filtration, Modification of Kozeny – Carman Equation for filtration. Estimation of cake resistance and medium resistance.	
UNIT-V	09 Hrs
Agitation and mixing: Application of agitation, Agitation equipment, Types of impellers – Propellers, Paddles and Turbines, Flow patterns in agitated vessels, Prevention of swirling, Standard turbine design, Power correlation and power calculation, Mixing of solids, Mixing index, **Miscellaneous Separation:** Jigging, Heavy media separation, Froth floatation process, Additives used during flotation, Floatation cells, Typical floatation circuits, Size enlargement (only principle of equipment) – Flocculation, Briquetting, Palletization, Granulation	

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Laboratory Component	
1. Sieve analysis and Screen effectiveness studies 2. Particle Size Analysis using Air Elutriator 3. Particle Size Analysis using ICI sedimentation 4. Particle Size Analysis using Beaker decantation 5. Determination of Specific surface area using Air permeability set up 6. Verification of Laws of size reduction using Ball mill 7. Verification of Laws of size reduction using Jaw crusher 8. Verification of Laws of size reduction using Drop weight crusher 9. Design of Thickener 10. Separation of solids using Cyclone 11. Heavy media Separation using Froth floatation cell 12. Determination of specific cake and medium resistance using Leaf filter 13. Determination of specific cake and medium resistance using Plate and frame filter press	

Course Outcomes: After completing the course, the students will be able to	
1	Understand the principles of size analysis, size reduction, particle motion, filtration, mixing and size enlargement.
2	Choose appropriate methods and equipment for size reduction, particle size determination, conveying, separation and mixing of solids
3	Evaluate particle size and performance of size reduction, conveying, separation and methods of handling of solids and settling velocity
4	Develop equations for motion of particles through fluids and fluid flow past the particles.

Reference Books	
1.	Unit Operations of Chemical Engineering, Warren McCabe, Julian Smith, Peter Harriott., 7th Edition, 2004, McGraw Hill Education, *ISBN*-13: 978-0072848236
2.	Introduction to particulate Technology, Martin Rhodes, 2nd Edition, 2008, Wiley, ISBN- 13: 978-0470014271
3.	Coulson and Richardson's Chemical Engineering Vol. 2, Richardson J.F, J. H. Harker with J. R. Buckhurst, 5th Edition, 2002, Butterworth-Heinemann, ISBN-978-0750644457
4.	Unit Operations, Brown G.G., 1st Edition, 2005, CBS Publishers & Distributors*, ISBN* 13: 978-8123910994
5	Perry's Chemical Engineer's Hand book, Don W. Green, Marylee Z. Southard, 9th Edition, 2018, McGraw-Hill Education, ISBN-13: 978-0071834087

ASSESSMENT AND EVALUATION PATTERN		
	CIE	**SEE**
WEIGHTAGE	**50%**	**50%**
QUIZZES		
Quiz-I	Each quiz is evaluated for 10 marks adding up to **20 MARKS.**	
Quiz-II		
THEORY COURSE (Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating)		
Test – I	Each test will be conducted for 50 Marks adding upto 100 marks. Final test marks will be reduced to **40 MARKS**	
Test – II		
EXPERIENTIAL LEARNING	**40**	
MAXIMUM MARKS FOR THE THEORY	**100**	**100**
PRACTICALS	**50**	**50**
TOTAL MARKS FOR THE COURSE	**150**	**150**

Semester: III					
CHEMICAL PROCESS CALCULATIONS					
(Theory)					
Course Code	:	21CH35	**CIE Marks**	:	100
Credits: L:T:P	:	3:1:0	**SEE Marks**	:	100
Total Hours	:	45L+30T	**SEE Duration**	:	3 Hrs.

UNIT-I	8 Hrs
Basic Chemical Calculations: Conversion of equations, composition of mixtures of solids, liquids and gases, percentage by weight, mole and volume. Normality, Molarity, Molality and ppm. Concentration scales based on specific gravity-Baume, Twaddle, Brix and API gravity scales	
UNIT-II	**10 Hrs**
Vapor Pressure: Definition of vapor pressure, partial pressure, relative saturation, percentage saturation, humidity, molal humidity, relative humidity, percentage humidity, Problems involving Evaporation and condensation processes	
Material balance without reaction: Introduction to material balances, problems on mixing, distillation	
UNIT-III	**10 Hrs**
Material balance without reaction (continued): Extraction, crystallization, evaporation, absorption and leaching. Material balances without reactions involving bypass, recycle and purging	
UNIT-IV	**10 Hrs**
Material balance with Chemical reactions: Limiting and excess reactants, fractional and percentage conversion, yield and selectivity, numerical problems	
Fuels and combustion: Ultimate and proximate analyses of fuels, orsat analysis, combustion problems	
UNIT-V	**7 Hrs**
Energy Balance: General energy balance equation for steady state, heat capacity, estimation of heat capacity for solids, liquids, gases and their mixtures. Standard heat of formation, standard heat of reaction, standard heat of combustion. Calculation of Δ_{HR} at elevated temperatures, adiabatic reaction temperature and adiabatic flame temperature	

Course Outcomes: After completing the course, the students will be able to	
CO1	Understand the basic principles of unit operation and processes
CO2	Apply the conservation principles to unit operations and processes to carry out material balance
CO3	Analyze the unit operations and processes to carry out energy balance
CO4	Develop systematic problem formulation and problem-solving skills

Reference Books	
1.	Stoichiometry and Process Calculations, Narayanan K.V., and Lakshmikutty F., 2nd Edition, 2017, Prentice Hall India Pvt Ltd, New Delhi, ISBN- 9788120352896
2.	Elementary principles of Chemical Processes, Richard M.F, Ronald W. R, Lisa G. B 4th Edition, 2016, Wiley Publishers, ISBN- 9781118431221
3.	Stoichiometry, Bhatt B. I., Shuchen B Thakore., 5th Edition,2010, Tata McGraw Hill Publishing Ltd., New Delhi, ISBN 9780070681149 0070681147
4.	Basic Principles and Calculations in Chemical Engineering, Himmelblau D.M and Riggs J B., 8th Edition, 2012, Prentice Hall of India, New Delhi, ISBN-0-13-234660-5

ASSESSMENT AND EVALUATION PATTERN		
	CIE	**SEE**
WEIGHTAGE	**50%**	**50%**
QUIZZES		
Quiz-I	Each quiz is evaluated for 10 marks adding up to **20 MARKS.**	
Quiz-II		
THEORY COURSE (Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating)		
Test – I	Each test will be conducted for 50 Marks adding upto 100 marks. Final test marks will be reduced to **40 MARKS**	
Test – II		
EXPERIENTIAL LEARNING	**40**	
MAXIMUM MARKS FOR THE THEORY	**100**	**100**

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Semester: III					
INDUSTRIAL CHEMISTRY (Theory)					
Course Code	:	21CH36	CIE Marks	:	50
Credits: L:T:P	:	2:0:0	SEE Marks	:	50
Total Hours	:	30L	SEE Duration	:	2 Hours

Unit – I	10 Hrs
Reaction mechanism: Electron displacements in organic molecules – inductive, electromeric, mesomeric and hyper conjugative effects – Types of organic reactions- Addition, Substitution, elimination (with one example to each). Reaction mechanism, types of reaction mechanisms, order, and rate equations. **Palladium catalyzed C-C Bond formation**- Suzuki-Meyura, Sonogashira reactions with mechanism. **Metal hydride reductions**- Lithiumaluminium hydride, sodium borohydride. Mechanism and industrial applications of -Beckmann, Hoffmann and Bayer-Villiger rearrangements. Safety and environmental aspects of the above reagents.	

Unit –II	10 Hrs
Green Chemistry and Industrially benign green reactions: Introduction, Need, Principles, planning of a green synthesis (E-factor, % atom utilization, type of the reaction involved, solvent selection, reagents, use of protecting groups, catalysts, and energy requirements). Micro-wave and ultrasound assisted reactions: principle and example. Examples of green synthesis- adipic acid, disodiumimidodiacetate, benzoic acid. Green synthesis of nano materials. Diel's-Alder reaction, Baker-Venkataraman rearrangement, Claisen rearrangement. Barton reaction, Biginelli reaction	

Unit –III	10 Hrs
Chemicals in day-to-day life: **Dyes:** Introduction, chromophore auxochrome theory, Modern theory of colour and constitution. Classification Preparation of Congo red, methyl orange, malachite green, phenolphthalein, anthraquinone dyes-alizarin and indigo dye. Safety and environmental aspects of dyes and remedial measures. **Soaps and detergents:** Manufacture of soap by Kettle process Mechanism of cleansing action of soap. Synthetic detergents – types of detergents. Difference between soaps and detergents. **Insecticides:** Definition, Classification synthesis, governing factors, uses, limitations of malathion, Carbaryl and Dieldrin. Hazards and environmental Safety aspects of insecticides and pesticides.	

Course Outcomes: After completing the course, the students will be able to	
CO 1	Identify the reactions and mechanisms for chemical engineering applications.
CO 2	Analyse the chemical engineering problems related with chemistry and to propose solutions
CO 3	Apply the knowledge of green and sustainable chemistry in solving societal, public health and environmental issues.
CO 4	Develop sustainable solutions for problems associated with synthetic organic chemistry, dyes, soaps, detergents, insecticides.

Reference Books	
1.	Organic Chemistry, Morrison and Boyd, Pearson Education India; 7th edition, 2010, ISBN-13: 978-8131704813.
2.	Green Chemistry. V K Ahluwalia, Acne Books Pvt., Ltd. 3rd Edition, 2019, ISBN: 978-9388264-44-0
3.	Green chemistry and ten commandments of sustainability, Stanley E. Manahan, ChemChar Research, Inc Publishers, 2nd Edition, 2006, ISBN- 0-9749522-4-9
E- Books	
4.	https://www.sciencedirect.com/book/9780128092705/green-chemistry
5.	https://www.organic-chemistry.org

ASSESSMENT AND EVALUATION PATTERN		
	CIE	**SEE**
WEIGHTAGE	**50%**	**50%**
QUIZZES		
Quiz-I	Each quiz is evaluated for 10 marks adding up to **20 MARKS.**	
Quiz-II		
THEORY COURSE (Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating)		
Test – I	Each test will be conducted for 50 Marks adding upto 100 marks. Final test marks will be reduced to **20 MARKS**	
Test – II		
EXPERIENTIAL LEARNING	**20**	
MAXIMUM MARKS FOR THE THEORY	**50 MARKS**	**50 MARKS**
TOTAL MARKS FOR THE COURSE	**50**	**50**

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Semester: III					
Bridge Course: MATHEMATICS (Theory) (AS, BT, CH, CV, EC, EE, EI, IM, ME, TE)					
Course Code	:	21DMA37		CIE Marks	:	50
Credits: L:T:P	:	2:0:0		SEE Marks		----
Audit Course					
Unit-I					05 Hrs

Differential Calculus:
Partial derivatives – Introduction, simple problems. Total derivative, composite functions. Jacobians – simple problems.

Unit – II	05 Hrs

Vector Differentiation:
Introduction, simple problems in terms of velocity and acceleration. Concepts of gradient, divergence – solenoidal vector function, curl – irrotational vector function and Laplacian, simple problems.

Unit –III	06 Hrs

Differential Equations:
Higher order linear differential equations with constant coefficients, solution of homogeneous equations - Complementary functions. Non homogeneous equations –Inverse differential operator method of finding particular integral based on input function (force function).

Unit –IV	05 Hrs

Numerical Methods:
Solution of algebraic and transcendental equations – Intermediate value property, Newton-Raphson method. Solution of first order ordinary differential equations – Taylor series and 4th order Runge-Kutta methods. Numerical integration – Simpson's $1/3^{rd}$, $3/8^{th}$ and Weddle's rules. (All methods without proof).

Unit –V	05 Hrs

Multiple Integrals:
Evaluation of double integrals, change of order of integration. Evaluation of triple integrals. Applications – Area, volume and mass – simple problems.

Course Outcomes: After completing the course, the students will be able to	
CO1:	Illustrate the fundamental concepts of partial differentiation, double integrals, vector differentiation, solutions of higher order linear differential equations and numerical methods.
CO2:	Derive the solution by applying the acquired knowledge of total derivatives of implicit functions, Jacobians, homogeneous linear differential equations, velocity and acceleration vectors to the problems of engineering applications.
CO3:	Evaluate the solution of the problems using appropriate techniques of differential and integral calculus, vector differentiation, differential equations and numerical methods to the real world problems arising in many practical situations.
CO4:	Compile the overall knowledge of differential and integral calculus, vector differentiation, differential equations and numerical methods gained to engage in life – long learning.

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Reference Books	
1	B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2015, ISBN: 978-81-933284-9-1.
2	Higher Engineering Mathematics, B.V. Ramana, 11th Edition, 2010, Tata McGraw-Hill, ISBN: 978-0-07-063419-0.
3	N.P. Bali & Manish Goyal, A Text Book of Engineering Mathematics, Lakshmi Publications, 7th Edition, 2010, ISBN: 978-81-31808320.
4	Advanced Engineering Mathematics, E. Kreyszig, 10th Edition (Reprint), 2016. John Wiley & Sons, ISBN: 978-0470458365.

Continuous Internal Evaluation (CIE); Theory (50 Marks)

CIE is executed by way of quizzes (Q) and tests (T**)**. A minimum of two quizzes are conducted and each quiz is evaluated for 10 marks adding up to 20 marks. The two tests are conducted for 30 marks each and the sum of the marks scored from two tests is reduced to 30. **Total CIE is 20(Q) +30(T)=50 Marks.**

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Semester: III					
DESIGN THINKING LAB					
Course Code	:	**21CH39**	**CIE Marks**	:	**50**
Credits: L:T:P	:	**0:0:2**	**SEE Marks**	:	**50**
Hours	:	**26P**	**SEE Duration**	:	**02 Hours**
Course Learning Objectives: To enable the students to:					
1	*Knowledge Application:* Acquire the ability to make links across different areas ofknowledge and to generate, develop and evaluate ideas and information to applythese skills to provide solutions of societal concern				
2	*Communication:* Acquire the skills to communicate effectively and to present ideas clearly and coherently to a specific audience in both the written and oral forms.				
3	*Collaboration:* Acquire collaborative skills through working in a team to achieve common goals.				
4	*Independent Learning:* Learn on their own, reflect on their learning and take appropriate action to improve it.				

Guidelines for Design Thinking Lab:
1. The Design Thinking Lab (DTL) is to be carried out by a team of two-three students.

2. Each student in a team must contribute equally in the tasks mentioned below.

3. Each group has to select a theme that will provide solutions to the challenges of societal concern. Normally three to four themes would be identified by the by the department

4. Each group should follow the stages of Empathy, Design, Ideate, prototype and Test for completion of DTL.

5. After every stage of DTL, the committee constituted by the department along with thecoordinators would evaluate for CIE. The committee shall consist of respective coordinator & two senior faculty members as examiners. The evaluation will be done for each student separately.

6. The team should prepare a Digital Poster and a report should be submitted after incorporation of any modifications suggested by the evaluation committee.

The Design Thinking lab tasks would involve:
1. Carry out the detailed questionnaire to arrive at the problem of the selected theme.The empathy report shall be prepared based on the response of the stake holders.

2. For the problem identified, the team needs to give solution through thinking out of thebox innovatively to complete the ideation stage of DTL

3. Once the idea of the solution is ready, detailed design must be formulated in theDesign stage considering the practical feasibility.

4. If the Design of the problem is approved, the team should implement the design andcome out with prototype of the system.

5. Conduct thorough testing of all the modules in the prototype developed and carry outintegrated testing.

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6. Demonstrate the functioning of the prototype along with presentations of the same.

7. Prepare a Digital poster indicating all the stages of DTL separately. A Detailed projectreport also should be submitted covering the difficulties and challenges faced in each stage of DTL.

8. Methods of testing and validation should be clearly defined both in the Digital poster as well as the report.

The students are required to submit the Poster and the report in the prescribed format provided by the department.

Course Outcomes: After completing the course, the students will be able to	
CO 1:	Interpreting and implementing the empathy, ideate and design should be implemented by applying the concepts learnt.
CO 2:	The course will facilitate effective participation by the student in team work and development of communication and presentation skills essential for being part of any of the domains in his / her future career.
CO 3:	Applying project life cycle effectively to develop an efficient prototype.
CO 4:	Produce students who would be equipped to pursue higher studies in a specialized area or carry out research work in an industrial environment.

Scheme of Evaluation for CIE Marks: Evaluation will be carried out in three phases:

Phase	Activity	Weightage
I	Empathy, Ideate evaluation	10M
II	Design evaluation	15M
III	Prototype evaluation, Digital Poster presentation and report submission	25M
	Total	**50M**

Scheme of Evaluation for SEE Marks:

Sl. No.	Evaluation Component	Marks
1.	Written presentation of synopsis: Write up	5M
2.	Presentation/Demonstration of the project	15M
3.	Demonstration of the project	20M
4.	Viva	05M
5.	Report	05M
	Total	**50M**

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Semester III						
SUMMER INTERNSHIP-I (Practice)						
Course Code	:	21CHI310		CIE Marks	:	50
Credits: L:T:P	:	0:0:2		SEE Marks	:	50
Total Hours	:	3 Weeks		SEE Duration	:	1 Hours

Guidelines	3 Weeks

1. A minimum of 1 credit of internship after I year may be counted towards B.E. degree program.
2. During II semester to III semester transition, three weeks of internship is mandatory.
3. Internship report and certificate need to be submitted at the end of the internship to the concerned department for the evaluation.
4. Internship evaluation will be done during III semester for 1 credit in two phases.
5. Students can opt the internship with the below options:

1. **Within the respective department at RVCE (Inhouse) Departments** may offer internship opportunities to the students through the available tools so that the students come out with the solutions to the relevant societal problems that could be completed within THREE WEEKS.
2. **At RVCE Centre of Excellence/Competence**
   RVCE hosts around 16 CENTER OF EXCELLENCE in various domains and around 05 CENTER OP COMPETENCE. The details of these could be obtained by visiting the website https:/ /rvce.edu.in / rvce-center-excellence. Each center would be providing the students relevant training/internship that could be completed in three weeks.
C. **At Intern Shala**
   Intern Shala is India's no.1 internship and training platform with 40000+ paid internships in Engineering. Students can opt any internship for the duration of three weeks by enrolling on to the platform through https: / /internsha1a.com

D. **At Engineering Colleges nearby their hometown**
   Students who are residing out of Bangalore, should take permission from the nearing Engineering College of their hometown to do the internship. The nearby college should agree to give the certificate and the letter/email stating the name of the student along with the title of the internship held with the duration of the internship in their official letter head.
E. **At Industry or Research Organizations**
   Students can opt for interning at the industry or research organizations like BEL, DRDO, ISRO, BHEL, etc.. through personal contacts. However, the institute/industry should provide the letter of acceptance through hard copy/email with clear mention of the title of the work assigned along with the duration and the name of the student.

Procedures for the Internship:

1. Request letter/Email from the office of respective departments should go to Places where internships are intended to be carried out with a clear mention of the duration of Three Weeks. Colleges/Industry/ CoEs/CoCs will confirm the training slots and the number of seats allotted for the internship via confirmation letter/ Email.

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2. Students should submit a synopsis of the proposed work to be done during internship program. Internship synopsis should be assessed or evaluated by the concerned Colleges/Industry/CoEs/CoC. Students on joining internship at the concerned Colleges/Industry/ CoEs/CoCs submit the Daily log of student's dairy from the joining date.
3. Students will submit the digital poster of the training module/project after completion of internship.
4. Training certificate to be obtained from industry.

Course Outcomes: After completing the course, the students will be able to	
CO1:	Develop communication, interpersonal, critical skills, work habits and attitudes necessary for employment.
CO2:	Assess interests, abilities in their field of study, integrate theory and practice and explore career opportunities prior to graduation.
CO3:	Explore and use state of art modern engineering tools to solve societal problems with affinity towards the environment and involve in professional ethical practice.
CO4:	Compile, document and communicate effectively on the internship activities with the engineering community.

ASSESSMENT AND EVALUATION PATTERN		
	CIE	SEE
Phase – I	20	
Phase- II	30	50
TOTAL MARKS FOR THE COURSE	50	

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Semester: IV					
STATISTICS AND PROBABILITY FOR DATA SCIENCE (Theory) (Common to ALL Programs)					
Course Code	:	**21MA41**		**CIE Marks**	:	**100**
Credits: L:T:P	:	**2:1:0**		**SEE Marks**	:	**100**
Total Hours	:	**30L+15T**		**SEE Duration**	:	**3.00 Hours**

Unit-I	**06 Hrs**
Statistics: Central moments, mean, variance, coefficients of skewness and kurtosis in terms of moments. Correlation analysis, rank correlation, linear and multivariate regression analysis – problems.	
Unit – II	**06 Hrs**
Random Variables: Random variables-discrete and continuous, probability mass function, probability density function, cumulative density function, mean and variance. Two or more random variables - Joint probability mass function, joint probability density function, conditional distribution and independence, Covariance and Correlation.	
Unit –III	**06 Hrs**
Probability Distributions: Discrete distributions - Binomial, Poisson. Continuous distributions – Exponential, Normal and Weibul.	
Unit –IV	**06 Hrs**
Sampling and Estimation: Population and sample, Simple random sampling (with replacement and without replacement). Sampling distributions of means ($\int$ known), Sampling distributions of mean ($\int$ unknown): t - distribution, Sampling distributions of variance ($\int$ unknown): Chi - squared distribution. Estimation - Maximum Likelihood Estimation (MLE).	
Unit –V	**06 Hrs**
Inferential Statistics: Principles of Statistical Inference, Test of hypothesis - Null and alternative hypothesis, Procedure for statistical testing, Type I and Type II errors, level of significance, Tests involving the normal distribution, one – tailed and two – tailed tests, P – value, Special tests of significance for large and small samples (F, Chi – square, Z, t – test).	

Course Outcomes: After completing the course, the students will be able to	
CO1:	Illustrate the fundamental concepts of statistics, random variables, distributions, sampling, estimation and statistical hypothesis.
CO2:	Apply the acquired knowledge of statistics, random variables, distributions, sampling, estimation and statistical hypothesis to solve the problems of engineering applications.
CO3:	Analyze the solution of the problems using appropriate statistical and probability techniques to the real world problems arising in many practical situations.
CO4:	Interpret the overall knowledge of statistics, probability distributions and sampling theory gained to engage in life-long learning.

	Reference Books
1	Theory and Problems of Probability, Seymour Lipschutz & Marc Lars Lipson, 2nd Edition, Schaum's Outline Series, McGraw – Hill,2000, ISBN: 9780071386517.
2	Applied Statistics and Probability for Engineers, Douglas C. Montgomery and George C. Runger, 7th Edition, John Wiley & Sons, 2019, ISBN: 9781119570615.
3	Probability & Statistics for Engineers & Scientists, Ronald E. Walpole & Raymond H. Myers, 9th edition, 2016, Pearson Education, ISBN-13: 9780134115856.
4	The Elements of Statistical Learning - Data Mining, Inference, and Prediction, Trevor Hastie Robert Tibshirani Jerome Friedman, 2nd Edition, 2009 (Reprint 2017), Springer, ISBN-10: 0387848576, ISBN-13: 9780387848570.

ASSESSMENT AND EVALUATION PATTERN		
	CIE	**SEE**
WEIGHTAGE	**50%**	**50%**
QUIZZES		
Quiz-I	Each quiz is evaluated for 10 marks adding up to **20 MARKS**	
Quiz-II		
THEORY COURSE (Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analysing, Evaluating, and Creating)		
Test – I	Each test will be conducted for 50 Marks adding up to 100 marks. Final test marks will be reduced to **40 MARKS**	
Test – II		
EXPERIENTIAL LEARNING	**40**	
MATLAB	**20**	
Model presentation/ case study/ video preparation	**20**	
MAXIMUM MARKS FOR THE THEORY	**100 MARKS**	**100 MARKS**

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Semester IV					
ENVIRONMENTAL TECHNOLOGY					
(Theory)					
Course Code	:	**21BT42A**	**CIE Marks**	:	**50**
Credits: L:T:P	:	**2:0:0**	**SEE Marks**	:	**50**
Total Hours	:	**26 L**	**SEE Duration**	:	**90 min**
Course Learning Objectives: The students will be able to					
1	Explain the various components of environment and the significance of the sustainability of healthy environment.				
2	Identify the implications of different types of the wastes produced by natural and anthropogenic activity.				
3	Develop critical thinking for shaping strategies (scientific,social,economic and legal) for environmental protection and conservation od biodiversity, social equity and sustainable development.				
4	Design the models that help mitigate or prevent the negative impact of proposed activity on the environment in line with Sustainable Developmental Goals.				

Unit I	08 hrs
Introduction: Climate action – Paris convention, Sustainable Developmental Goals in relation to environment, Components of environment, Ecosystem. Environmental education, Environmental acts & regulations, role of non-governmental organizations (NGOs), EMS: ISO 14000, Environmental Impact Assessment. Environmental auditing.	
Unit I	09 hrs
Pollution and its remedies: Air pollution – point and non-point sources of air pollution and their controlling measures (particulate and gaseous contaminants). Noise pollution, Land pollution (sources, impacts and remedial measures), **Water management:** Advanced water treatment techniques, water conservation methods. **Waste management:** Solid waste, e-waste & biomedical waste – sources, characteristics & disposal methods. Concepts of Reduce, Reuse and Recycling of the wastes. **Waste to Energy:** Different types of Energy, Conventional sources & Non-conventional sources of energy: Solar, Hydro Electric, Wind, Nuclear, Biomass & Biogas Fossil Fuels and Hydrogen.	
Unit III	09 hrs
Environmental design: Green buildings, green materials, Leadership in Energy and Environmental Design (LEED), Hydroponics, Organic Farming, Biofuels, IC engine to E mobility transition and its impacts, Carbon Credits, Carbon Foot Prints, Opportunities for Green Technology Markets, Carbon Sequestration. **Resource recovery system:** Processing techniques, Materials recovery systems, Biological conversion (composting and anaerobic digestion). Thermal conversion products (Combustion, Incineration, Gasification, Pyrolysis, use of Refuse Derived Fuels). Case studies.	

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Reference Books	
1.	Shashi Chawla, A Textbook of Environmental Studies, McGraw Hill Education, 2017, ISBN: 1259006387,
2.	Richard A Schneider and Jerry A Nathanson, Basic Environmental Technology, Pearson, 6th Edition, 2022. ISBN: 9789332575134,
3.	G. Tyler Miller (Author), Scott Spoolman (Author), (2020) Environmental Science – 15th edition, Publisher: Brooks Cole, ISBN-13: 978-1305090446 ISBN-10: 130509044
4.	Howard S. Peavy, Donald R. Rowe and George Tchobanoglous. 2000. Environmental Engineering, McGraw Hill Education, First edition (1 July 2017). ISBN-10**:** 9351340260, ISBN-13**:** 978-9351340263

Course Outcomes: After completing the course, the students will be able to	
CO1:	Identify the components of environment and exemplify the detrimental impact of anthropogenic activities on the environment.
CO2:	Differentiate the various types of wastes and suggest appropriate safe technological methods to manage the waste.
CO3:	Apply different renewable energy resources and can analyse the nature of waste and propose methods to extract clean energy.
CO4:	Adopt the appropriate recovering methods to recover the essential resources from the wastes for reuse or recycling.

Experiential learning topics	
Assessment of the environment of certain big campuses/areas/industries etc, a case study	
1	Development of data sheet
2	Survey and its record
3	Identifying the problems associated
4	Provide a solution for the identified problem

Experiments to be performed	
1	Data development
2	Working model (in silico or demo model)
3	Preparing a report
4	Brainstorming of the work carried out.

ASSESSMENT AND EVALUATION PATTERN		
	CIE	**SEE**
WEIGHTAGE	**50%**	**50%**
QUIZZES		
Quiz-I	Each quiz is evaluated for 5 marks adding up to 1**0 MARKS.**	
Quiz-II		
THEORY COURSE (Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating)		
Test – I	Each test will be conducted for 25 Marks adding upto 50 marks. Final test marks will be reduced to 2**0 MARKS**	
Test – II		
EXPERIENTIAL LEARNING	**20**	
Case Study-based Teaching-Learning	**10**	
Experiments performed	**10**	
MAXIMUM MARKS FOR THE THEORY	**50 MARKS**	**50 MARKS**
TOTAL MARKS FOR THE COURSE	**50**	**100**

Experiential learning evaluation will be evaluated based on the experiments and the preparation, presentation of the topics, equal weightage is given for experiments and theory.

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Semester: IV					
PROCESS HEAT TRANSFER					
(Theory and Practice)					
Course Code	:	21CH43		CIE Marks	:	100 +50
Credits: L:T:P	:	3:0:1		SEE Marks	:	100 + 50
Total Hours	:	45L+30P		SEE Duration	:	3 Hours

Unit-I	09 Hrs
Introduction: Various modes of heat Transfer. Conduction, Convection and Radiation **Conduction:** Fourier's law, steady state unidirectional heat flow through single and multiple layer slabs, cylinders & spheres.	

Unit – II	09 Hrs
Insulation: Properties of insulation materials. Critical and optimum thickness of insulation. **Unidirectional unsteady state heat conduction** **Extended Surfaces:** Types of fins-Derivation of fin efficiency for longitudinal fins.	

Unit –III	09 Hrs
Convection: Individual and Overall heat transfer coefficients. LMTD, LMTD correction factor. Dimensional analysis. Empirical correlations for forced and natural convection.	

Unit –IV	09 Hrs
Heat Transfer with Phase Change: Boiling phenomenon - nucleate boiling and film boiling. Condensation-Film and drop wise condensation. Nusselt's equation and application. **Heat Transfer Equipment:** Construction and working of double pipe heat exchanger, shell and tube heat exchangers, condensers, evaporators and types of evaporators.	

Unit –V	09 Hrs
Radiation: Absorptivity, reflectivity, emissivity, emissive power and intensity of radiation. Stefan-Boltzmann law, Weins displacement law, Kirchoff's law. Radiation between surfaces.	

LABORATORY EXPERIMENTS
1.Natural Convection in Bare Tube   2. Natural Convection in Tubes with Fins   3. Vertical Condenser   4. Horizontal Condenser.   5. Shell and Tube Condenser   6. Emissivity Determination   7. Packed Bed Heat Transfer   8. Double Pipe Heat Exchanger.   9. Heat Transfer in Jacketed Vessel   10. Transient Heat Conduction   11. Insulation Thickness   12. Heat Transfer in Fluidized Bed   13. Evaporator   14. Heat Transfer in jacketed vessel

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Course Outcomes: After completing the course, the students will be able to	
CO1	Understand various modes of heat transfer
CO2	Apply basic equations of heat transfer to find heat flux and temperature distribution
CO3	Analyse the rate of heat flow in various geometries and phases
CO4	Evaluate the basis dimensions heat transfer equipment and components for various applications

Reference Books	
1	Unit Operations of Chemical Engineering, McCabe and Smith W.L., 7th Edition, 2017,McGraw Hill, New York, ISBN: 0072848235,
2	Chemical Engineering, Coulson J.M and Richardson J.F., Vol.2, 6thEdition, 2006, Indian Delhi, ISBN: 9780080131856
3	Process Heat Transfer, Kern D.Q., 7th Edition 2017, McGraw Hill, New York, ISBN: 0070341907.
4	Heat Transfer, Rao Y.V.C., First Edition, 2017, Universities Press (India) Ltd., New Delhi, ISBN: 9780072848236.

ASSESSMENT AND EVALUATION PATTERN		
	CIE	**SEE**
WEIGHTAGE	**50%**	**50%**
QUIZZES		
Quiz-I	Each quiz is evaluated for 10 marks adding up to **20 MARKS.**	
Quiz-II		
THEORY COURSE (Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating)		
Test – I	Each test will be conducted for 50 Marks adding upto 100 marks. Final test marks will be reduced to **40 MARKS**	
Test – II		
EXPERIENTIAL LEARNING	40	
MAXIMUM MARKS FOR THE THEORY	100	100
PRACTICALS	50	50
TOTAL MARKS FOR THE COURSE	150	150

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Semester: IV					
CHEMICAL REACTION ENGINEERING					
(Theory and Practice)					
Course Code	:	21CH44		**CIE Marks**	:	100 + 50
Credits: L:T:P	:	3:0:1		**SEE Marks**	:	100 + 50
Total Hours	:	45L+30P		**SEE Duration**	:	3 Hours

Unit-I	**09 Hrs**
Introduction: classification of reactions, rate, order, molecularity. Temperature dependent term in Arrhenius equation, Single reactions: Integral method, differential method of analysis, constant volume, variable volume reactions, half-life, total pressure method.	

Unit – II	**09 Hrs**
Reactor Design: Type of reactors, Design of batch, plug flow and mixed flow ideal reactors both constant volume and variable volume reactions, space time, mean residence time.	

Unit –III	**09 Hrs**
Multiple reactor systems: Size comparison of reactors, Analysis of different types of ideal reactors in series and parallel combination, Design of combination of reactors, optimum combination of reactors.	

Unit –IV	**09 Hrs**
Multiple reactions: Kinetics of series, parallel, series-parallel combination, and reversible reactions, Design of ideal batch, plug flow and mixed flow reactors for series and parallel reactions.	

Unit –V	**09 Hrs**
Residence Time Distribution: Non-ideality and its causes, Residence Time Distribution studies, E and F curves, mean residence time, segregated model, tanks in series model, axial dispersion model	

LABORATORY EXPERIMENTS	
1	Batch Reactor-Equimolar
2	Plug Flow Reactor.
3	Mixed Flow Reactor
4	Residence Time Distribution in Packed Bed Reactor
5	Residence Time Distribution in Tubular vessel
6	Residence Time Distribution in Constantly Stirred Tank Reactor.
7	Semi Batch Reactor
8	Batch Reactor-Non-equimolar
9	Temperature effect on kinetics
10	Reactors in series
11	Fluidised Bed Reactor
12	Adiabatic Reactor

Course Outcomes: After completing the course, the students will be able to	
CO1	Explain the principles and fundamentals of reaction engineering by applying basic science and engineering
CO2	Apply the concepts of reaction engineering to solve the problems in simple reacting systems
CO3	Analyze reacting systems with single and multiple reactions
CO4	Design and analyze reactors.

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Reference Books	
1	Chemical Reaction Engineering, Octave Levenspiel, 3rd Edition, 2004, ISBN 9780471254
2	Elements of Chemical Reaction Engineering, H. Scott Fogler, 5th Edition, 2016, ISBN 9780133887822
3	Chemical Engineering Kinetics, J M Smith, 3rd Edition, 1981, ISBN 9780070587106

ASSESSMENT AND EVALUATION PATTERN		
	CIE	**SEE**
WEIGHTAGE	**50%**	**50%**
QUIZZES		
Quiz-I	Each quiz is evaluated for 10 marks adding up to **20 MARKS.**	
Quiz-II		
THEORY COURSE (Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating)		
Test – I	Each test will be conducted for 50 Marks adding upto 100 marks. Final test marks will be reduced to **40 MARKS**	
Test – II		
EXPERIENTIAL LEARNING	40	
MAXIMUM MARKS FOR THE THEORY	100	100
PRACTICALS	50	50
TOTAL MARKS FOR THE COURSE	150	150

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Semester: IV					
CHEMICAL ENGINEERING THERMODYNAMICS (Theory)					
Course Code	:	21CH45		CIE Marks	:	100
Credits: L:T:P	:	3:1:0		SEE Marks	:	100
Total Hours	:	45L + 30T		SEE Duration	:	3 Hours

Unit-I	09 Hrs
First Law: Review of definitions, Cyclic process, Steady flow process. **Equations of State:** Ideal gas law, van der Waals equation of state. Work done in various processes. **The Second Law of Thermodynamics:** Statement, heat engines, heat pumps, mathematical statement for second law, Carnot cycle, Calculation of ideal work and lost work.	

Unit – II	09 Hrs
Fundamental Property relations: Maxwell's Relations, Relations for Internal energy, Enthalpy, Entropy and heart capacities, Gibb's free energy and generating function, Residual properties, Enthalpy and Entropy from Residual Properties. Two phase systems.	

Unit –III	09 Hrs
Framework of Solution Thermodynamics: Chemical Potential and equilibrium, Partial Properties, Gibbs- Duhem Equation, Ideal gas state mixture model, Gibbs theorem, fugacity and fugacity co-efficient of pure specie and species in solution, Determination of fugacity (pure species) and partial molar properties	

Unit –IV	09 Hrs
Binary systems: Ideal solution model, Lewis-Randal Rule, Excess properties **Phase Equilibrium**: Qualitative behavior, Phase rule, Pxy and Txy diagrams, Raoult's law, positive and negative deviations, azeotropes. **Thermodynamic formulations of Vapor Liquid Equilibria:** Excess Gibbs Energy and activity coefficients, Modified Raoult's law, Bubble point and dew point calculations, van Laar and Margules Equations.	

Unit –V	09 Hrs
Chemical Reaction Equilibria: Phase rule for reacting systems, reaction coordinate, Application of equilibrium criteria to chemical reactions, standard Gibbs-Energy Change and the Equilibrium constant, Effect of temperature on the equilibrium constant, Evaluation of equilibrium constants, Relation of equilibrium constants to composition, Equilibrium conversions for single reactions.	

Course Outcomes: After completing the course, the students will be able to	
CO1	Understand the principles and fundamentals of thermodynamics by applying basic science and engineering.
CO2	Apply the concepts of the thermodynamics principles to chemical engineering systems.
CO3	Analyze simple chemical engineering systems involving single phase, two phase and reacting systems.
CO4	Estimate thermodynamic properties.

Reference Books	
1	Introduction to Chemical Engineering Thermodynamics J Smith. M. and Vanness H.C., 8th Ed., 2018, McGraw Hill (India), ISBN13: 9780070145870
2	Chemical Engineering Thermodynamics, Rao Y.V.C., 2nd Edition, 2013, New Age International Publications, ISBN: 978873710483
3	Textbook of Chemical Engineering Thermodynamics, Narayanan K.V., 2nd Ed., 2013, Prentice Hall of India Private Limited, New Delhi, ISBN 978-8120347472
4	Engineering Thermodynamics, Nag P.K., 6th Ed., 2017, Tata McGraw Hill Book Co., New Delhi, ISBN: 978-9352606429

ASSESSMENT AND EVALUATION PATTERN		
	CIE	SEE
WEIGHTAGE	**50%**	**50%**
QUIZZES		
Quiz-I	Each quiz is evaluated for 10 marks adding up to **20 MARKS.**	
Quiz-II		
THEORY COURSE (Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating)		
Test – I	Each test will be conducted for 50 Marks adding upto 100 marks. Final test marks will be reduced to **40 MARKS**	
Test – II		
EXPERIENTIAL LEARNING	40	
MAXIMUM MARKS FOR THE THEORY	100	100

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Semester IV					
TECHNOLOGIES FOR CLEAN AND RENEWABLE ENERGY PRODUCTION (Theory)					
Course Code	:	21CH4A1	CIE Marks	:	50
Credits: L:T:P	:	2:0:0	SEE Marks	:	50
Total Hours	:	30 L	SEE Duration	:	90 min

Unit - I	08 Hrs
Introduction, characterization of coal and conventional routes for energy production from coal. Cleaner routes for energy production form coal	

Unit - II	11 Hrs
Characterization of crude oil and conventional routes for crude oil utilization. Cleaner routes for energy production form petroleum crude. Cleaner energy production from gaseous fuels	

Unit - III	11 Hrs
Solar and wind energy production. Production of hydro and geothermal energy. Energy production from biomass and wastes and energy conservation	

Course Outcomes: After completing the course, the students will be able to	
CO1:	Recall the fundamentals of clean and renewable energy
CO2:	Explain the characterization of fuels.
CO3:	Compare energy production using various methods

Reference Books	
1	Miller Bruce G., Coal Energy Systems, Elsevier Academic Press, Paris 2005
2	Twidel, J. and Tony W., Renewable Energy Resources, Second Edition, Taylor & Francis 2006
3	Kreith F., Goswami D.Y., Energy Management and Conservation, CRC Press 2008
4	Sukhatme S., J Nayak J., Solar Energy: Principles of thermal Collection and Storage, 3 rd Ed., Tata McGrow-Hill Pulishing Company Ltd. 2008
5	Mondal P and Dalai A., Sustainable utilization of natural resources, CRC Press 2017.

ASSESSMENT AND EVALUATION PATTERN		
	CIE	**SEE**
WEIGHTAGE	**50%**	**50%**
QUIZZES		
Quiz-I	Each quiz is evaluated for 10 marks adding up to **20 MARKS.**	
Quiz-II		
THEORY COURSE (Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating)		
Test – I	Each test will be conducted for 50 Marks adding upto 100 marks. Final test marks will be reduced to **20 MARKS**	
Test – II		
EXPERIENTIAL LEARNING	**20**	
MAXIMUM MARKS FOR THE THEORY	**50 MARKS**	**50 MARKS**
TOTAL MARKS FOR THE COURSE	**50**	**50**

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Semester IV					
COLLOIDS AND SURFACES (Theory)					
Course Code	:	**21CH4A2**	**CIE Marks**	:	**50**
Credits: L:T:P	:	**2:0:0**	**SEE Marks**	:	**50**
Total Hours	:	**30 L**	**SEE Duration**	:	**90 min**

Unit - I	08 Hrs
Introduction to Colloids. Characterization of Colloids	
Unit - II	**11 Hrs**
van der Waals Interactions. Colloid-Polymer Interactions	
Unit - III	**11 Hrs**
Electrical Double Layer Interactions. Electrokinetics and Particles at Interfaces	

Course Outcomes: After completing the course, the students will be able to	
CO1:	Recall the fundamentals of colloids and surfaces
CO2:	Explain the surface phenomena in all the colloids
CO3:	Analyse the interactions between particles

References	
	https://nptel.ac.in/courses/105106204

ASSESSMENT AND EVALUATION PATTERN		
	CIE	**SEE**
WEIGHTAGE	**50%**	**50%**
QUIZZES		
Quiz-I	Each quiz is evaluated for 10 marks adding up to **20 MARKS.**	
Quiz-II		
THEORY COURSE (Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating)		
Test – I	Each test will be conducted for 50 Marks adding upto 100 marks. Final test marks will be reduced to **20 MARKS**	
Test – II		
EXPERIENTIAL LEARNING	**20**	
MAXIMUM MARKS FOR THE THEORY	**50 MARKS**	**50 MARKS**
TOTAL MARKS FOR THE COURSE	**50**	**50**

Semester IV					
NATURAL GAS ENGINEERING					
(Theory)					
Course Code	:	21CH4A3		**CIE Marks**	:	50
Credits: L:T:P	:	2:0:0		**SEE Marks**	:	50
Total Hours	:	30 L		**SEE Duration**	:	90 min

Unit - I	08 Hrs
Introduction, Gas Production: Upstream, Reservoir- Well Completion. Properties of Natural Gas: Phase Behavior: Well inflow performance relationship (IPR), Skin factor, Productivity Index, Gas well testing.	

Unit - II	11 Hrs
Wellbore Performance: TPR Curve, Single Phase & amp; Multi Phase flow, Choke Performance: CPR Curve, Sonic and Subsonic Flow, Well Deliverability: Nodal Analysis. Natural Gas Production: Downstream, Surface Facilities, Principle of Separator, Design of Separator: Vertical, Horizontal; Two Phase Separation, Three Phase Separation Natural Gas Processing: Dehydration of Natural Gas, Design of Dehydration, Sweeting	

Unit - III	11 Hrs
Transportation and Measurement, Pipeline Design Flow through pipeline, issues and solutions, Unconventional Production of Natural Gas: Shale Gas, Gas Hydrates, Coal bed Methane, Oil Shale, Pyrolysis of Carbonaceous Materials etc.	

Course Outcomes: After completing the course, the students will be able to	
CO1:	Recall the fundamentals of Natural gas engineering
CO2:	Explain the processes and technologies involved in gas processing
CO3:	Design the unit operations involved in gas processing.

Reference Books	
1	B. Guo and A. Ghalambor, Natural Gas Engineering Handbook, Gulf Publishing Company, 2005.
2	D.L. Katz and R.L. Lee, Natural Gas Engineering, McGraw_Hill, 1990.
3	B. Guo, W.C. Lyons and A. Ghalambor, Petroleum Production Engineering: A Computer AssistedApproach, Elseveir, 2007.
4	T. Ahmed and P. D. McKinney, Advanced Reservoir Engineering, Elseveir, 2005.

ASSESSMENT AND EVALUATION PATTERN		
	CIE	**SEE**
WEIGHTAGE	**50%**	**50%**
QUIZZES		
Quiz-I	Each quiz is evaluated for 10 marks adding up to **20 MARKS.**	
Quiz-II		
THEORY COURSE (Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating)		
Test – I	Each test will be conducted for 50 Marks adding upto 100 marks. Final test marks will be reduced to **20 MARKS**	
Test – II		
EXPERIENTIAL LEARNING	**20**	
MAXIMUM MARKS FOR THE THEORY	**50 MARKS**	**50 MARKS**
TOTAL MARKS FOR THE COURSE	**50**	**50**

Semester IV					
APPLICATION OF SPECTROSCOPIC METHODS IN MOLECULAR STRUCTURE DETERMINATION **(Theory)**					
Course Code	:	**21CH4A4**	**CIE Marks**	:	**50**
Credits: L:T:P	:	**2:0:0**	**SEE Marks**	:	**50**
Total Hours	:	**30 L**	**SEE Duration**	:	**90 min**

Unit - I	**08 Hrs**
Introduction to spectroscopic methods – Nuclear magnetic resonance spectroscopy (NMR), spin ½ nuclei, 1H and 13C-NMR spectroscopy, FT-NMR method. Chemical shifts, spin spin coupling, spin-spin splitting pattern recognition for structure elucidation, coupling constants. 1H NMR spectroscopy, Second order effects in NMR spectrum, AB and AA'BB', ABC spin systems. Solving simple structure elucidation problems with 1H and 13C NMR spectroscopy	

Unit - II	**11 Hrs**
Stereochemistry determination using NMR techniques. Study of dynamic processes by NMR spectroscopy – examples from organic and organometallic chemistry Mass Spectrometry – various ionization methods – EI, CI, ESI and MALDI methods, fragmentation patterns of simple organic molecules, Use of HRMS. Mass spectrometry – fragmentation patterns of simple organic molecules (continued), solving structure elucidation problems using mass spectrometry.	

Unit - III	**11 Hrs**
UV-Vis spectroscopy, electronic transitions in organic molecules, selection rules, application of Beer Lambert law, qualitative and quantitative analysis by UV-Vis spectroscopy. Solving structure elucidation problems using multiple spectroscopic data (NMR, MS, IR and UV-Vis).	

Course Outcomes: After completing the course, the students will be able to	
CO1:	Understand the principles of spectroscopic methods
CO2:	Explain the various spectroscopic methods
CO3:	Apply spectroscopic methods in the determination of organic molecules.

References	
	https://onlinecourses.nptel.ac.in/noc22_cy45/preview

ASSESSMENT AND EVALUATION PATTERN		
	CIE	**SEE**
WEIGHTAGE	**50%**	**50%**
QUIZZES		
Quiz-I	Each quiz is evaluated for 10 marks adding up to **20 MARKS.**	
Quiz-II		
THEORY COURSE (Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating)		
Test – I	Each test will be conducted for 50 Marks adding upto 100 marks. Final test marks will be reduced to **20 MARKS**	
Test – II		
EXPERIENTIAL LEARNING	**20**	
MAXIMUM MARKS FOR THE THEORY	**50 MARKS**	**50 MARKS**
TOTAL MARKS FOR THE COURSE	**50**	**50**

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Semester IV					
INTRODUCTION TO POLYMER SCIENCE **(Theory)**					
Course Code	:	**21CH4A5**		**CIE Marks**	:	**50**
Credits: L:T:P	:	**2:0:0**		**SEE Marks**	:	**50**
Total Hours	:	**30 L**		**SEE Duration**	:	**90 min**

Unit - I	**08 Hrs**
Introduction: Background, Nomenclature, Classifications, Molecular Weight, Examples of Applications, Principles of Polymerization. Synthesis of Polymers: Step-Growth Polymerization, Radical Chain Polymerization, Synthesis of Polymers: Radical Chain Polymerization (cont.), Controlled Radical Polymerization, Emulsion Polymerization.	

Unit - II	**11 Hrs**
Synthesis of Polymers: Ionic Chain Polymerization, Coordination Polymerization, Ring-Opening Polymerization, Copolymerization. Characterization of Polymers: Polymers in Solution, Chain Dimension, Determination of Molecular Weight. Determination of Molecular Weight (cont.), Frictional Properties of Polymers in Solution, Hydrodynamic Size, Chemical Composition, Polymer Processing.	

Unit - III	**11 Hrs**
Phase Structure and Morphology of Bulk Polymers: Amorphous and Crystalline States, Viscoelasticity, Multicomponent Polymer Systems, Properties of Bulk Polymers. Properties of Bulk Polymers (Cont.): Mechanical, Optical, Electrical, Surface and Other Industrially Relevant Properties, Polymer Degradation and Stability, Polymer Additives, Few Contemporary Topics, Challenges and Opportunities in Polymer Science.	

Course Outcomes: After completing the course, the students will be able to	
CO1:	Recall the fundamentals of polymer science
CO2:	Explain the synthesis and characterization of polymers
CO3:	Analyse the various properties of polymers

Reference Books	
1	Introduction to Polymers, Third Edition by Robert J. Young, Peter A. Lovell, CRC Press

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ASSESSMENT AND EVALUATION PATTERN		
	CIE	**SEE**
WEIGHTAGE	**50%**	**50%**
QUIZZES		
Quiz-I	Each quiz is evaluated for 10 marks adding up to **20 MARKS.**	
Quiz-II		
THEORY COURSE (Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating)		
Test – I	Each test will be conducted for 50 Marks adding upto 100 marks. Final test marks will be reduced to **20 MARKS**	
Test – II		
EXPERIENTIAL LEARNING	**20**	
MAXIMUM MARKS FOR THE THEORY	**50 MARKS**	**50 MARKS**
TOTAL MARKS FOR THE COURSE	**50**	**50**

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ

ವಿಷಯ ಸಂಕೇತ (Course Code)	21KSK39/49	ನಿರಂತರ ಆಂತರಿಕ ಮೌಲ್ಯಮಾಪನದ ಅಂಕಗಳು	50
ಒಂದು ವಾರಕ್ಕೆ ಬೋಧನಾ ಅವಧಿ (Teaching Hours / Week (L:T:P: S)	0:2:0:1	ಸೆಮಿಸ್ಟರ್ ಅಂತ್ಯದ ಪರೀಕ್ಷೆಯ ಅಂಕಗಳು	50
ಒಟ್ಟು ಬೋಧನಾ ಅವಧಿ Total Hours of Pedagogy	25 ಗಂಟೆಗಳು	ಒಟ್ಟು ಅಂಕಗಳು	100
ಕ್ರೆಡಿಟ್ಸ್ (Credits)	01	ಪರೀಕ್ಷೆಯ ಅವಧಿ	01 ಗಂಟೆ

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಪಠ್ಯದ ಕಲಿಕೆಯ ಉದ್ದೇಶಗಳು:

1. ವೃತ್ತಿಪರ ಪದವಿ ವಿದ್ಯಾರ್ಥಿಗಳಾಗಿರುವುದರಿಂದ ಕನ್ನಡ ಭಾಷೆ, ಸಾಹಿತ್ಯ ಮತ್ತು ಕನ್ನಡದ ಸಂಸ್ಕೃತಿಯ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು.

2. ಕನ್ನಡ ಸಾಹಿತ್ಯದ ಪ್ರಧಾನ ಭಾಗವಾದ ಆಧುನಿಕ ಪೂರ್ವ ಮತ್ತು ಆಧುನಿಕ ಕಾವ್ಯಗಳನ್ನು ಸಾಂಕೇತಿಕವಾಗಿ ಪರಿಚಯಿಸಿ ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಸಾಹಿತ್ಯ ಮತ್ತು ಸಂಸ್ಕೃತಿಯ ಬಗ್ಗೆ ಅರಿವು ಹಾಗೂ ಆಸಕ್ತಿಯನ್ನು ಮೂಡಿಸುವುದು.

3. ತಾಂತ್ರಿಕ ವೃತ್ತಿಗಳ ಪರಿಚಯವನ್ನು ಹಾಗೂ ಅವರುಗಳ ಸಾಧಿಸಿದ ವಿಷಯಗಳನ್ನು ಪರಿಚಯಿಸುವುದು.

4. ಕನ್ನಡ ಶಬ್ದಸಂಪತ್ತಿನ ಪರಿಚಯ ಮತ್ತು ಕನ್ನಡ ಭಾಷೆಯ ಬಳಕೆ ಹಾಗೂ ಕನ್ನಡದಲ್ಲಿ ಪತ್ರ ವ್ಯವಹಾರವನ್ನು ತಿಳಿಸಿಕೊಡುವುದು.

ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವ್ಯವಸ್ಥೆ (Teaching-Learning Process - General Instructions) :

These are sample Strategies, which teacher can use to accelerate the attainment of the course outcomes.

1. ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡವನ್ನು ಬೋಧಿಸಲು ತರಗತಿಯಲ್ಲಿ ಶಿಕ್ಷಕರು ಪ್ರಸ್ತುತ ಪುಸ್ತಕ ಆಧಾರಿಸಿ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನವನ್ನು ಅನುಸರಿಸುವುದು. ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ತಯಾರಿಸಲು ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಪ್ರೇರೇಪಿಸುವುದು ಮತ್ತು ತರಗತಿಯಲ್ಲಿ ಅವುಗಳನ್ನು ಚರ್ಚಿಸಲು ಅವಕಾಶ ಮಾಡಿಕೊಡುವುದು.

2. ಇತ್ತೀಚಿನ ತಂತ್ರಜ್ಞಾನದ ಅನುಕೂಲಗಳನ್ನು ಬಳಸಿಕೊಳ್ಳುವುದು - ಅಂದರೆ ಕವಿ-ಕಾವ್ಯ ಪರಿಚಯದಲ್ಲಿ ಕವಿಗಳ ಚಿತ್ರಣ ಮತ್ತು ಲೇಖನಗಳು ಮತ್ತು ಕಥೆ ಕಾವ್ಯಗಳ ಮೂಲ ಅಂಶಗಳಿಗೆ ಸಂಬಂಧಪಟ್ಟ ಧ್ವನಿ ಚಿತ್ರಗಳು, ಸಂಭಾಷಣೆಗಳು, ಈಗಾಗಲೇ ಇತರ ವಿಮರ್ಶಕರು ಬರೆದಿರುವ ವಿಮರ್ಶಾತ್ಮಕ ವಿಷಯಗಳನ್ನು ಟಿಪಿಟಿ, ಡಿಜಿಟಲ್ ಮಾಧ್ಯಮಗಳ ಮುಖಾಂತರ ವಿಶ್ಲೇಷಿಸುವುದು.

3. ನವೀನ ಮಾದರಿಯ ಸಾಹಿತ್ಯ ಬೋಧನೆಗೆ ಸಂಬಂಧಪಟ್ಟ ವಿಧಾನಗಳನ್ನು ಶಿಕ್ಷಕರು ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಅನುಕೂಲವಾಗುವ ರೀತಿಯಲ್ಲಿ ಅಳವಡಿಸಿಕೊಳ್ಳಬಹುದು.

ಘಟಕ -1 ಲೇಖನಗಳು

1. ಕರ್ನಾಟಕ ಸಂಸ್ಕೃತಿ - ಹಂಪ ನಾಗರಾಜಯ್ಯ

2. ಕರ್ನಾಟಕದ ಏಕೀಕರಣ : ಒಂದು ಅಪೂರ್ವ ಚರಿತ್ರೆ - ಜಿ. ವೆಂಕಟಸುಬ್ಬಯ್ಯ

3. ಆಡಳಿತ ಭಾಷೆಯಾಗಿ ಕನ್ನಡ - ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ ಮತ್ತು ಪ್ರೊ. ವಿ. ಕೇಶವಮೂರ್ತಿ

ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಖಾಂತರ ಚರ್ಚಿಸುವುದು.

ಘಟಕ -2 ಆಧುನಿಕ ಪೂರ್ವದ ಕಾವ್ಯ ಭಾಗ	
1. ವಚನಗಳು : ಬಸವಣ್ಣ, ಅಕ್ಕಮಹಾದೇವಿ, ಅಲ್ಲಮಪ್ರಭು, ಆಯ್ದಕ್ಕಿ ಮಾರಯ್ಯ, ಜೇಡರದಾಸಿಮಯ್ಯ, ಆಯ್ದಕ್ಕಿ ಲಕ್ಕಮ್ಮ.	
2. ಕೀರ್ತನೆಗಳು : ಅದರಿಂದೇನು ಫಲ ಇದರಿಂದೇನು ಫಲ – ಪುರಂದರದಾಸರು	
ತಲ್ಲಣಿಸದಿರು ಕಂಡ್ಯ ತಾಳು ಮನವೇ – ಕನಕದಾಸರು	
3. ತತ್ವಪದಗಳು : ಸಾವಿರ ಕೊಡಗಳ ಸುಟ್ಟು – ಶಿಶುನಾಳ ಶರೀಫ	
ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಖಾಂತರ ಚರ್ಚಿಸುವುದು.

ಘಟಕ -3 ಆಧುನಿಕ ಕಾವ್ಯಭಾಗ	
1. ಡಿವಿಜಿ ರವರ ಮಂಕುತಿಮ್ಮನ ಕಗ್ಗದಿಂದ ಆಯ್ದ ಕೆಲವು ಭಾಗಗಳು	
2. ಕುರುಡು ಕಾಂಚಾಣ : ದಾ.ರಾ. ಬೇಂದ್ರೆ	
3. ಹೊಸಬಾಳಿನ ಗೀತೆ : ಕುವೆಂಪು	
ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಖಾಂತರ ಚರ್ಚಿಸುವುದು.

ಘಟಕ -4 ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯ	
1. ಡಾ. ಸರ್. ಎಂ. ವಿಶ್ವೇಶ್ವರಯ್ಯ : ವೃತ್ತಿ ಮತ್ತು ಇತಿಹ್ಯ - ಎ ಎನ್ ಮೂರ್ತಿರಾವ್	
2. ಕರಕುಶಲ ಕಲೆಗಳು ಮತ್ತು ಪರಂಪರೆಯ ವಿಜ್ಞಾನ : ಕರೀಗೌಡ ಬೀಚನಹಳ್ಳಿ	
ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಖಾಂತರ ಚರ್ಚಿಸುವುದು.

ಘಟಕ -5 ಕಥೆ ಮತ್ತು ಪ್ರವಾಸ ಕಥನ	
1. ಯುಗಾದಿ : ವಸುಧೇಂದ್ರ	
2. ಮೆಗಾನೆ ಎಂಬ ಗಿರಿಜನ ಪರ್ವತ : ಹಿ.ಚಿ. ಬೋರಲಿಂಗಯ್ಯ	
ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಖಾಂತರ ಚರ್ಚಿಸುವುದು.

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಕಲಿಕೆಯಿಂದ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಆಗುವ ಪರಿಣಾಮಗಳು (course Outcomes):

1. ಕನ್ನಡ ಭಾಷೆ, ಸಾಹಿತ್ಯ ಮತ್ತು ಕನ್ನಡದ ಸಂಸ್ಕೃತಿಯ ಪರಿಚಯವಾಗುತ್ತದೆ.
2. ಕನ್ನಡ ಸಾಹಿತ್ಯದ ಆಧುನಿಕ ಪೂರ್ವ ಮತ್ತು ಆಧುನಿಕ ಕಾವ್ಯಗಳು ಮತ್ತು ಸಂಸ್ಕೃತಿಯ ಬಗ್ಗೆ ಆಸಕ್ತಿಯು ಮೂಡುತ್ತದೆ.
3. ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯವಾಗುತ್ತದೆ.
4. ಕನ್ನಡ ಭಾಷಾಭ್ಯಾಸ, ಸಾಮಾನ್ಯ ಕನ್ನಡ ಹಾಗೂ ಆಡಳಿತ ಕನ್ನಡದ ಪದಗಳ ಪರಿಚಯವಾಗುತ್ತದೆ.

ಮೌಲ್ಯಮಾಪನದ ವಿಧಾನ (Assessment Details- both CIE and SEE) :

(methods of CIE - MCQ, Quizzes, Open book test, Seminar or micro project)
The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The student has to obtain a minimum of 40% marks individually both in CIE and 35% marks in SEE to pass. Theory Semester End Exam (SEE) is conducted for 50 marks (01 hour duration). Based on this grading will be awarded.

Continuous Internal Evaluation:
Three Tests each of **20 Marks (duration 01 hour)**
> a. First test at the end of 5th week of the semester
> b. Second test at the end of the 10th week of the semester
> c. Third test at the end of the 15th week of the semester

Two assignments each of **10 Marks : 1.** First assignment at the end of 4th week of the semester
> 2. Second assignment at the end of 9th week of the semester

Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for **20 Marks** (**duration 01 hours**)
> 3. At the end of the 13th week of the semester

The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be **scaled down to 50 marks**
CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

ಸೆಮಿಸ್ಟರ್ ಅಂತ್ಯದ ಪರೀಕ್ಷೆಯು ಈ ಕೆಳಗಿನಂತಿರುತ್ತದೆ - **Semester End Exam (SEE):**

SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject.
> 1. The question paper will have 50 questions. Each question is set for 01 mark.

SEE Pattern will be in MCQ Model for 50 marks. Duration of the exam is 01 Hour.

ಪಠ್ಯಪುಸ್ತಕ :

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ

ಡಾ. ಹಿ.ಚಿ.ಬೋರಲಿಂಗಯ್ಯ ಮತ್ತು ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ,
ಪ್ರಸಾರಾಂಗ, ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಬೆಳಗಾವಿ.

ಬಳಕೆ ಕನ್ನಡ - baLake Kannada (Kannada for Usage)

ಕನ್ನಡ ಕಲಿಕೆಗಾಗಿ <u>ನಿಗದಿಪಡಿಸಿದ</u> ಪಠ್ಯಪುಸ್ತಕ - (Prescribed Textbook to Learn Kannada)

ವಿಷಯ ಸಂಕೇತ (Course Code)	21KBK39/49	ನಿರಂತರ ಆಂತರಿಕ ಮೌಲ್ಯಮಾಪನದ ಅಂಕಗಳು (Continuous Internal Evaluation Marks)	50
ಒಂದು ವಾರಕ್ಕೆ ಬೋಧನಾ ಅವಧಿ (Teaching Hours / Week (L:T:P: S)	0:2:0:1	ಸೆಮಿಸ್ಟರ್ ಅಂತ್ಯದ ಪರೀಕ್ಷೆಯ ಅಂಕಗಳು (Semester End Examination Marks)	50
ಒಟ್ಟು ಬೋಧನಾ ಅವಧಿ Total Hours of Pedagogy	25 ಗಂಟೆಗಳು	ಒಟ್ಟು ಅಂಕಗಳು (Total Marks)	100
ಕ್ರೆಡಿಟ್ಸ್ (Credits)	01	ಪರೀಕ್ಷೆಯ ಅವಧಿ (Exam Hours)	01 ಗಂಟೆ

ಬಳಕೆ ಕನ್ನಡ ಪಠ್ಯದ ಕಲಿಕೆಯ ಉದ್ದೇಶಗಳು (Course Learning Objectives):

- To Create the awareness regarding the necessity of learning local language for comfortable and healthy life.
- To enable learners to Listen and understand the Kannada language properly.
- To speak, read and write Kannada language as per requirement.
- To train the learners for correct and polite conservation.

ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವ್ಯವಸ್ಥೆ (Teaching-Learning Process - General Instructions) :

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.

1. ಬಳಕೆ ಕನ್ನಡವನ್ನು ತರಗತಿಯಲ್ಲಿ ಶಿಕ್ಷಕರು ಬೋಧಿಸಲು ವಿಟಿಯು ಸೂಚಿಸಿರುವ ಪಠ್ಯಪುಸ್ತಕವನ್ನು ಉಪಯೋಗಿಸಬೇಕು.

2. ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ತಯಾರಿಸಲು ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಉತ್ತೇಜಿಸುವುದು ಮತ್ತು ತರಗತಿಯಲ್ಲಿ ಅವುಗಳನ್ನು ಚರ್ಚಿಸಲು ಅವಕಾಶ ಮಾಡಿಕೊಡುವುದು.

3. ಪ್ರತಿ ವಿದ್ಯಾರ್ಥಿ ಪುಸ್ತಕವನ್ನು ತರಗತಿಯಲ್ಲಿ ಬಳಸುವಂತೆ ನೋಡಿಕೊಳ್ಳುವುದು ಮತ್ತು ಪ್ರತಿ ಪಾಠ ಮತ್ತು ಪ್ರವಚನಗಳ ಮೂಲ ಅಂಶಗಳಿಗೆ ಸಂಬಂಧಪಟ್ಟಂತೆ ಪೂರಕ ಚಟುವಟಿಕೆಗಳಿಗೆ ತೊಡಗಿಸತಕ್ಕದ್ದು.

1. ಡಿಜಿಟಲ್ ತಂತ್ರಜ್ಞಾನದ ಮುಖಾಂತರ ಇತ್ತೀಚೆಗೆ ಡಿಜಿಟಲೀಕರಣ ಗೊಂಡಿರುವ ಭಾಷೆ ಕಲಿಕೆಯ ವಿಧಾನಗಳನ್ನು ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ಮುಖಾಂತರ ಚರ್ಚಿಸಲು ಕ್ರಮಕ್ಕೆಗೊಳ್ಳುವುದು. ಇದರಿಂದ ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ತರಗತಿಯಲ್ಲಿ ಹೆಚ್ಚು ಏಕಾಗ್ರತೆಯಿಂದ ಪಾಠ ಕೇಳಲು ಮತ್ತು ಅಧ್ಯಯನದಲ್ಲಿ ತೊಡಗಲು ಅನುಕೂಲವಾಗುತ್ತದೆ.

2. ಭಾಷಾಕಲಿಕೆಯ ಪ್ರಯೋಗಾಲಯದ ಮುಖಾಂತರ ಬಹುಬೇಗ ಕನ್ನಡ ಭಾಷೆಯನ್ನು ಕಲಿಯಲು ಅನುಕೂಲವಾಗುವಂತೆ ಕಾರ್ಯಚಟುವಟಿಕೆಗಳನ್ನು ಮತ್ತು ಕ್ರಿಯಾ ಯೋಜನೆಗಳನ್ನು ರೂಪಿಸುವುದು.

Module-1

1. Introduction, Necessity of learning a local language. Methods to learn the Kannada language.
2. Easy learning of a Kannada Language: A few tips. Hints for correct and polite conservation, Listening and Speaking Activities
3. Key to Transcription.
4. ವೈಯಕ್ತಿಕ, ಸ್ವಾಮ್ಯಸೂಚಕ/ಸಂಬಂಧಿತ ಸಾರ್ವನಾಮಗಳು ಮತ್ತು ಪ್ರಶ್ನಾರ್ಥಕ ಪದಗಳು - **Personal Pronouns, Possessive Forms, Interrogative words**

ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಖಾಂತರ ಚರ್ಚಿಸುವುದು.

Module-2
1. ನಾಮಪದಗಳ ಸಂಬಂಧಾರ್ಥಕ ರೂಪಗಳು, ಸಂದೇಹಾಸ್ಪದ ಪ್ರಶ್ನೆಗಳು ಮತ್ತು ಸಂಬಂಧವಾಚಕ ನಾಮಪದಗಳು - **Possessive forms of nouns, dubitive question and Relative nouns**   2. ಗುಣ, ಪರಿಮಾಣ ಮತ್ತು ವರ್ಣಬಣ್ಣ ವಿಶೇಷಣಗಳು, ಸಂಖ್ಯಾವಾಚಕಗಳು **Qualitative, Quantitative and Colour Adjectives, Numerals**   3. ಕಾರಕ ರೂಪಗಳು ಮತ್ತು ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯಗಳು – ಸಪ್ತಮಿ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯ – (ಅ, ಅದು, ಅವ್, ಅಲ್ಲಿ) **Predictive Forms, Locative Case**

ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಖಾಂತರ ಚರ್ಚೆಸುವುದು.

Module-3
1. ಚತುರ್ಥಿ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯದ ಬಳಕೆ ಮತ್ತು ಸಂಖ್ಯಾವಾಚಕಗಳು – **Dative Cases, and Numerals**   4. ಸಂಖ್ಯಾಗುಣವಾಚಕಗಳು ಮತ್ತು ಬಹುವಚನ ನಾಮರೂಪಗಳು – **Ordinal numerals and Plural markers**   5. ನ್ಯೂನ / ನಿಷೇಧಾರ್ಥಕ ಕ್ರಿಯಾಪದಗಳು ಮತ್ತು ವರ್ಣ ಗುಣವಾಚಕಗಳು   **Defective / Negative Verbs and Colour Adjectives**

ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಖಾಂತರ ಚರ್ಚೆಸುವುದು.

Module-4
1. ಅಪ್ಪಣೆ / ಒಪ್ಪಿಗೆ, ನಿರ್ದೇಶನ, ಪ್ರೋತ್ಸಾಹ ಮತು ಒತ್ತಾಯ ಅರ್ಥರೂಪ ಪದಗಳು ಮತ್ತು ವಾಕ್ಯಗಳು   **Permission, Commands, encouraging and Urging words (Imperative words and sentences)**   2. ಸಾಮಾನ್ಯ ಸಂಭಾಷಣೆಗಳಲ್ಲಿ ದ್ವಿತೀಯ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯಗಳು ಮತ್ತು ಸಂಭವನೀಯ ಪ್ರಕಾರಗಳು   **Accusative Cases and Potential Forms used in General Communication**   3. "ಇರು ಮತ್ತು ಇರಲ್ಲ" ಸಹಾಯಕ ಕ್ರಿಯಾಪದಗಳು, ಸಂಭಾವ್ಯಸೂಚಕ ಮತ್ತು ನಿಷೇಧಾರ್ಥಕ ಕ್ರಿಯಾ ಪದಗಳು - **Helping Verbs "iru and iralla", Corresponding Future and Negation Verbs**   6. ಹೋಲಿಕೆ (ತರತಮ) , ಸಂಬಂಧ ಸೂಚಕ ಮತ್ತು ವಸ್ತು ಸೂಚಕ ಪ್ರತ್ಯಯಗಳು ಮತ್ತು   ನಿಷೇಧಾರ್ಥಕ ಪದಗಳ ಬಳಕೆ- **Comparitive, Relationship, Identification and Negation Words**

ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಖಾಂತರ ಚರ್ಚೆಸುವುದು.

Module-5
1. ಕಾಲ ಮತ್ತು ಸಮಯದ ಹಾಗೂ ಕ್ರಿಯಾಪದಗಳ ವಿವಿಧ ಪ್ರಕಾರಗಳು - **ifferent types of forms of Tense, Time and Verbs**   2. ದ್, -ತ್, - ತು, - ಇತು, - ಆಗಿ, - ಅಲ್ಲ, - ಗ್, -ಕ್, ಇದೆ, ಕ್ರಿಯಾ ಪ್ರತ್ಯಯಗಳೊಂದಿಗೆ ಭೂತ, ಭವಿಷ್ಯತ್ ಮತ್ತು ವರ್ತಮಾನ ಕಾಲ ವಾಕ್ಯ ರಚನೆ - **Formation of Past, Future and Present Tense Sentences with Verb Forms**   3. **Kannada Vocabulary List :** ಸಂಭಾಷಣೆಯಲ್ಲಿ ದಿನೋಪಯೋಗಿ ಕನ್ನಡ ಪದಗಳು - **Kannada Words in Conversation**

ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಖಾಂತರ ಚರ್ಚೆಸುವುದು.

ಬಳಕೆ ಕನ್ನಡ ಪಠ್ಯದ ಕಲಿಕೆಯಿಂದ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಆಗುವ ಅನುಕೂಲಗಳು ಮತ್ತು ಫಲಿತಾಂಶಗಳು: **course Outcomes (Course**

Skill Set): At the end of the Course, The Students will be able
1. To understand the necessity of learning of local language for comfortable life.
2. To Listen and understand the Kannada language properly.
3. To speak, read and write Kannada language as per requirement.
4. To communicate (converse) in Kannada language in their daily life with kannada speakers.
5. To speak in polite conservation.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50)in the semester-end examination(SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous Internal Evaluation:
Three Tests each of **20 Marks (duration 01 hour)**
   a. First test at the end of 5th week of the semester
   b. Second test at the end of the 10th week of the semester
   c. Third test at the end of the 15th week of the semester
Two assignments each of **10 Marks : 1.** First assignment at the end of 4th week of the semester
   7. Second assignment at the end of 9th week of the semester
Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for **20 Marks** (**duration 01 hours**)
   8. At the end of the 13th week of the semester
The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be **scaled down to 50 marks**
CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.
ಸೆಮಿಸ್ಟರ್ ಅಂತ್ಯದ ಪರೀಕ್ಷೆಯು ಈ ಕೆಳಗಿನಂತಿರುತ್ತದೆ - **Semester End Exam (SEE):**

SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject.
   2. The question paper will have 50 questions. Each question is set for 01 mark.
   3. SEE Pattern will be in MCQ Model for 50 marks. Duration of the exam is 01 Hour.

Textbook :

   ಬಳಕೆ ಕನ್ನಡ

ಲೇಖಕರು : ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ

ಪ್ರಸಾರಾಂಗ, ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಬೆಳಗಾವಿ.

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		Semester: IV			
		NATIONAL SERVICE SCHEME			
		(Practice)			
Course Code	:	**21HSAE39A/21HSAE46A**	**CIE Marks**	:	**50 s**
Credits: L:T:P	:	**0:0:1**	**SEE Marks**	:	**50**
Total Hours	:	**13 P**	**SEE Duration**	:	**2 Hours**

Prerequisites
1. Students should have service-oriented mindset and social concern.
2. Students should have dedication to work at any remote place, any time with available resources and proper timemanagement for the other works.
3. Students should be ready to sacrifice some of the timely will and wishes to achieve service-oriented targets ontime.

Content	**13 Hours**

Students must take up any one activity on below mentioned topics and has to prepare contents for awareness and technical contents for implementation of the projects and has to present strategies for implementation of the same. Compulsorily must attend one camp.
CIE will be evaluated based on their presentation, approach, and implementation strategies.
(Any one of the below mentioned activity)

1. Helping local schools to achieve good result and enhance their enrolment in Higher/technical/ vocational education.
2. Preparing an actionable business proposal for enhancing the village/ farmer income and approach for implementation.
3. Developing Sustainable Water management system for rural/ urban areas and implementation approaches.
4. Setting of the information imparting club for women leading to contribution in social and economic issues.
5. Spreading public awareness/ government schemes under rural outreach program. (Minimum 5 programs)
6. Contribution to any national level initiative of Government of India. For eg. Digital India, Skill India, Swachh Bharat, Atmanirbhar Bharath, Make in India, Mudra scheme, Skill development programs etc..
7. Social connect and responsibilities
8. Plantation and adoption of plants. Know your plants
9. Organic farming, Indian Agriculture (Past, Present and Future) Connectivity for marketing
10. Waste management – Public, Private and Govt organization, 5 R's
11. Water conservation techniques – Role of different stakeholders - Implementation
12. Govt. School Rejuvenation and assistance to achieve good infrastructure.
13. Organize National integration and social harmony events/ workshops / seminars. (Minimum 2 programs)

AND <u>ONE NSS-CAMP</u>

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Course Outcomes: After completing the course, the students will be able to	
CO1:	Understand the importance of his/her responsibilities towards society.
CO2:	Analyze the environmental and societal problems/ issues and will be able to design solutions for thesame.
CO3:	Evaluate the existing system and to propose practical solutions for the same for sustainable development.
CO4:	Implement government or self-driven projects effectively in the field.

ASSESSMENT AND EVALUATION PATTERN		
WEIGHTAGE	**50%**	**50%**
	CIE	**SEE**
Presentation 1- Selection of topic- (phase 1) Justification for Importance, need of the hour withsurveyed data.	**10**	*****
EXPERIENTIAL LEARNING Presentation 2 (phase 2) Content development, strategies for implementationmethodologies.	**10**	*****
Case Study-based Teaching-Learning	**10**	Implementation strategies of the project with report
Sector wise study & consolidation	**10**	
Video based seminar (4-5 minutes per student)	**10**	
TOTAL MARKS FOR THE COURSE	**50 MARKS**	**50 MARKS**

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Semester: IV					
NATIONAL CADET CORPS					
(Practice)					
Course Code	:	**21HSAE39B21HSAE46B**	**CIE Marks**	:	**50**
Credits: L: T:P	:	0:0:1	**SEE Marks**	:	**50**
Total Hours	:	**15 P**	**SEE Duration**	:	**2 Hrs**

Unit 1	**7 Hrs**
Drill (Contact Hrs. 12). Foot Drill- Drill ki Aam Hidayaten, Word ki Command, Savdhan,Vishram, Aram Se, Murdna, Kadvar Sizing, Teen Line Banana, Khuli Line, Nikat Line, Khade Khade Salute Karna	
Unit 2	**3 Hrs**
Weapon Training (WT): Introduction & Characteristics of 7.62 Self Loading rifle,Identification of rifle parts	
Unit 3	**3 Hrs**
Adventure activities: Trekking and obstacle course	
Unit 4	**2 Hrs**
Social Service and Community Development (SSCD): Students will participate in various activities throughout the semester e.g., Blood donation Camp, Swachhata Abhiyan,Constitution Day, All National Festival	

Course Outcomes: Cadets will be able to: -	
CO1	Understand that drill as the foundation for discipline and to command a group for commongoal.
CO2	Understand the importance of a weapon its detailed safety precautions necessary for prevention of accidents and identifying the parts of weapon
CO3	Understand that trekking will connect human with nature and cross the obstacles to experience army way of life.
CO4	Understand the various social issues and their impact on social life, Develop the sense of self-less social service for better social & community life.

Reference Books	
1	NCC Cadet Hand Book by R K Gupta, Ramesh Publishing House, New Delhi, Book code:R-1991, ISBN: 978-93-87918-57-3, HSN Code: 49011010
2	nccindia.ac.in

ASSESSMENT AND EVALUATION PATTERN		
WEIGHTAGE	**50%**	**50%**
	CIE	SEE
Drill Skill Test	**20**	*****
Weapon Training	**10**	*****
Adventure activities	**10**	Report on adventure and social service activities
Social service activities	**10**	
TOTAL MARKS FOR THE COURSE	**50 MARKS**	**50 MARKS**

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Semester: IV				
PHYSICAL EDUCATION (SPORTS & ATHLETICS) (Practice)				
Course Code	: 21HSAE39C/21HSAE46C		CIE Marks	: 50
Credits: L:T:P	: 0:0:1		SEE Marks	: 50
Total Hours	: 30 P		SEE Duration	: 2.30 Hours

Introduction of Physical Education and Sports				
General & Specific warm up exercises Conditioning exercises Any 2 Major Games Intramural Competitions				
Choose any one according to serial no				
1. Kho-Kho	Giving Kho, Single chain, Pole dive, Pole turning, 3-6 Up	6. Kabaddi	Hand touch, Chain hold, Anklehold, Thigh hold, Getting bonus	
2. Throwball	Service, Receive, Spin pass, Simple pass, Jump throw	7. Volleyball	Attack, Block, Service, Upper hand pass, Lower hand pass	
3. Netball	Step with ball, Shooting, Passing, Blocking	8. Handball	Step with ball, Shooting, Passing,Blocking, Dribbling	
4. Softball	Catching, Pitching, Slugging,Base Running, Stealing	9. Football	Dribbling, Chest Drop, Ball Control,Thigh Drop, Shooting	
5. Ball badminton	Service, Fore hand receive, Back hand receive, Spin smash, Rally	10. Table Tennis	Service, Fore hand receive, Back hand receive, Smash, Rally	

Course Outcomes: After completing the course, the students will be able to	
CO1	Understand the basic principles and practices of Physical Education and Sports.
CO2	Instruct the Physical Activities and Sports practices for Healthy Living
CO3	To develop professionalism among students to conduct, organize & Officiate Physical Education and Sports events at schools and community level

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Topics for Viva:

1. On rules and regulations pertaining to the games / sports
2. On dimensions of the court, size / weight of the ball and standards pertaining to that sports / game
3. Popular players and legends at state level / National level/ International level
4. Recent events happened and winner / runners in that particular sport / game
5. General awareness about sport / game, sports happenings in the college campus

Reference Books	
1	Muller, J. P. (2000). Health, Exercise and Fitness. Delhi: Sports.
2	Vanaik.A (2005) Play Field Manual, Friends Publication New Delhi
3	IAAF Manual
4	M.J Vishwanath, (2002) Track and Field Marking and Athletics Officiating Manual, Silver Star Publication, Shimoga
5	Steve Oldenburg (2015) Complete Conditioning for Volleyball, Human Kinestics.
Note: Skills of Sports and Games (Game Specific books) may be referred	

ASSESSMENT AND EVALUATION PATTERN CIE-50 MARKS		
Activity book- **10** marks		
QUIZZES		
Quiz-I	Each quiz is evaluated for 10 marksadding up to **20 MARKS.**	
Quiz-II		
Test – I	Demonstration of skills is evaluated for10 marks adding up to **20 MARKS.**	
Test – II		
ASSESSMENT AND EVALUATION PATTERN SEE-50 MARKS		
Practical	**30 marks**	
Viva voce	**20 marks**	
Total	**50 marks**	

Rubric for CIE (2022 Scheme)			Rubric for SEE (2022 Scheme)		
Sl. No.	**Content**	**Marks**	**Sl. No.**	**Content**	**Marks**
1	Attendance	10	1	Performing Skills (Any Two)	30
2	Performing Skills (Any Two)	20			
3	Court measurement (Markings)	20	2	Viva	20
	Total:	**50**		**Total:**	**50**

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Semester: IV				
MUSIC **(Practice)**				
Course Code	:	**21HSAE39D1/21HSAE46D1**	**CIE Marks**	: 50
Credits: L:T:P		0:0:1	**SEE Marks**	: 50
Total Hours	:	13P	**SEE Duration**	: 2 Hours

Prerequisites:
1. Students should know basics of music. 2. Students should have dedication to learn and improve on their musical skills. 3. Students should have participated in musical events and have basic knowledge on how to present their music.

Content	**13 Hours**
1. Introduction to different genres of music 2. Evolution of genres in India: Inspiration from the world 3. Ragas, time and their moods in Indian Classical Music 4. Identification of ragas and application into contemporary songs 5. Adding your touch to a composition 6. Maths and Music: A demonstration 7. Harmonies in music 8. Chords: Basics and application into any song 9. Music Production-I 10. Music Production-II Students have to form groups of 2-4 and present a musical performance/ a musical task which shall be given bythe experts. The experts shall judge the groups and award marks for the same. CIE will be evaluated based on their presentation, approach and implementation strategies. Students need to submit their certificates of any event they participated or bagged prizes in. This shall also be considered for CIE evaluation.	

Course Outcomes: After completing the course, the students will be able to	
CO1	Understand basics of Music and improve their skills
CO2	Appreciate the impacts on health and well being
CO3	Perform and present music in a presentable manner
CO4	Develop skills like team building and collaboration

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Reference Books	
1.	Music Cognition: The Basics by Henkjan Honing
2.	Basic Rudiments Answer Book - Ultimate Music Theory: Basic Music Theory Answer Book by Glory StGermain
3.	Elements Of Hindustani Classical Music by Shruti Jauhari
4.	Music in North India: Experiencing Music, Expressing Culture (Global Music Series) by George E. Ruckert

ASSESSMENT AND EVALUATION PATTERN		
WEIGHTAGE	50%	50%
	CIE	SEE
Presentation 1- Selection of topic- (phase 1)	10	*****
EXPERIENTIAL LEARNING Presentation 2 (phase 2)	10	*****
Case Study-based Teaching-Learning	10	Implementation strategies of theproject with report
Sector wise study & consolidation	10	
Video based seminar (4-5 minutes per student)	10	
TOTAL MARKS FOR THE COURSE	50 MARKS	50 MARKS

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Semester: IV				
DANCE (Practice)				
Course Code	: 21HSAE39D2/21HSAE46D2		CIE Marks	: 50
Credits: L:T:P	0:0:1		SEE Marks	: 50
Total Hours	: 13P		SEE Duration	: 2 Hours

Prerequisites:
1. Students should have the will and interest to learn dancing. 2. Students should have a positive mindset. 3. Students should be willing to interact and cooperate in group activities.

Content	13 Hours
1. Introduction to Dance 2. Preparing the body for dancing by learning different ways to warm up. 3. Basics of different dance forms i.e. classical, eastern, and western. 4. Assessing the interest of students and dividing them into different styles based on interaction. 5. Advancing more into the styles of interest. 6. Understanding of music i.e. beats, rhythm, and other components. 7. Expert sessions in the respective dance forms. 8. Activities such as cypher, showcase to gauge learning. 9. Components of performance through demonstration. 10. Introduction to choreographies and routines. 11. Learning to choreograph. 12. Choreograph and perform either solo or in groups.	

Course Outcomes: After completing the course, the students will be able to	
CO1:	Understand the fundamentals of dancing.
CO2:	Adapt to impromptu dancing.
CO3:	Ability to pick choreography and understand musicality.
CO4:	To be able to do choreographies and perform in front of a live audience.

Reference Books	
1	Dance Composition: A practical guide to creative success in dance making by Jacqueline M. Smith-Autard

ASSESSMENT AND EVALUATION PATTERN		
WEIGHTAGE	**50%**	**50%**
	CIE	**SEE**
Presentation 1- Selection of topic- (phase 1)	**10**	*****
EXPERIENTIAL LEARNING Presentation 2 (phase 2)	**10**	*****
Case Study-based Teaching-Learning	**10**	Implementation strategies of the project with report
Sector wise study & consolidation	**10**	
Video based seminar (4-5 minutes per student)	**10**	
TOTAL MARKS FOR THE COURSE	**50 MARKS**	**50 MARKS**

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Semester: IV				
LIGHTS CAMERA DRAMA **(Practice)**				
Course Code	: **21HSAE39D3/ 21HSAE46D3**	**CIE Marks**	:	**50**
Credits: L:T:P	: **0:0:1**	**SEE Marks**	:	**50**
Total Hours	: **13P**	**SEE Duration**	:	**2 Hours**

Prerequisites:
1. Students should have creative oriented mindset and social concern.
2. Students should have dedication to work with their classmates for long hours until a collective goal is reached.
3. Students should be ready to sacrifice some of the timely will and wishes to achieve targets on time.

Content	13 Hours

1. **Break the ICE**
2. **Introduction to freedom** Talk to each and every single person for a period of 5 complete minutes**.** This is aimedat to make everyone in the room comfortable with each other. This helps everyone get over social anxiety, Shyness and Nervousness.
3. **Ura**
4. **Rhythm Voice Projection, Voice Modulation, Weeping & Coughing** Voice projection is the strength of speaking or <u>singing</u> whereby the <u>voice</u> is used powerfully and <u>clearly</u>. It is a technique employed to command respectand attention, as when a <u>teacher</u> talks to a class, or simply to be heard clearly, as used by an actor in a <u>theatre</u>.
5. **It's Leviosa, Not Leviosaaa!**
6. **Speech work: Diction, Intonation, Emphasis, Pauses, Pitch and Volume Tempo Dialogues delivery.** The art of dialogue delivery plays a vital role in in ensuring the efficacy of communication especially from the dramatic aspect of it, this unit discusses some tips to help the young actors improve their dialogue delivery skills:
7. **Elementary, My dear Watson.**
8. **Responsibilities of an actor tools of an actor character analysis** Observations aspects, Stage presence,concentration, conviction, confidence, energy and directionality.
9. **Show time**
10. **Pick a genre: COMEDY, THRILLER, HORROR, and TRAGEDY: Showcase a performance.** Stylized acting with reference to historical and mythological plays. **Mime**: conventional, occupational and pantomime **Monoacting:** different types of characters

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Course Outcomes: After completing the course, the students will be able to	
CO1:	Develop a range of Theatrical Skills and apply them to create a performance.
CO2:	Work collaboratively to generate, develop and communicate ideas.
CO3:	Develop as creative, effective, independent and reflective students who are able to make inform edchoices in process and performance.
CO4:	Develop an awareness and understanding of the roles and processes undertaken in contemporary professional theatre practice.

CIE's will be evaluated through mono-acting or dialogue. The students need to use whatever they've learnt through the course of the drama class. Judges/Teachers can award the marks accordingly. Certificates won outside of college, can be submitted for evaluation as well.

For SEE's. Students need to form groups of 4-6. They need to pick a genre and enact a play of at least 20 mins long. The venue will be IEM auditorium. No mics should be used. They will be given 2 weeks to prepare.

Reference Books	
1	The Empty Space by Peter Brook
2	The Viewpoints Book: A Practical Guide to Viewpoints and Composition by Anne Bogart and Tina Landau

ASSESSMENT AND EVALUATION PATTERN		
WEIGHTAGE	**50%**	**50%**
	CIE	**SEE**
Presentation 1- Selection of Script (phase 1)	10	*****
EXPERIENTIAL LEARNING Presentation 2 (phase 2)	10	*****
Case Study-based Teaching-Learning	10	Implementation strategies of the project with report
Interpretation of Script	10	
Performance based seminar (20 mins long)	10	
TOTAL MARKS FOR THE COURSE	**50 MARKS**	**50 MARKS**

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Semester: IV					
ART **(Practice)**					
Course Code	:	21HSAE39D4/21HSAE46D4	CIE Marks	:	50
Credits: L:T:P		0:0:1	SEE Marks	:	50
Total Hours	:	13P	SEE Duration	:	2 Hours

Prerequisites:
Although there are no prerequisite qualifications for this subject, students must have a basic understanding of and interest in the fields of art and design in order to enroll in it.

Content	13 Hours
1. Use points, line and curves to create various shapes and forms 2. Use of shapes and forms to create various objects and structures 3. Recognizing distinctions in objects when viewed from various perspectives and grasping basic notions of perspective 4. Students will be introduced to the significance of color in art, as well as the principles of color theory and application. 5. Applied the concepts of unity, harmony, balance, rhythm, emphasis and proportion, abstraction and stylization tocreate a composition. 6. Learn how to use which materials and for what types of art and textures. 7. Use of the above concepts to create art through the medium of collage, mosaic, painting, mural, batik, tie and dye. 8. Real world application of the above concepts in the form of book cover design and illustration, cartoon, poster,advertisements, magazine, computer graphics and animation 9. Familiarization with the many art forms and techniques of expression found throughout India. **AND** **ONE EDUCATIONAL VISIT TO AN ART MUSEUM / INSTITUTE / GALLERY** **Students must turn in assignments for each of the above said topics on a weekly basis and have to compulsorily take part in the museum visit. CIE will be evaluated based on a still life piece, a composition usingany one of the media of composition and a presentation on Indian art styles and creation of a piece pertaining to the presented art style.**	

Reference Books	
1.	Catching the Big Fish: Meditation, Consciousness, and Creativity by David Lynch
2.	Art & Fear: Observations on the Perils (and Rewards) of Artmaking by David Bayles & Ted Orland

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Course Outcomes: After completing the course, the students will be able to	
CO1:	To use lines, shapes, and colors to depict the various sentiments and moods of life and nature.
CO2:	To use one's creativity to develop forms and color schemes, as well as the ability to portray them effectively indrawing and painting on paper.
CO3:	To develop the ability to properly use drawing and painting materials (surfaces, tools and equipment, and so on).
CO4:	To improve their observation abilities by studying everyday items as well as numerous geometrical and non-geometrical (i.e. organic) shapes found in life and nature and to hone their drawing and painting talents in response to these insights.

ASSESSMENT AND EVALUATION PATTERN		
WEIGHTAGE	**50%**	**50%**
	CIE	SEE
Presentation 1- Selection of topic- (phase 1)	**10**	*****
EXPERIENTIAL LEARNING Presentation 2 (phase 2)	**10**	*****
Case Study-based Teaching-Learning	**10**	Implementation strategies of the project with report
Sector wise study & consolidation	**10**	
Video based seminar (4-5 minutes per student)	**10**	
TOTAL MARKS FOR THE COURSE	**50 MARKS**	**50 MARKS**

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Semester: IV					
PHOTOGRAPHY					
(Practice)					
Course Code	:	21HSAE39D5/ 21HSAE46D5		CIE Marks	:	50
Credits: L:T:P	0:0:1			SEE Marks	:	50
Total Hours	:	13P		SEE Duration	:	2 Hours

Prerequisites:
1. Students should know basics of photography and cinematography.
2. Students should have dedication to learn and improve on their photography and film making skills.
3. Students should have participated in photography events.
4. Students should have a DSLR camera.

Content	13 hours
1. Introduction to photography. 2. Understanding the terminologies of DSLR. 3. Elements of photography. 4. Introduction to script writing, storyboarding. 5. Understanding the visualization and designing a set. 6. Basics of film acting 7. Video editing using software 8. Introduction to cinematography. 9. Understanding about lighting and camera angles. 10. Shooting a short film. **Students must form groups of 2-4 and present a short film which shall be given by the experts. The experts shalljudge the groups and award marks for the same.** **CIE will be evaluated based on their presentation, approach and implementation strategies. Students need to submit their certificates of any event they participated or bagged prizes in. This shall also be considered for CIEevaluation.**	

Course Outcomes: After completing the course, the students will be able to	
CO1:	Understand basics of photography and videography and improve their skills
CO2:	Appreciate the skills acquired from photography
CO3:	Perform and present photos and films in a presentable manner
CO4:	Develop skills like team building and collaboration

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Reference Books			
1.	Read This If You Want to Take Great Photographs – Henry Carroll		
2.	The Digital Photography Book: Part 1 – Scott Kelby		

ASSESSMENT AND EVALUATION PATTERN		
WEIGHTAGE	**50%**	**50%**
	CIE	**SEE**
Presentation 1- Selection of topic- (phase 1)	**10**	*****
EXPERIENTIAL LEARNING Presentation 2 (phase 2)	**10**	*****
Case Study-based Teaching-Learning	**10**	Implementationstrategies of theproject with report
Sector wise study & consolidation	**10**	
Video based seminar (4-5 minutes per student)	**10**	
TOTAL MARKS FOR THE COURSE	**50 MARKS**	**50 MARKS**

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Semester: IV					
Bridge Course: C PROGRAMMING (Theory) (Common to all Branches)					
Course Code	:	21DCS47		CIE	:	50 Marks
Credits: L:T:P	:	2:0:0		SEE	:	---
Total Hours	:	30L		SEE Duration	:	2 Hours

Unit-I	08 Hrs
Introduction-Perspectives **Business Domains:** Programming. **Applications:** Design games, GUI, DBMS, Embedded Systems, Compilers and Operating Systems. **Introduction to Computer Concepts:** Introduction to Computer Hardware, Software and its Types. **Introduction to C programming:** Programming paradigms, Basic structure of C program, Process of compiling and running a C program, Features of C language, Character set, C tokens, Keywords and Identifiers, Constants, Variables, Data types, Pre-processor directives. **Handling Input and Output operations and operators:** Formatted input/output functions, Unformatted input/output functions with programming examples using all functions.	

Unit – II	10 Hrs
Operators: Introduction to operator set, Arithmetic operators, Relational operators, Logical Operators, Assignment operators, Increment and Decrement operators, Conditional operators, Bit-wise operators, Special operators. **Expressions:** Arithmetic expressions, evaluation of expressions, Precedence of arithmetic operators, Type conversion in expressions, Operator precedence and associativity. **Decision Making and Branching:** Decision making with 'if' statement, Simple 'if' statement, the 'if…else' statement, nesting of 'if…else' statements, The 'else if' ladder, The 'switch' statement, The '*?:*' operator, The '*goto*' statement.	

Unit –III	12 Hrs
Programming Constructs: Decision making and looping: The 'for','while','do-while' statements with examples, Jumps in loops. **Arrays:** Introduction to Arrays, Types of arrays, Declaration arrays, Initializing dimensional arrays (One Dimensional and Multidimensional Array) with examples. **String Operations:** Introduction, Declaration and Initializing String Variables using arrays, String operations and functions with examples. **Functions:** Need for Functions, Types of functions (User Defined and Built –In), working with functions, Definition, declaration and its scope. **Pointers:** Introduction, Benefits of using pointers, Declaration and Initialization of pointers, Obtaining a value of a variable.	

Course Outcomes: After completing the course, the students will be able to:-	
CO 1	Apply logical skills to solve the engineering problems using C programming constructs.
CO 2	Evaluate the appropriate method/data structure required in C programming to develop solutions by investigating the problem.
CO 3	Design a sustainable solution using C programming with societal and environmental concern by engaging in lifelong learning for emerging technology
CO 4	Demonstrate programming skills to solve inter-disciplinary problems using modern tools effectively by exhibiting team work through oral presentation and written reports.

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Reference Books	
1.	Programming in C, P. Dey, M. Ghosh, 2011, 2nd Edition, Oxford University press, ISBN (13): 9780198065289.
2.	Algorithmic Problem Solving, Roland Backhouse, 2011, Wiley, ISBN: 978-0-470-68453-5
3.	The C Programming Language, Kernighan B.W and Dennis M. Ritchie, 2015, 2nd Edition, Prentice Hall, ISBN (13): 9780131103627.
4.	Turbo C: The Complete Reference, H. Schildt, 2000, 4th Edition, Mcgraw Hill Education, ISBN-13: 9780070411838.
5.	Rasberry pi: https://www.raspberrypi.org/documentation/
6.	Nvidia: https://www.nvidia.com/en-us/
7.	Ardunio: https://www.arduino.cc/en/Tutorial/BuiltInExamples
8.	Scratch software: https://scratch.mit.edu/

PRACTICE PROGRAMS
Implement the following programs using cc/gcc compiler

1. Develop a C program to compute the roots of the equation $ax^2 + bx + c = 0$.
2. Develop a C program that reads N integer numbers and arrange them in ascending or descending order using selection sort and bubble sort technique.
3. Develop a C program for Matrix multiplication.
4. Develop a C program to search an element using Binary search and linear search techniques.
5. Using functions develop a C program to perform the following tasks by parameter passing to read a string from the user and print appropriate message for palindrome or not palindrome.
6. Develop a C program to compute average marks of 'n' students (Name, Roll_No, Test Marks) and search a particular record based on 'Roll_No'.
7. Develop a C program using pointers to function to find given two strings are equal or not.
8. Develop a C program using recursion, to determine GCD , LCM of two numbers and to perform binary to decimal conversion.

ASSESSMENT AND EVALUATION PATTERN		
	CIE	**SEE**
WEIGHTAGE	**100%**	---
QUIZZES		
Quiz-I	Each quiz is evaluated for 10 marks adding up to 1**0 MARKS.**	
Quiz-II		
THEORY COURSE (Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating)		
Test – I	Each test will be conducted for 50 Marks adding upto 100 marks. Final test marks will be reduced to 3**0 MARKS**	
Test – II		
EXPERIENTIAL LEARNING	**10**	
TOTAL MARKS FOR THE COURSE	**50**	---

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Semester: IV					
UNIVERSAL HUMAN VALUES AND PROFESSIONAL ETHICS (Theory & Practice)					
Course Code	:	21HSU48	CIE Marks	:	50
Credits: L:T:P	:	2:0:0	SEE Marks	:	50
Total Hours	:	28L+14P	SEE Duration	:	2 Hours

Unit-I	05 Hrs

Course Introduction - Need, Basic Guidelines, Content and Process for Value Education: Purpose and motivation for the course, recapitulation from Universal Human Values-I, Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking.

Unit – II	06 Hrs

Understanding Harmony in the Human Being - Harmony in Myself!: Understanding human being as a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body' - happiness and physical facility, Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Health.

Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

Unit –III	06 Hrs

Understanding Harmony in the Family and Society- Harmony in Human Human Relationship: Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship, Understanding the meaning of Trust; Difference between intention and competence, Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals, Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family. Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives

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Unit –IV	05 Hrs

Understanding Harmony in the Nature and Existence - Whole existence as Coexistence: Understanding the harmony in the Nature, Interconnectedness and mutual fulfilment among the four orders of nature recyclability and self-regulation in nature, Understanding Existence as Co-existence of mutually interacting units in all pervasive space, Holistic perception of harmony at all levels of existence. Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

Unit –V	06 Hrs

Implications of the above Holistic Understanding of Harmony on Professional Ethics, Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems, Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations, Sum up.
Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.
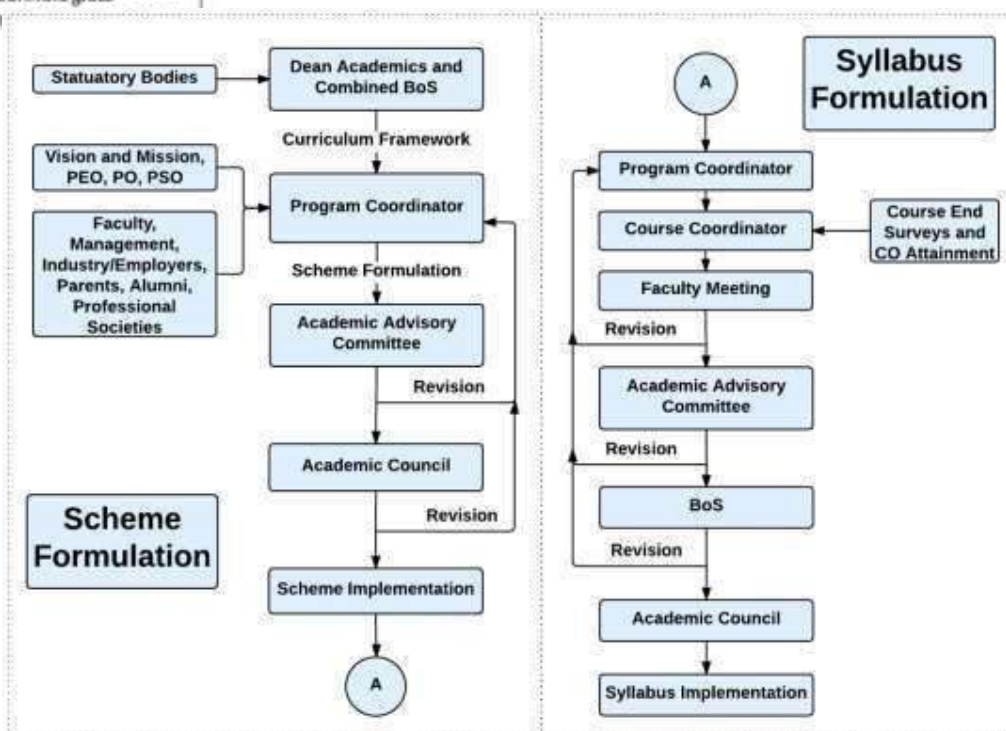
Course Outcomes: After completion of the course the students will be able to	
CO1	By the end of the course, students are expected to become more aware of themselves, and their surroundings (family, society, nature); they would become more responsible in life, and in handling problems with sustainable solutions,
CO2	While keeping human relationships and human nature in mind. They would have better critical ability.
CO3	They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society).
CO4	It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction

Reference Books	
1	Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2	Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004
3	The Story of Stuff (Book).
4	The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5	Small is Beautiful - E. F Schumacher.
6	Slow is Beautiful - Cecile Andrews.

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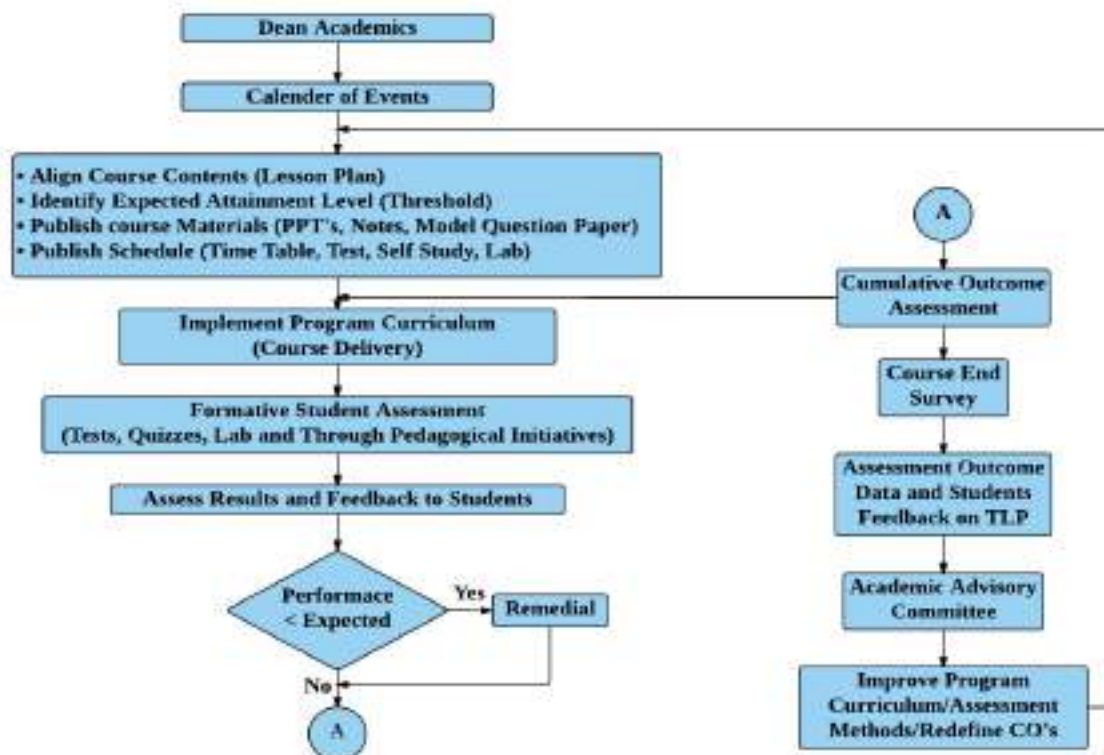University, Belagavi

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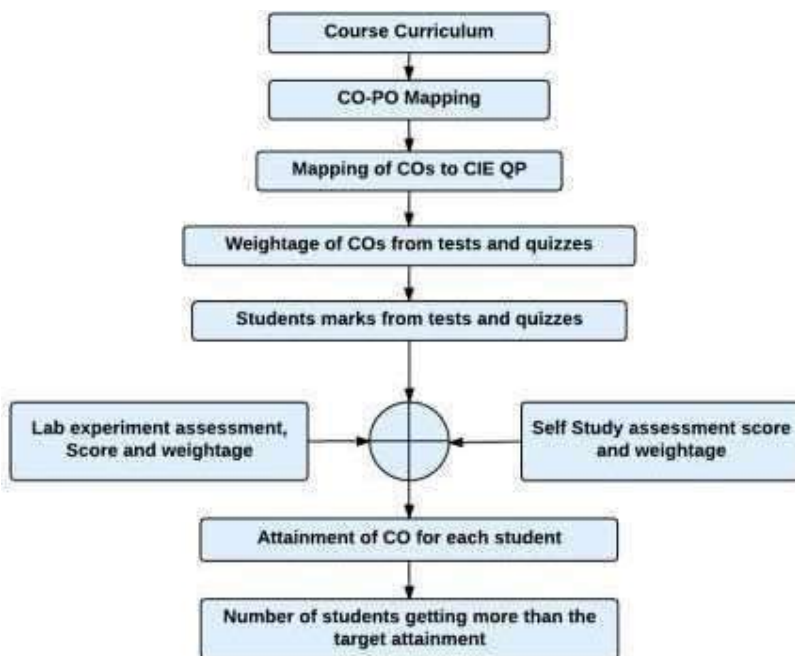| ASSESSMENT AND EVALUATION PATTERN |
|---|
| This is a compulsory credit course. The assessment is to provide a fair state of development of the student, so participation in classroom discussions, self-assessment, peer assessment etc. will be used in evaluation. Example: Assessment by faculty mentor: 10 marks Self-assessment: 10 marks Assessment by peers: 10 marks Socially relevant project/Group Activities/Assignments: 20 marks Semester End Examination: 50 marks. The overall pass percentage is 40%. In case the student fails, he/she must repeat the course |

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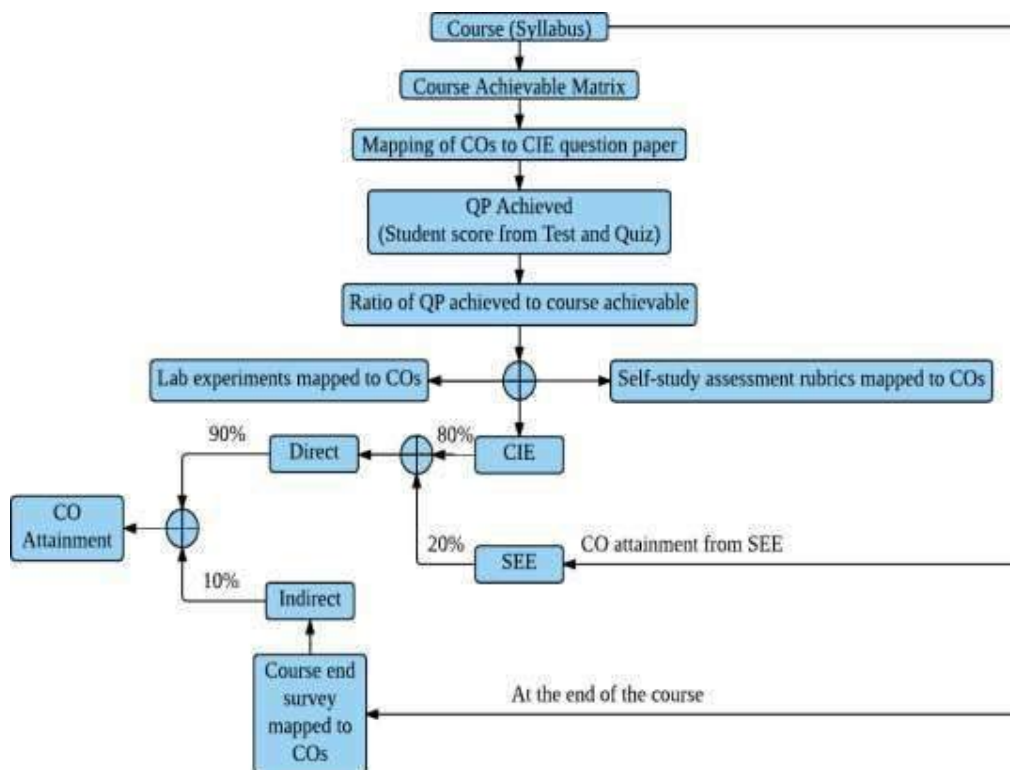RV College of Engineering ®

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Curriculum Design Process

Academic Planning and Implementation

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Process for Course Outcome Attainment

Final CO Attainment Process

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Program Outcome Attainment Process

```
              Course (Syllabus)
                    │
                    ▼
               CO Attainment
                    │
                    ▼
              CO – PO Mapping
                    │
                    ▼
              PO Attainment
                 DIRECT
                    │
                  80%
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                   (⊕) ──────────────►  PO Attainment
                    ▲
                  20%
                    │
Alumni Survey ──►  PO Attainment  ◄── Employer Survey
                   INDIRECT
                    ▲
                    │
              Senior Exit Survey
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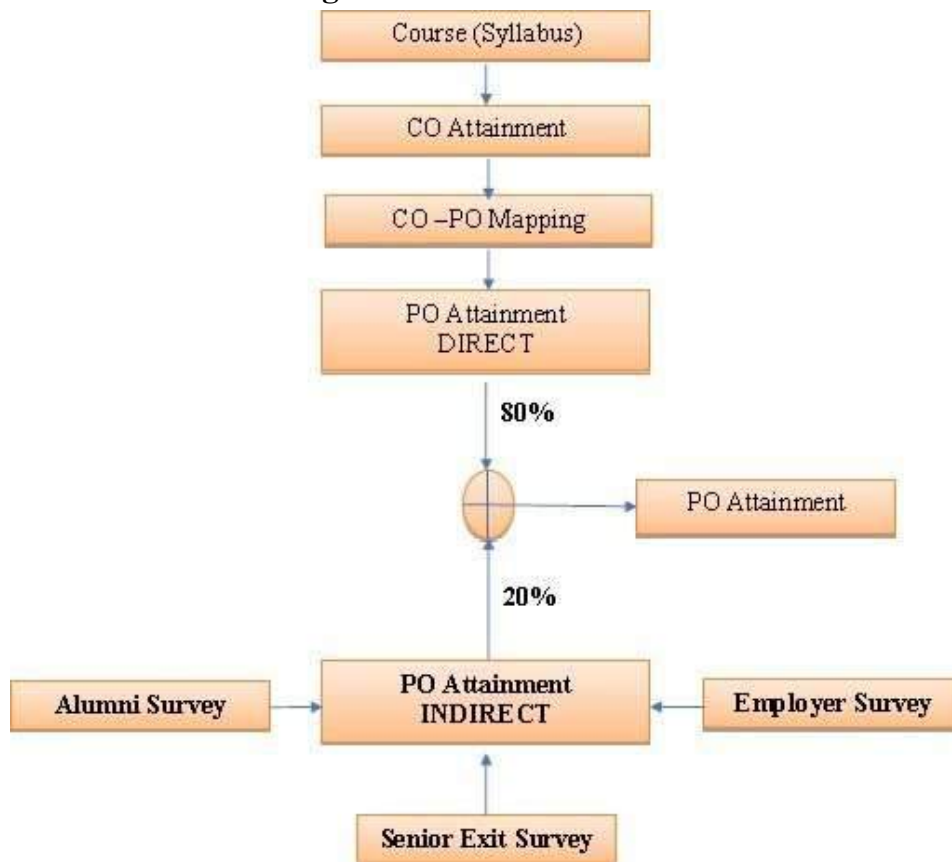
1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialisation for the solution of complex engineering problems.

2. **Problem analysis:** Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. **Design/development of solutions:** Design solutions for complex engineering problems and designsystem components or processes that meet the specified needs with appropriate consideration for public health and safety, and cultural, societal, and environmental considerations.

4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling to complex engineering activities, with an understanding of the limitations.

6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and sustainability:** Understand the impact of the professional engineering solutionsin societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with the society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one''s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.