

Autonomous Institution Affiliated to Visvesvaraya Technological University, Belagavi Approved by AICTE, New Delhi



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

BACHELOR OF ENGINEERING (B.E) IN MECHANICAL ENGINEERING

(ACADEMIC YEAR 2022-2023)

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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
24.	AEC	Ability Enhancement Courses

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INDEX

SECOND YEAR COURSES									
Sl. No.	Sl. Course Code Name of the Course								
	III Semester								
1.	21MA31C	Integral Transforms, Optimization and Numerical Techniques	1						
2.	21ME32	Engineering Materials	3						
3.	21ME33	Solid Mechanics	5						
4.	21ME34	Engineering Thermodynamics	8						
5.	21ME35	Metrology and Machine Drawing	11						
6.	21ME36	Python for Mechanical Engineers	14						
7.	21DMA37	Bridge Course Mathematics	16						
8.	21ME39	Design Thinking Lab	18						
9.	21MEI310	Summer Internship- I	20						
		IV Semester	·						
10.	21MA41	Engineering Mathematics-IV	22						
11.	21BT42A	Environmental Technology	24						
12.	21ME43	Theory of Machines	27						
13.	21ME44	Fluid Mechanics	30						
14.	21ME45	Manufacturing Technology	33						
15.	21ME4AX	Professional Core Elective – Group A - MOOC Courses	36						
16.	21HS46A / 21HS46V	Kannada Course: AADALITHA KANNADA (21HS46A) / VYAVAHARIKA KANNADA (21HS46V)	44						
	21HSAE46X	Ability Enhancement course - I	50						
17.	21DCS47	Bridge Course C Programming	66						
18.	21HSU48	Universal Human Values and Professional Ethics	68						



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	III SEMESTER													
S1. No.	Course Code	Course Title		Credit Allocation		BoS	BoS Category	CIE Duration	Max Marks CIE		SEE Duration	Max Marks SEE		
			L	Т	Р	Total			(П)	Theory	Lab	(П)	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	21ME33	Solid Mechanics	3	0	1	4	ME	Theory+Lab	1.5	100	50	3	100	50
4	21ME34	Engineering Thermodynamics	3	0	1	4	ME	Theory+Lab	1.5	100	50	3	100	50
5	21ME35	Metrology and Machine Drawing	2	0	1	3	ME	Theory+Lab	1.5	100	50	3	100	50
6	21ME36	Python for Mechanical Engineers	2	0	0	2	ME	Theory	1	50	****	2	50	****
7	21DMA37***	Bridge Course: Mathematics	2(A)	0	0	AUDIT	MA	Theory	1	50	****	-	****	****
8	21ME39	Design Thinking Lab	0	0	2	2	ME	Lab	1	****	50	2	****	50
9	21MEI310	Summer Internship- I	0	0	1	1	ME	Lab	1	****	50	1	****	50
-		•	•	-	•	22								•

* Summer Internship-1 will be done after the II semester for 03 Weeks. (Will have CIE & SEE)





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	ENGINEERING MATHEMATICS - III										
Sl. No	COURSE TITLE	COURSE CODE	BRANCHES								
1	Linear algebra, Integral transforms and Number	21MA31A	CS & IS								
	theory										
2	Linear algebra, Integral transforms and Fourier	21MA31B	AS, EC, EE, EI, ET								
	series										
3	Integral Transforms, Optimization and	21MA31C	BT, CH, CV, IM, ME								
	Numerical Techniques										
4	Mathematics for AI and ML	21MA31D	AI & ML								
	** MANDATORY C	OURSES									
Sl. No	COURSE TITLE	COURSE CODE	BRANCHES								
1	Environmental Technology	21BT32A	All circuit Branches								
2	Bioinspired Engineering	21BT32B	BT								
3	Engineering Materials	21ME32	AS, CH & ME								
	*** Bridge Course: Audit course for lat	eral entry diploma st	tudents								
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													
S1. No.	Course Code	Course Title		edit	Alloc	ation	BoS	Category	CIE Duration	Max Marks CIE		SEE Duration	Max Marks SEE	
			L	Т	Р	Total			(H)	Theory	Lab	(H)	Theory	Lab
1	21MA41*	Statistics and Probability for Data Science	2	1	0	3	MA	Theory	1.5	100	****	3	100	****
2	21BT42A**	Environmental Technology	2	0	0	2	BT	Theory	1	50	****	2	50	****
3	21ME43	Theory of Machines	3	0	0	3	ME	Theory	1.5	100	50	3	100	50
4	21ME44	Fluid Mechanics	3	0	1	4	ME	Theory+Lab	1.5	100	50	3	100	50
5	21ME45	Manufacturing Technology	2	0	1	3	ME	Theory+Lab	1.5	100	50	3	100	50
6	21ME4AX#	Professional Elective – Group A - MOOC Courses	2	0	0	2	ME	MOOC	1.5	50	****	2	50	****
7	21HS46A / 21HS46V	Kannada Course: AADALITHA KANNADA (21HS38A) / VYAVAHARIKA KANNADA (21HS38V)	1	0	0	1	HSS	Theory	1	50	****	2	50	****
	21HSAE46X#	Ability Enhancement course - I	0	0	1	1	HSS	Theory	1	50	****	2	50	****
8	21DCS47***	Bridge Course: C Programming	2(A)	1	0	AUDIT	CS	Theory	1	50	****	-	****	****
9	21HSU48	Universal Human Values and Social Connect	2	0	0	2	HSS	Theory	1	50	****	2	50	****
	•	•	•			21				-			-	

* Summer Internship-II will be done after the IV Semester 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	AS, CH, ME, EC, EE, EI, TE, BT, CS, IS, CV								
	** Mandatory Courses										
Sl. No	COURSE TITLE	COURSE CODE	BRANCHES								
1	Materials for Electronics Engineering	21EC42	EC, EE, EI, TE								
2	Environmental Technology	21BT42A	AS, CH, IM, ME, BT								
3	Bio inspired Engineering	21BT42B	AI, CS, IS								
4	Civil Engineering Materials	21CV42 CV									
	*** Bridge Course: Audit course for	lateral entry diplom	a students								
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 ELECTIVES (MOOC COURSES)								
Sl. No.	D. Course Code Course Title							
1.	21ME4A1	Mechanical Measurement Systems	8 Weeks					
2.	21ME4A2	Design Practice	8 Weeks					
3.	21ME4A3	Manufacturing Guidelines for Product Design	8 Weeks					
4.	21ME4A4	Electronic Packaging and Manufacturing	8 Weeks					
5.	21ME4A5	Waste to Energy Conversion	8 Weeks					
6.	21ME4A6	Theory and Practice of Non-Destructive Testing	8 Weeks					
7.	21ME4A7	Solar Photovoltaics: Principles, Technologies & Materials	8 Weeks					
8.	21ME4A8	Surface Engineering of Nanomaterials	8 Weeks					

# Ability Enhancement Courses									
Sl. No	COURSE TITLE	COURSE CODE	BRANCHES						
1	National Service Scheme (NSS)	21HSAE39A	Common for all the						
2	National Cadet Corps (NCC)	21HSAE39B	branches.						
3	Physical Education	21HSAE39C	under any vertical is						
4	Music / Dance / Lights Camera Drama	21HSAE39D1 / 2 / 3	mandatory, more than one						
5	Art / Photography	21HSAE39E1 / 2	also permitted.						



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			Semester: III						
INTEGRAL TR	INTEGRAL TRANSFORMS, OPTIMIZATION AND NUMERICAL TECHNIQUES								
(Theory)									
(Common to BT, CH, CV, IVI, ME) Course Code 100 Morks									
Credits: L.T.P	•	3.1.0		SEE	•	100 Marks			
Total Hours	:	45 L + 15 T		SEE Duration	:	3.00 Hours			
			I	222 2 41 40 10 11					
		Ŭ	Init-I			09 Hrs			
Laplace Transform:									
Existence and unique	nes	s of Laplace Tran	sform (LT), transform	n of elementary fu	inctio	ns, region of			
convergence. Propert	ties	- Linearity, scalin	ig, s-domain shift, diff	erentiation in the	s-dom	ain, division			
by t, differentiation a	and	integration in th	e time domain. Trans	form of unit imp	oulse	function and			
periodic functions (sq	uar	e wave, saw-tooth	wave, triangular wave	e, full and half wa	ve rec	ctifier).			
		Un	nit – II			09 Hrs			
Inverse Laplace Tra	nsf	orm and solution	to differential equat	ions:					
Inverse Laplace trans	sfor	ms – properties, e	evaluation using differ	rent methods. Con	nvolu	tion theorem			
(without proof), probl	lem	s. Applications to	solve ordinary linear of	lifferential equation	ons.				
		Un	nit –III			09 Hrs			
Fourier Series:									
Periodic function, eve	en a	nd odd functions.	Dirichlet's conditions,	Euler's formulae	for F	ourier series,			
problems on time per	iod	ic signals (square	wave, half wave recti	fier, saw-tooth w	ave a	nd triangular			
wave), Fourier sine se	erie	s, Fourier cosine s	eries.						
		Un	nit —IV			09 Hrs			
Linear Programmin	g:								
Mathematical formul	atic	on of Linear Prog	ramming Problem (L	PP). Solving LPF	o usin	g Graphical,			
Simplex and Big M m	neth	nods.							
		Uı	nit —V			09 Hrs			
Numerical Methods:	:								
Numerical solutions t	ор	artial differential e	equations – Finite diffe	erence approximation	tion to	o derivatives,			
solution of Laplace e	qua	tion in two-dimer	nsion, heat and wave e	equations in one d	imens	sion (explicit			
methods).	•			•		` -			
· · · · · · · · · · · · · · · · · · ·									
Course Outcomes: A	fte	r completing the	course, the students	will be able to					
CO1: Illustrate the f	fune	damental concepts	of Laplace and invers	e Laplace transfor	ms, F	ourier 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.



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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, 44 th 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
4	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							
Quiz-II	adding up to 20 MARKS							
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 – II	test marks will be reduced to 40							
	MARKS							
EXPERIENTIAL LEARNING	40							
MATLAB	20							
Model presentation/ case study/ video	20							
preparation	20							
MAXIMUM MARKS FOR THE 100 MADYC								
THEORY	IUU MAKKS	MARKS						



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Semester III						
Course Title: Engineering Materials						
			(Theory)			
Course Code	••	21ME32		CIE	••	50 Marks
Credits: L:T:P	:	2:0:0		SEE	:	50 Marks
Total Hours	:	30		SEE Duration	:	1 ¹ / ₂ Hours

Unit - I	08 Hrs	
Mechanical Properties of Materials: Review of mechanical properties - strength,	hardness,	
toughness, impact strength, brittleness, malleability, ductility, Plastic deformation by twir	ining 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 solution	ns, 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 & C	Cast Iron-	
composition, properties, and applications.		
Phase transformation in steel: TTT diagram of plain carbon steel, annealing, nor	malizing,	
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 stainles	ss 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	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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Refe	erence Books
1	William D Callister, "Material Science and Engineering", John Wiley and Sons, 1997 10th edition,
I	ISBN ISBN-13: 9781119321590
2	Sydney H Avner, "Introduction to Physical Metallurgy" Mc Graw Hill Book Company, 1994, ISBN 0-
	07-Y85018-6
2	William F Smith, "Material Science and Engineering", Mc Graw Hill Book Company, 2008, 4th
3	edition. ISBN0-07-066717-9

ASSESSMENT AND EVALUATION PATTERN				
	CIE	SEE		
WEIGHTAGE	50%	50%		
QUIZZES	·			
Quiz-I	Each quiz is evaluated for			
Quiz-II	10 marks adding up to 20 MARKS. Reduced to 10	****		
THEORY COURSE				
(Bloom's Taxonomy Levels: Remembering Analyzing, Evaluating, and Creating)	g, Understanding, Applying,			
Test – I	Each test will be conducted for 25 Marks			
Test – II	adding up to 50 marks. Final test marks will be reduced to 20 MARKS	****		
(Maximum of 20 N	****			
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		





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Semester: III						
Course Title: SOLID MECHANICS						
(Theory and Practice)						
Course Code	:	21ME33		CIE	:	100 + 50 Marks
Credits: L:T:P	:	3:0:1		SEE	:	100 + 50 Marks
Total Hours	:	46 Hrs + 39 Hrs		SEE Duration	:	3 + 3 Hours

Part – A		
Unit – I	06 Hrs	
Stress and Strains: Stresses in Compound Bars and Composite bars, Thermal Str	esses in	
Compound and Composite structures. Introduction to stress-strain tensors, invariants, l	Principal	
stresses (3D stresses)		
Unit -II	10 Hrs	
Bending moment and shear force in beams: Introduction, Types of beams, Lo	ads and	
Reactions, Shear forces and bending moments, Rate of loading, Sign conventions, Rela	ationship	
between shear force and bending moments, Shear force and bending moment diagrams subjected		
to concentrated loads, uniform distributed load (UDL) for different types of beams. (UVL not		
included)		
Bending stress in beams: Introduction, Assumptions in simple bending theory, Derivation of		
Bernoulli's equation, Modulus of rupture, Section modulus, Flexural rigidity, Bending stress		
distribution in beams of various sections.		
	10 II.	

Umit –III	10 Hrs
Shear stresses in beams: Expression for horizontal shear stress distribution in beam, Sh	ear stress
diagram for simple rectangular and I section and T sections only. Numericals.	
Deflection of determinate Beams: Introduction, Definitions of slope, Deflection, Elas	tic curve,
Derivation of differential equation of flexure, Sign convention, Double integration method	od, Slope
and deflection using Macaulay's method for prismatic beams and overhanging beams sul	bjected to

	5
point loads, UDL and couple. Numerical problems.	
Unit –IV	10 Hrs
Torsion of shafts: Assumptions in theory of pure torsion, Torsion equations, Torsional right	gidity and
modulus of rupture, Power transmitted, Comparison of solid and hollow circula	ar shafts.
Numericals.	
Analysis of columns and struts: Introduction, Euler's theory on columns, Effective	ve length,
Slenderness ratio, short and long columns, Radius of gyration, Problems on Euler's Buch	kling load
and Rankine's theory (no derivation), Limitations of Euler's theory.	
Unit - V	10 Hrs
Thick and thin cylinders: Stresses in thin cylinders, Changes in dimensions of cylinder	diameter,

Thick and thin cylinders: Stresses in thin cylinders, Changes in dimensions of cylinder (diameter, length and volume), Thick cylinders subjected to internal and external pressures (Lame's equation), (Compound cylinders not included).



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Theories of Failures: Maximum Principal stress theory, Maximum shear stress theory; Maximum strain theory, Maximum Strain energy theory, Maximum Distortion Energy Theory, Numericals

	PART – B				
	Solid Mechanics Laboratory				
	Section – I (Destructive testing)	30 Hrs			
1.	Preparation of specimens as per ASTM Standards				
2.	Microstructural studies of MS, Al and Cu structural materials using optical microscope	e			
3.	Mechanical Characterization of MS and CI (Hardness, Tensile, Compression, Double s	shear,			
	Impact - Charpy, Izod and Drop weight, Torsion and Wear)				
4.	Study of fracture and worn-out surfaces using SEM				
	Section – II (Non-destructive testing)	09 Hrs			
1.	Magnetic Particle Test				
2.	Ultrasonic Test				
3.	Dye Penetrant Test				

Course	Course Outcomes: After completing the course, the students will be able to				
CO1:	Apply material properties and behaviour under different types of loading conditions.				
CO2:	Compute the stresses, strains, moments, deflections and derive the expressions used from				
	the fundamentals.				
CO3:	Design geometrical shape & size for various applications such as beams, shafts, pressure				
	vessels and columns using failure theories				
CO4 :	Determine mechanical properties by destructive and non-destructive methods				

Reference B	ooks
--------------------	------

1.	Strength of Materials , S Ramamrutham, R Narayanan, 2020, Dhanpatrai Publishing Company 20 th Edition ISBN 9788187433545
-	Elements of Strength of Materials , Timoshenko, 2022, Affiliated East-West Press,
2.	ISBN: 9788176710190
	Strength of Materials, S.S. Bhavikatti, 2021, S.Chand & Company, New Delhi, 5 th Edition
3	Strength of Materials, 5 5 Bhavikati, 2021, 5 Chand & Company, 1000 Denn, 5 Denni, 5
5.	ISBN: 978-9354531972,
4.	Mechanics of Materials, F.P. Beer and R.Johnson, McGraw-Hill Publishers,
	ISBN: 9780073529387 2006
	ISBN: 7760075527587; 2000
5.	https://onlinecourses.nptel.ac.in/



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University, Belagavi		
ASSESSME	NT AND EVALUATION PATTERN	
	CIE	SEE
WEIGHTAGE	50%	50%
QU	JIZZES	
Quiz-I	Each quiz is evaluated for 10 marks adding up to 20	****
Quiz-II	MARKS.	
THEORY COURSE		
(Bloom's Taxonomy Levels: Rea Analyzing, Evaluating, and Creating	membering, Understanding, Applying, ng)	
	Each test will be conducted for	

	· · · · · · · · · · · · · · · · · · ·		
(Bloom's Taxonomy Levels: Remember			
Analyzing, Evaluating, and Creating)			
	Each test will be conducted for		
Test – I	50 Marks adding up to 100	****	
	marks. Final test marks will be		
Test – II	reduced to 40 MARKS		
EXPERIENTIAL LEARNING	(Maximum of 40 Marks)	****	
Assignment Problems	05		
Determine the alternate method (IoT)		****	
to evaluate deflection, strain, and stress	25		
(Physical models)			
Coding for mechanical structural	10		
applications	10		
MAXIMUM MARKS FOR THE	100 MADES	100 ΜΑΒΚΩ	
THEORY	100 WIARKS	IUU MIAKKS	
PRACTICALS	50	50	
TOTAL MARKS FOR THE	150	150	
COURSE	130	130	

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Semester: III **Course Title: Engineering Thermodynamics** (Theory and Practice) **Course Code: CIE Marks:** 100 + 5021ME34 : : 100 + 50Credits: L:T:P **SEE Marks:** : 3:0:1 : **Hours:** : 46 hrs + 39 hrs **SEE Duration:** 3 hrs + 3 hrs:

Part – A	
Unit - I	06 Hrs
First Law of Thermodynamics: First law of Thermodynamics for closed system un	dergoing
thermodynamic cycle (Joule's experiment) and undergoing change of state, Internal energy	, PMM-I,
Enthalpy, Applications of first law of thermodynamics to steady flow processes, Steady Sta	te Steady
Flow Energy Equation and its applications, Problems.	
Unit – II	10 Hrs

Second Law of Thermodynamics: Thermal energy reservoirs, heat engines, refrigerators and heat pumps, Efficiency and COP. Statements of second law of thermodynamics, Equivalence of Kelvin-Planck and Clausius statements, PMM-II, Irreversibility and factors of irreversibility, Carnot cycle, Carnot theorems/Carnot principles, Problems.

Entropy: Clausius theorem and Inequality, Entropy-property of a system, Principle of increase of entropy, Change of entropy for different processes, Exergy and Anergy, Problems.

Unit – III	10 Hrs	
Gas Power Cycles: Derivation of Efficiency of air standard cycles - Otto and Diesel cycle	es; mean	
effective pressure, Comparison of Otto, Diesel and Dual cycles, Problems.		
Gas Turbines: Brayton cycle, Working of Closed and Open cycles, Thermal efficiency of ideal,		
actual and modified Brayton cycle, Isentropic efficiency, Regeneration, Reheating, Inter-	rcooling,	
Problems.		
Unit – IV	10 Hrs	

Reciprocating air compressors: Classification, Work input with and without clearance, Volumetric efficiency, Adiabatic, Isothermal and Mechanical efficiency, Maximum work input in multi-stage compression with intercooling, Intermediate pressure for minimum work input, Problems.

Vapor Power Cycles: Ideal and Actual Rankine cycle, Thermal efficiency of Rankine cycle, Modification of Rankine cycle – Regenerative cycle, Reheat cycle, Problems.

			UNIT-V	7				10	Hrs
Refrigeration	Cycles:	Vapour	Compression	refrigeration	system,	Effect	of	condenser	and
evaporator pressure on COP, Properties of refrigerants, Problems on VCR and air refrigeration cycles						ycles			
for industrial applications, Vapour Absorption refrigeration system.									
D 1 (•			1.5.1				•	1	DII

Psychometrics: Atmospheric air and Psychrometric properties, DBT, WBT, Partial pressures, RH and Specific humidity, Dew point temperature, degree of saturation, Adiabatic saturation temperature, Psychrometric processes, Use of Psychrometric chart, Problems.



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Engineering Thermodynamics Lab	
Section – I	09 Hrs
1. Determination of fuel and lubricating oil properties.	
(Flash point, Fire point, Viscosity, and Calorific Value)	
2. Valve timing diagram of a 4 stroke IC Engine.	
3. COP of Vapor Compression Refrigeration system	
Section – II	30 Hrs
1. Performance tests on IC Engines – Petrol and Diesel Engine	
2. Performance test on two stage reciprocating air compressor	
3. Experiments on automotive mechatronic systems	
a. Study of fuse box configuration	
b. Inspection of fuse and relay condition	
c. Study of sensors in automotive systems	
d. Use of multi-meter for automotive diagnosis	
e. Study of starter motor	
f. Analysis and diagnosis of faults on various sub-systems of passenger vehicles.	

4. Demonstration of OBD kit for a four-wheeler

Course (Dutcomes: After completing the course, the students will be able to
CO1:	Explain basic concepts and Laws of thermodynamics
CO2:	Analyse the performance of thermodynamic cycles with different processes
CO3:	Apply the knowledge to solve problems associated with thermodynamic applications
CO4:	Determination of fuel properties and fault detection in automotive systems

Referen	ice Books
1	Basic & Applied Thermodynamics, P K Nag, 2 nd Edition, 2017, McGraw Hill Education,
	ISBN 10-0070151318, 13-978-0070151314
	Thermodynamics - An Engineering Approach, Yunus A. Cengel, Michael A. Boles, Mehmet
2	Kanoglu, 9th Edition, 2019, McGraw Hill Education, ISBN 10-9353165741, 13-978-
	9353165741
	Principles of Engineering Thermodynamics, Moran, Shapiro, Boettner, Bailey, 8th Edition,
3	2015, Wiley Publications, ISBN 10-8126556722, 13-978-8126556724
4	Thermal Engineering, R.K. Rajput, 10 th Edition, 2020, Laxmi Publications, ISBN 10-
	8131808041, 13-978-8131808047
5	www.nptel.ac.in
6	www.matlab.in





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ASSESSMENT AND EVALUATION PATTERN				
	CIE	SEE		
WEIGHTAGE	50%	50%		
QUIZZES	·			
Quiz-I	Each quiz is evaluated			
	for 10 marks adding	****		
Quiz-II	up to 20 MARKS.			
THEORY COURSE				
(Bloom's Taxonomy Levels: Remembering, Und	lerstanding, Applying,			
Analyzing, Evaluating, and Creating)				
	Each test will be			
Test – I	conducted for 50			
	Marks adding up to	****		
	100 marks. Final test			
Test – II	marks will be reduced			
	to 40 MARKS			
EXPERIENTIAL LEARNING (Maxim	um of 40 Marks)	****		
Simulation of thermodynamic cycles using	10			
suitable software	10			
Development of thermodynamic systems	20	****		
(prototypes)				
Assignment problems	10			
MAXIMUM MARKS FOR THE THEORY	100 MARKS	100 MARKS		
PRACTICALS	50	50		
TOTAL MARKS FOR THE COURSE	150	150		



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Semester III **Course Title: METROLOGY AND MACHINE DRAWING** (Theory and Practice) **Course Code** 21ME35 **CIE Marks:** : 100 + 50: Credits: L: T: P 2:0:1 **SEE Marks:** 100 + 50: : **Total Duration** 36 Hrs + 39 Hrs **SEE Duration:** : : 03 + 03 Hours

PART – A	
Unit – 1	04 hrs

Concepts of Measurements: Methods of measurements, errors in measurements, accuracy and precision, repeatability, standards and their roles, wavelength standard, modern metre, Hierarchical classification of standards, Line and End measurements, calibration of end bars. Fundamentals of measurement systems, generalized measurement system, Transducers-Characteristics transfer efficiency, primary and secondary transducers, mechanical transducers.

Comparators: Mechanical- Reed, Mikrokator, sigma comparator. Electrical type- LVDT.	Optical-
Zeiss ultra-optimeter, Angular measurements- Sine bar, optical bevel protractor. Slip gaug	ges and
classification.	

Unit - 2

Limits, fits and tolerances: Definition of tolerance, Principle of interchangeability and selective assembly, Indian standards, concept of limits of size and tolerances, definition of fits, types of fits, hole basis system, shaft basis system, classification of gauges, brief concept of design of gauges (Taylor's principles), Wear allowance on gauges.

Unit - 3	08 hrs
Advances in Metrology: Precision instruments based on laser-Principles- laser interfer	ometer-
Michelson interferometer and machine tool metrology. Coordinate measuring machine (CMM)-
Constructional features – types, applications.	
Measurement of Torque, Force & Temperature: Force- Equal arm, unequal arm, lo	ad cell,

proving ring. Torque- Torsion bar dynamometer, Prony brake dynamometer. Temperaturethermocouple, RTD, bimetallic strip, pressure thermometers, optical pyrometer, Infrared thermometers.

4

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Unit - 4	Uð IIFS
Machine Drawing Concepts: Conventional Representations of Interrupted views, Ma	chining
symbols, surface roughness symbols. GD &T symbols, form tolerance- flatness, cylir	ndricity,
straightness, circularity, orientation- tolerances-perpendicularity, parallelism and angularity.	
Screw thread profiles: Terminology, Standard forms of V-threads, Standard Square	threads,
modified forms of square threads. Types of Welded Joints, Representation of welds, symbols	and its

conventions.

08 hrs

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Unit - 5

08 hrs

Digital Metrology: Metrology and Digitalization, Implementation Strategy, Data Acquisition, Setup Fundamentals for Measurement and Data Acquisition, Length Measurement in Open Loop, Thermal Measurement and Data-Acquisition Considerations, Data Transfer to Cloud, Internet of Things (IoT) Metrology, Closed-Loop Data Analysis- (In-Process Inspection), Digital Twin Metrology Inspection.

Advanced MEMS Inspection: ACES Methodology, Computational Solution, Experimental Solution Based on Optoelectronic Methodology, The OELIM System, MEMS Samples Used, Deformations of a Microgyroscope, Functional Operation of a Microaccelerometer, Thermomechanical Deformations of a Cantilever Microcontact.

Part – B	
Metrology and Machine Drawing Lab	39 Hrs
1. Assembly drawing - Universal Coupling, Screw Jack, Plummer block, Conne	ecting rod,
Crane Hook.	

2. CAM profile – Radial, offset of knife edge, roller and flat followers type CAM profiles

3. Demonstration of slip gauge, LVDT, Profile Projector, Tool Makers Microscope, Strain Gauges, Thermocouples, Surface profilometer

Course	e Outcomes: After completing the course, the students will be able to
CO1:	Understand the principle of linear and angular measurements and its use in Digital
	metrology.
CO2:	Illustrate the principle of MEMS, CMM, torque, force and temperature measuring devices.
CO3:	Apply the principle of GD&T to assemblies in machine drawing
CO4:	Create 3D model of machine components and indicate the drawing conventions.

Reference Books Engineering Metrology and Measurements, NV Raghavendra, L Krishna murthy, 2013, 1 Oxford publishers. ISBN: 978-0198085492. Geometric Dimensioning and Tolerancing for Mechanical Design, Gene Cogorno, 2006, 2 McGraw-Hill, ISBN-13:978-0071772129 Metrology and Instrumentation, Samir Mekid, Ryszard J. Pryputniewicz, 2022, Wiley-3 ASME Press Series, ISBN: 9781119721734 Optical Imaging and Metrology, John Wiley and Sons, ISBN: 9783527648474 4 Fundamentals of Machine Drawing, Sadhu Singh, 2013, Prentice Hall India Learning 5 publications. ISBN: 9788120346796 6 https://nptel.ac.in/courses/112104250 - Engineering Metrology



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ASSESSMENT AND EVALUATION PATTERN			
	CIE	SEE	
WEIGHTAGE	50%	50%	
QUIZZES			
Ouiz-I	Each quiz is evaluated		
	for 10 marks adding up	****	
Quiz-II			
THEORY COURSE			
(Bloom's Taxonomy Levels: Remembering, Understand	ing, Applying, Analyzing,		
Evaluating, and Creating)			
	Each test will be		
Test – I	conducted for 50 Marks		
	adding up to 100 marks.	3. ****	
Test – II	Final test marks will be		
	reduced to 40 MARKS		
EXPERIENTIAL LEARNING (Maximun	n of 40 Marks)	****	
IoT based measuring system	10		
Advanced machine assembly drawing 20		****	
Applying GD & T for machine components	10		
MAXIMUM MARKS FOR THE THEORY	100 MARKS	100 MARKS	
PRACTICALS	50	50	
TOTAL MARKS FOR THE COURSE	150	150	



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Semester III Course Title: Python for Mechanical Engineers (Theory) CIE **Course Code** 21ME36 **50 Marks** : : Credits: L:T:P : 2:0:0 SEE : 50 Marks **Total Hours SEE Duration** : 1¹/₂ Hours : 30

Unit - I	08 Hrs
Introduction to Python: Unique features of Python, Install Python and Environment Setup	(jupyter),
First Python Program, Python Identifiers, Keywords and Indentation Comments and	document
interlude in Python Command line arguments Getting User Input Python Data Types,	variables,
Python Core objects and Functions, Number and Mathematical functions, Control flow (if	-elif-else),
loop (foor,	
while)	

Unit - II11 HrsOperators: List, Tuple, Dictionary, Set, Ranges, Generators and Yield, Comprehensions and
Lambda Expressions, Reading and writing text files, writing Text Files, Appending to Files, Strings,
regular expressions,

Data Analysis using Pandas, NumPy, SciPy

Unit - 111

11 Hrs

Plotting and visualization: Matplot functions, Seaborn, Boken, Ploty

Solving Dynamic Equations: Curve Fitting and Regression, Understanding Iterative Solvers, Data Analysis, Programs on simple equation of Mechanics, Mechanical vibration, thermal, heat transfer and fluid mechanics

Course	e Outcomes: After completing the course, the students will be able to
CO1:	Explain basic principles of Python programming
CO2:	Implement object oriented concepts,
CO3:	Implement database and data analytics applications.
CO4:	Simulate and Visulizaiton of mechanical problems

Refe	rences:
1	Python for Mechanical and Aerospace Engineering, Alexander Kenan, 2020, ISBN-13-978-
	1736060629
2	Programming and Problem Solving with Python, Ashok Namdev Kamthane, Amit Ashok
	Kamthane, 2020, McGraw Hill, ISBN-13:978-9390113026
3	Python for Everybody: Exploring Data Using Python, Charles Severance, 2016, ISBN
	13:9781530051120
4	https://onlinecourses.nptel.ac.in/noc21_cs32/preview



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



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		Semester: III				
	Bridg	ge Course: MATHEM	ATICS			
	(Common to all branch	es)			
Course Code :	21DMA37		CIE	:	50 Ma	arks
Credits: L:T:P :	2:0:0		SEE	:	50 Ma	arks
Audit Cour	rse		SEE Duration	:	2.00 H	Iours
Unit-I 05 Hrs						
Differential Calculus:						
Partial derivatives –	Introduction,	simple problems. To	otal derivative, o	comp	osite f	functions.
Jacobians – simple pro	blems.					I
		Unit – II				05 Hrs
Vector Differentiation	n:		. .			
Introduction, simple	problems in	terms of velocity and	acceleration. C	once	pts of	gradient,
divergence – solenoid	al vector funct	tion, curl – irrotational	vector function a	nd L	aplacia	n, simple
problems.						
		Unit –III				06 Hrs
Differential Equations:						
Higher order linear d	ifferential equ	ations with constant c	oefficients, solut	ion (of hom	ogeneous
equations-Complemen	tary functions	. Non-homogeneous eq	juations –Inverse	diff	erential	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 4 th order Runge-						
Kutta methods. Nume	rical integration	on – Simpson's $1/3^{rd}$, 3	/8 th and Weddle's	s rul	es. (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, v	olume and mag	ss – simple problems.				
Course Outcomes: Af	fter completin	g the course, the stude	ents will be able t	0		
CO1: Illustrate the	fundamental	concepts of partial dif	ferentiation, dou	ble	integral	s, vector
differentiation	, solutions of	higher order linear	differential equa	tions	and r	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



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	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 $-\log \log \log 1$

Reference Books1B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2015,
ISBN: 978-81-933284-9-1.2Higher Engineering Mathematics, B.V. Ramana, 11th Edition, 2010, Tata McGraw-Hill,
ISBN: 978-0-07-063419-0.3N.P. Bali & Manish Goyal, A Text Book of Engineering Mathematics, Lakshmi
Publications, 7th Edition, 2010, ISBN: 978-81-31808320.4Advanced 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							
Course Title: DESIGN THINKING LAB							
	(Practice)						
Course Code	:	21ME39			CIE Marks	•••	50 Marks
Credits: L:T:P	:	0:0:2			SEE Marks	:	50 Marks
Total Hours	:	39 Hrs			SEE Duration	:	3 Hours

Unit	_	T		
omu				

Understanding Design thinking:

to Visvesvaraya Technological University, Belagavi

Design Thinking Methodology: The 5 Stages of the Design Thinking Process-Empathise, Define (the problem), Ideate, Prototype, and Test. Shared model in team-based design – Theory and practice in Design thinking – Explore presentation signers across globe – Multivarible product or Prototyping, Real-Time design interaction capture and analysis – Enabling efficient collaboration in digital space – Empathy for design – Collaboration in distributed Design

Unit - II

DT For strategic innovations Growth:

Story telling representation – Strategic Foresight - Change – Sense Making - Maintenance Relevance – Value redefinition - Extreme Competition – experience design - Standardization – Humanization - Creative Culture – Rapid prototyping, Strategy and Organization – Business Model design.

Unit - III	
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14 Hrs

15 Hrs

10 Hrs

Design Thinking Workshop:

The Design Challenge: Define the Design Challenge, Prototyping & Iteration- Feasibility Study, Testing- Documentation and the Pitching: 10 hours design thinking workshop from the expect and then presentation by the students on the learning from the workshop,

Course Outcomes: After completing the course, the students will be able to				
CO1:	Understanding various design process procedure			
CO2:	Explore reverse engineering to understand products			
CO3:	Develop technical drawing/prototype for design ideas			
CO4:	Create design ideas through different techniques			

References Books:

1	Kilion Langenfeld, Design Thinking for Beginners, Personal Growth Hackers, ISBN: 13-
	9783967160628
2	Andrew Pressman, Design Thinking: A Guide to Creative Problem Solving for Everyone,
	Routeldge Taylor & Francis Grovel, 1st Edition, 2018, ISBN: 13-978-1-315-56193-6
3	Walter Brenner, Falk Uebernickel, Design Thinking for Innovation Research and Practice,
	Springer, 1 st Edition, 2016, ISBN: 13-9783319260983
4	Emrah Yayici, Design Thinking Methodology Book, ArtBiz Tech Publishers, 1st Edition, 2016,
	ISBN:10-6058603757, 13-9786058603752



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ASSESSMENT AND EVALUATION PATTERN				
	CIE	SEE		
WEIGHTAGE	50%	50%		
PRACTICALS	50	50		
TOTAL MARKS FOR THE COURSE	50	50		

3 Weeks



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Semester III **Course Title: SUMMER INTERNSHIP-I** (Practice) **Course Code 21MEI310 CIE Marks** : 50 Marks 1 Credits: L:T:P 0:0:2 **SEE Marks 50 Marks** : : **Total Hours 3 Weeks SEE Duration 1 Hours** : 1

Guidelines	• • • •	eens
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.

Guidelines

- 5. Students can opt the internship with the below options:
 - A. 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.

B. At RVCE Centre of Excellence/Competence

RVCE hosts around 16 CENTER OP EIXCELLENCE 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://internshala.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



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> 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.
- 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	e 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					
	ST	'A'I	FISTICS AND PR	ROBABILITY FO	R DATA SCIENCE	C			
	(Theory)								
	(Common to ALL Programs)								
Course	e Code	:	21MA41		CIE	:	: 100 Marks		
Credit	s: L:T:P	:	2:1:0		SEE	:	100 Marks		
Total I	Hours	:	30L+15T		SEE Duration	:	3.00 Hours		
							0 6 77		
<u> </u>			U	nit-l			06 Hrs		
Statist	ics:		•				C .		
Central	moments, n	nea	n, variance, coeff	icients of skewnes	ss and kurtosis in te	erm	s of moments.		
Correla	ition analysis.	, rai	nk correlation, line	ear and multivariate	e regression analysis	– pi	roblems.		
D 1	X 7. • 1 1		Un	1t – 11			06 Hrs		
Rando Dandar	m variables		ate and continuou	a waahahilitaa waaaa	function much shilits		an aiter from ation		
Randoi	n variables-d	1SCI	ete and continuou	s, probability mass	function, probability	/ ae	ensity function,		
cumula	tive density i	unc	ction, mean and va	finance. I wo or mo	ional distribution of	- J(index or domas		
mass I	unction, join	IL I	tion	y function, condit	ional distribution a	na	independence,		
Covariance and Correlation.									
Drohol	nility Dictrib	nti					001115		
Probability Distributions:									
Weibul		15 -	Billonnai, 101880	n. Continuous uis	utoutons – Expone	ппа	ii, Normai and		
Unit –IV 06 Hrs									
Sampling and Estimation:									
Popula	tion and sam	ple	, Simple random	sampling (with re	placement and with	out	replacement).		
Sampli	ng distributio	ons	of means (σ known	own), Sampling dis	stributions of mean	(σ	unknown): t -		
distribu	ition, Sampl	ing	distributions of	variance (σ unk	xnown): Chi - squ	are	d distribution.		
Estima	tion - Maxim	um	Likelihood Estima	ation (MLE).	· ·				
			Un	it –V			06 Hrs		
Infere	ntial Statistic	s:					L		
Princip	les of Statisti	cal	Inference, Test of	f hypothesis - Null	and alternative hyp	othe	esis, Procedure		
for stat	istical testing	, T	ype I and Type II	errors, level of sig	nificance, Tests inv	olv	ing the normal		
distribu	ution, one – ta	ile	d and two – tailed	tests, P – value, Sp	ecial tests of signific	anc	e for large and		
small s	amples (F, C	hi -	- square, Z, t $-$ test	t).					
Course	Course Outcomes: After completing the course, the students will be able to								
COI:	illustrate the estimation a	tu nd	ndamental concep statistical hypothe	ts of statistics, rand	dom variables, distri	buti	ons, sampling,		



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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.

Refere	nce Books
1	Theory and Problems of Probability, Seymour Lipschutz & Marc Lars Lipson, 2 nd Edition,
	Schaum's Outline Series, McGraw – Hill,2000, ISBN: 9780071386517.
2	Applied Statistics and Probability for Engineers, Douglas C. Montgomery and George C.
Z	Runger, 7th Edition, John Wiley & Sons, 2019, ISBN: 9781119570615.
3	Probability & Statistics for Engineers & Scientists, Ronald E. Walpole & Raymond H.
	Myers, 9 th Edition, 2016, Pearson Education, ISBN-13: 9780134115856.
	The Elements of Statistical Learning - Data Mining, Inference, and Prediction, Trevor
4	Hastie Robert Tibshirani Jerome Friedman, 2 nd 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			
Quiz-II	marks adding up to 20 MARKS			
THEORY COURSE (Bloom's Taxonomy Levels: Remember Analysing, Evaluating, and Creating)	ing, Understanding, Applying,			
Test – I	Each test will be conducted for			
Test – II	50 Marks adding up to 100 marks. Final test marks will be reduced to 40 MARKS			
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)			
(Common to all branches)						
Course Code	:	21BT42A		CIE	:	50 Marks
Credits: L:T:P	:	2:0:0		SEE	:	50 Marks
Total Hours	:	26 L		SEE Duration	:	90 min

Unit I	08 Hrs	
Introduction: Climate action – Paris convention, Sustainable Developmental Goals in relation to		
environment, Components of environment, Ecosystem. Environmental education, Environment	iental	
acts & regulations, role of non-governmental organizations (NGOs), EMS: ISO 14000,		
Environmental Impact Assessment. Environmental auditing.		

Unit II09 HrsPollution 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),09 Hrs

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 Envir	onmental
Design (LEED), Hydroponics, Organic Farming, Biofuels, IC engine to E mobility transition	on and its
impacts, Carbon Credits, Carbon Foot Prints, Opportunities for Green Technology Markets	s, Carbon
Sequestration.	
Personana anonyme autom. Drocessia stochristen Materiala account automa Dialogical	

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.

Refer	rence 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





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0					
Course	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				
002.	Differentiate the various types of wastes and suggest appropriate safe teenhological				
	methods to manage the waste				
	methods to manage the waste.				
CO3	Apply different renewable energy resources for sustainable development of clean energy				
005.	Appry unrefer telewable energy resources for sustainable development of clean energy.				
CO4:	Adopt the appropriate recovering methods to recover the essential resources from the				
00.	radpr and appropriate recovering methods to recover and essential resources from and				
	wastes for reuse or recycling				
	wastes for rease of recycling.				

Experiential learning topics					
Assessment of the environment of certain big campuses/areas/industries etc, a case study					
1	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.	

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



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Semester IV						
Course Title: THEORY OF MACHINES						
	(Theory)					
Course Code	:	21ME43	(CIE	:	100 Marks
Credits: L:T:P	:	3:0:0	S	SEE	:	100 Marks
Total Hours	:	46 Hrs	S	SEE Duration	:	3 Hours

Unit - I

06 Hrs

Mechanisms:

Definition of link, pair, kinematic chain, mechanism, machine, inversion, structure, Types of motion: constrained, unconstrained and successfully constrained. Grashof's criterion, Gruebler's criterion for mobility of mechanisms, Numericals. Inversions of four bar chain, single slider crank chain and double slider crank chain. Straight line motion mechanisms - Peaucellier and Hart mechanisms. Intermittent motion mechanisms - Ratchet and pawl, Geneva wheel. Steering gear mechanism - Davis and Ackermann. Toggle mechanism, Pantograph, Hooke's joint. (No derivations)

Unit - II	10 Hrs
Velocity and Acceleration (Graphical Method):	
Relative Velocity Method: Velocity and acceleration of simple mechanisms, Coriolis com	ponent of
acceleration. Instantaneous centre Method: Centrodes - Kennedy's theorem - linear an	d angular
velocity of simple mechanisms. Klein's Construction Method - single slider crank mechanism	1.

Force Analysis:

Static Force Analysis: Static equilibrium, equilibrium of two and three force members; members with two forces and torque, free body diagram, static force analysis of four bar mechanism and slider crank mechanism without friction. Simple numerical problems. (No derivations). Dynamic Force Analysis - four bar mechanism and slider crank mechanism. Dynamically equivalent system. (No numerical problems)

Balancing of Rotating Masses:

Static and Dynamic balancing, Balancing of single rotating mass, Balancing in same plane and in different plane, Balancing of several rotating masses rotating at different planes. Numerical problems. (No derivations) (Graphical Method only)

Unit – III

Balancing of Reciprocating Masses:

Inertia effect of crank and connecting rod of single cylinder engine, partial balancing of multi-cylinder engine (Primary and Secondary forces and couples), Balancing of V engine, Direct and Reverse crank method. Numerical problems. (No derivations) (Graphical Method only)

Unit - IV	10 Hrs
Controlling Devices:	
Governors - Mechanical and Electronic: Types of governors - Centrifugal and Inert	ia, Porter

Governors – Mechanical and Electronic: Types of governors - Centrifugal and Inertia, Porter Governor and Hartnell Governor, electronic governor. Definitions - Speed of Governor, Sensitiveness, Stability, Isochronism, Hunting, Controlling force curves.

10 Hrs



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Flywheels and Gyroscope: Types of flywheels, Energy stored in flywheels, applications. Numericals, Mechanical and Electronic gyroscope, Vectorial representation of angular motion. Definitions. Gyroscopic couple. Applications – Automobile (Two and Four Wheelers), Aeroplane and Ship. (Only theory concepts)

Unit	- V	
------	-----	--

10 Hrs

Power Transmission Systems:

Epicyclic gear Trains: Numerical problems on epicyclic gear trains – Tabular column method only. Bevel gear Differential of an automobile.

Belt & Rope Drives: Types – Flat, V and Circular, Open belt and Cross belt drives. Velocity ratio, Slip and Creep. Ratio of belt tensions. Initial tension, centrifugal tension. Power transmitted by belt drive. Condition for maximum power transmission. Rope drive: Ratio of tensions, Initial tension and centrifugal tension. Power transmitted. Condition for maximum power transmission. Numerical problems on flat belt drives. (No derivations).

Course Outcomes: After completing the course, the students will be able to				
CO1:	Define basic terminologies of kinematics & Construct diagrams to estimate velocity and			
	acceleration for mechanism.			
CO2:	Apply the fundamental principles of statics and dynamics for balancing of rotating and			
	reciprocating masses			
CO3:	Illustrate the principles of governors, flywheels & gyroscope on stabilization of vehicles			
CO4:	Design basic power transmission systems such as gear trains, belt & rope drives for various			
	applications.			

References Books:							
1.	Theory of Machines, Thomas Bevan, 2009, 3 rd Edition, Pearson Publishers,						
	ISBN-9788123908748,						
2.	Theory of Machines and Mechanisms, John J. Uicker, 2017, Gordon R. Pennock & Joseph E.						
	Shigley, 5th Edition, Oxford University Press, ISBN 9780190264482						
3.	Theory of Machines Sadhu Singh, 2013, 2 nd Edition, Pearson Education Publications,						
	ISBN: 978813179989,						
4.	Theory of Machines, Rattan S.S., 2019, 5th Edition, Tata McGraw Hill Publications, ISBN:						
	9789353166281,						
5.	https://mechanicalbasics.com/theory-of-machines						



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ASSESSMENT AND EVALUATION PATTERN				
	CIE	SEE		
WEIGHTAGE	50%	50%		
QUIZZES				
Quiz-I	Each quiz is evaluated	****		
Quiz-II	to 20 MARKS.			
THEORY COURSE				
(Bloom's Taxonomy Levels: Remembering, Under				
Analyzing, Evaluating, and Creating)				
Test – I	Each test will be conducted for 50 Marks			
Test – II	adding up to 100 marks. Final test marks will be reduced to 40 MARKS	****		
EXPERIENTIAL LEARNING (Maxim	****			
Assignment on analytical method of Dynamic balancing problems.	10			
Development of controlling devices for power transmission (physical models)	20	****		
Use of ADAMS (software) for simulation of Mechanisms	10			
MAXIMUM MARKS FOR THE THEORY	100 MARKS	100 MARKS		
TOTAL MARKS FOR THE COURSE	100	100		


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Semester: IV						
Course Title: Fluid Mechanics						
	(Theory and Practice)					
Course Code:	:	21ME44		CIE Marks	:	100 + 50 Marks
Credits: L:T:P	:	3:0:1		SEE Marks	:	100 + 50 Marks
Total Duration:	:	46 Hrs + 39 Hrs		SEE Duration	:	03 + 03 Hrs

Part – A				
UNIT-I	06 Hrs			
Introduction to fluids and Fluid Statics: Important properties of fluids, Newton's Law of Viscosity,				
Pressure at a point; Pressure variation with depth; Manometer and other pressure measuring	ng devices;			
Hydrostatic forces and determination of centre of pressure on submerged plane and curve	d surfaces,			
Numericals				
UNIT-II	10 Hrs			
Buoyancy and Stability: Concept of buoyancy, Stability of floating bodies, Meta	centre and			
Metacentric height; analytical determination of meta centric height; stability of submerg	ged bodies,			
Numericals				
Fluid Kinematics: Types of fluid flows, Lagrangian and Eulerian descriptions; parameter	ers of flow			
visualization; velocity and total acceleration of a fluid particle, Stream function, Potentia	d function,			
Circulation, Vorticity and Rotationality, Numericals				
UNIT-III	10 Hrs			
Fluid Dynamics: General continuity equation in Cartesian coordinates; Euler's equation; Bernoulli's				
equation and their applications - Venturimeter, Orifice Meter, Pitot tube, Numericals				
Momentum analysis of inviscid fluid flow: Reynolds Transport theorem, forces acting on a control				
volume, linear momentum equation – Navier stokes equation, special cases, Numericals				
UNIT-IV	10 Hrs			
Viscous flow through pipes: Reynolds Number, Laminar and turbulent flows, Steady laminar flow				
through a smooth pipe - Hagen-Poiseuille equation, Major loss – Darcy Weisbach equation and Minor				
Losses, Numericals				
Turbulent flow in Pipes: Characteristics of turbulent flow, Turbulent shear stress, turbule	nt velocity			
profile, Moody charts, Numericals				
UNIT-V	10 Hrs			
Boundary Layer Theory: Flow over a flat plate: Displacement, Momentum and Energy	thickness,			
Flow separation concept, Numericals				
Dimensional and Model Analysis: Similitude; Geometric, Kinematic and	Dynamic			
similarities; Buckingham pi theorem and its application to fluid mechanics problems; Dim	ensionless			
numbers; Model studies, Numericals				





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Part – B

Fluid Mechanics Lab

39 Hrs

Calibration of Venturimeter, Orificemeter, Notches

Fluid flow in pipes – Major and Minor losses

Impact of jet on vanes

Flow Visualization experiments

Demonstration of IoT based flow measuring devices

Wind tunnel experiments

Course	Course Outcomes: After completing the course, the students will be able to				
CO1:	Explain and understand properties of fluids				
CO2:	Analyse the effect of forces for static and dynamic conditions of fluid flow				
CO3:	Apply desirable fluid parameters for real time problems				
CO4:	Adopt hydrostatic and dynamic concepts of fluids for engineering applications				

Referen	nce Books
1	A Textbook of Fluid Mechanics, R K Bansal, 8th Edition, 2020, Laxmi Publications, ISBN
	10-9788131802946, 13-978-8131802946
	Fluid Mechanics: Fundamentals and Applications, John. M. Cimbala Yunus A. Cengel, 4 th
2	Edition, 2019, McGraw-Hill Publications, ISBN 10-9353166217, 13-978-9353166212
2	Hydraulics and Fluid Mechanics, Dr. P.N. MODI, S.M. SETH, 22 nd Edition, 2019, Rajsons
3	Publications Pvt. Ltd., ISBN 10-8189401262, 13-9788189401269
4	Introduction to Fluid Mechanics and Fluid Machines, S K Som, Gautam Biswas, S
4	Chakraborty, 3rd Edition, 2017, ISBN 10-0071329196, 13-978-0071329194
5	www.nptel.ac.in
6	www.matlab.in



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ASSESSMENT AND EVALUATION PATTERN				
	CIE	SEE		
WEIGHTAGE	50%	50%		
QUIZZES	·			
Ouiz-I	Each quiz is evaluated			
	for 10 marks adding up	****		
Quiz-II	to 20 MARKS.			
THEORY COURSE				
(Bloom's Taxonomy Levels: Remembering, Und	lerstanding, Applying,			
Analyzing, Evaluating, and Creating)				
	Each test will be			
Test – I	conducted for 50 Marks			
	adding up to 100 marks.	****		
Test – II	Final test marks will be			
	reduced to 40 MARKS			
EXPERIENTIAL LEARNING (Maxim	****			
Simulation of fluid flow for different flow	10			
conditions	10	****		
Development of physical models	20			
Assignment Problems	10			
MAXIMUM MARKS FOR THE THEORY	100 MARKS	100 MARKS		
PRACTICALS	50	50		
TOTAL MARKS FOR THE COURSE	150	150		



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Semester IV **Course Title: MANUFACTURING TECHNOLOGY** (Theory and Practice) **Course Code:** 21ME45 100 + 50 marks **CIE Marks** : : Credits: L:T:P **SEE Marks** 100 + 50 marks : 2:0:1 : Hours /Week: 35 Hrs + 39 Hrs 3 + 3 Hours **SEE Duration** : :

Part – A				
Unit – 1 06 Hrs				
Casting – Patterns: Types & allowances. Moulding sand: Properties, types of moulds, Moulding				
machines, Cores: types & functions, Special Casting Processes: CO ₂ , Shell, Investment and Hot &				
cold chamber die casting, Centrifugal and Continuous casting. Gating and Riser Design: Elements of				
gating system, Types of gates and gating systems. Pouring time calculations: Top & bottom gating				
and condition to avoid aspiration effect (derivations and Numericals), Risers, Solidification Time:				
Chvorinov's rule and Caine's method (Numericals). Casting Defects: Types, causes and remedies.				
Unit - 2 08 Hrs				
Bulk deformation processes - Forging: Operations, Lubrication, Extrusion: Types & defects,				
Drawing: Wire, Rod and Tube drawing, Rolling Mills: Types & defects. Flat Rolling Terminology:				
Draft, Forward and backward slip, Roll strip contact length, Bite angle, Ragging, Neutral plane and				
Angle of nip, Numericals.				
Sheet Metal Forming: Press tool operations, Punch and die clearances, Sheet Metal Drawing:				
Drawing, cupping and deep drawing, Draw Die Design: Factors considered for designing a draw die				
& defects, Sheet Metal Dies: Progressive, Compound and Combination dies, Bending and bending				
allowance, Rubber forming, Numericals.				
Unit -3 08 Hrs				
Metal Cutting: Mechanics of chip formation, Types of chips, Orthogonal and oblique cutting,				
Merchant's thin shear plane model: Force Calculations, Shear angle, Chip thickness ratio, Velocity				
relationships, Strain rate, Work done in shear, Friction and total work done, Cutting tool geometry &				
significance of various tool angles, Cutting tool materials, Numericals.				
Tool Wear, Taylor's tool life equation, Machinability, Machinability index. Surface finish: Ideal				
surface finish in turning, Thermal aspects in metal cutting, Tool work thermocouple method for				
measuring chip-tool interface temperature, Cutting Fluids: Functions & types, Economics of				
Machining –Minimisation of the machining cost, Maximising the production rate, Numericals.				
Unit -4 06 Hrs				
Milling: Plain milling cutter nomenclature, Milling Time: Slab and face milling, Indexing: Direct,				
simple, compound, differential and angular indexing, Drilling: Twist drill geometry, Drilling time,				
Torque and thrust, Numericals				
Grinding: Types of abrasives, bonding processes, Creep feed grinding, Designation and selection of				
grinding wheel, wheel balancing, dressing and truing, Surface Finishing Processes: Lapping,				
Honing, Super finishing, Polishing and Buffing.				



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Unit -5	06 Hrs

Non-Conventional machining: Need and classification. EDM, ECM – Material removal rate (MRR) and Gap resistance, Electrochemical discharge machining (ECDM), CHM, USM, LBM, Numericals.

Welding: Emission and ionisation of arc, arc structure, characteristics (constant-current and constant voltage) and power, Modes of metal transfer; TIG, MIG welding, Submerged arc welding (SAW), Welding defects. Friction stir welding, Resistance welding: Principle and types of resistance welding.

Part – B			
Manufacturing Technology Lab			
Section – I (Machine Shop)	14 Hrs		
Lathe operations:			
1. Step, Taper Turning and Knurling			
2. External and Internal Thread Cutting			
3. Eccentric Turning			
Milling Operations:			
1. Cutting of spur gear teeth using Horizontal Milling Machine			
2. Making rectangular slot using Vertical Milling Machine			
Section – II (Foundry Practice)	12 Hrs		
1. Preparation of sand mould with and without pattern.			
2. Clay and Moisture content test on moulding sand			

- 3. Compression, Shear and Permeability test on the moulding sand specimen
- 4. Grain fineness test

Course Outcomes: After completing the course, the students will be able to				
CO1:	Understand the terminology related to primary and secondary operations.			
CO2:	Select appropriate manufacturing process for machine components			
CO3:	Apply principles of casting, forming, welding, and metal cutting for manufacturing process			
CO4 :	Develop engineering components using primary and secondary operations			

Reference Books

1	Manufacturing Technology, Vol. 1 – Foundry, Forming, and Welding, P N Rao, 5th Edition,
	2019, Mc Graw Hill Education (India) Private Limited, ISBN-13: 978-93-5316-050-0.
2	Manufacturing Technology, Vol. 2 – Metal Cutting and Machine Tools, P N Rao, 4th Edition,
2	2019, McGraw Hill Education (India) Pvt. Limited, ISBN-13: 978-93-5316-052-4.
2	Manufacturing Science, Amitabha Ghosh and Ashok Kumar Mallik, 2 nd Edition, 2010, East-
3	West Press Limited, ISBN: 978-81-7671-063-3.
4	Introduction to Micromachining, V.K. Jain, 2 nd Edition, 2006, Narosa Publishers, ISBN-13:
	978-8184873610.



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5 <u>https://nptel.ac.in/courses/112107219</u> - Fundamentals of Manufacturing Processes

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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	****	
Quiz-II	to 20 MARKS.		
THEORY COURSE			
(Bloom's Taxonomy Levels: Remembering, Unders	tanding, Applying,		
Analyzing, Evaluating, and Creating)			
	Each test will be		
Test – I	conducted for 50 Marks		
	adding up to 100 marks.	****	
Test – II	Final test marks will be		
	reduced to 40 MARKS		
EXPERIENTIAL LEARNING (Maxim	um of 40 Marks)	****	
Cost estimation of machined components	10		
Fabrication and Assembly of mechanical	30	****	
components	50		
MAXIMUM MARKS FOR THE THEORY	100 MARKS	100 MARKS	
PRACTICALS	50	50	
TOTAL MARKS FOR THE COURSE	150	150	



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Semester IV					
Course Title: MECHANICAL MEASUREMENT SYSTEMS					
(MOOC Course)					
Course Code	:	21ME4A1	CIE Marks	:	****
Credits: L:T:P	:	2:0:0	SEE Marks	:	100 Marks
Total Hours	:	30 Hrs	SEE Duration	:	3 Hours

Unit - I	10 Hrs
Introduction: Basic concepts of measurement, functional elements of instruments, classified	cation of
measuring instruments, methods of correction for interfering and modifying input	s, static
characteristics of measuring instruments, Static characteristics of measuring instruments,	loading
effect and impedance matching, statistical analysis, Chi-square test, least square method	
Unit - II	10 Hrs

Uncertainty analysis, problem solving, generalized model of a measuring system, zero and first order system, **First order system** - step response, ramp response, impulse response and frequency response, **Second order system** - step response, ramp response, impulse and frequency response, higher order systems, compensation

Transducers - flow measurement, temperature measurement, Strain gauges, pressure measurement, force and torque measurement, displacement and acceleration measurement, Sound measurement, **Thermophysical properties** of measurement, flow visualization, problem solving, Case study on air pollution sampling and measurement.

Unit - III

Course Outcomes: After completing the course, the students will be able to			
CO1:	Understand the basics of static measurement systems		
CO2:	Analyse dynamic measurement for First and Second order systems		
CO3:	Identify measurement systems for determining physical and mechanical behaviour of system		
CO4:	Visualize thermophysical properties and the problem solving of air pollution.		

Ref	References Books:				
1	Mechanical Measurements, Beckwith, Marangoni, Lienhard, Pearson Education India; 6 th Edition				
	(1 January 2013), ISBN-13: 978-9332518520				
2	Mechanical Measurements and Control, Dr. D.S. Kumar, Metropolitan Book Co. Pvt. Ltd. (1				
	January 2015), ISBN-10: 81-200-0438-8				
3	Doebelin's Measurement Systems, Ernest Doebelin, Dhanesh Manik, McGraw Hill Education; 6 th				
	Edition (1 July 2017), ISBN-13: 978-0070699687				
4	https://nptel.ac.in/courses/112107242				

10 Hrs



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Semester IV **Course Title: DESIGN PRACTICE** (MOOC Course) **** **Course Code** 21ME4A2 : **CIE Marks** : Credits: L:T:P **SEE Marks** : 2:0:0 **100 Marks** : **Total Hours SEE Duration** 30 Hrs **3 Hours** : :

Unit - I	10 Hrs	
Introduction to Design - Product design, Stanford model of Design thinking, Stages of eng	gineering	
design of products, Introduction to Concurrent engineering		
Unit - II	10 Hrs	
Concurrent engineering in Practice - Product embodiment design (robustness of design	/ FMEA	
techniques).		
House of quality - Specifications (Fits and Tolerances), Axiomatic Design		
Unit - III	10 Hrs	
Introduction to Group Technology - Creating forms and shapes, Geometric transformation a	models,	
Introduction to electronics - Material selection process in design, Applied Ergonomics - work		
systems design, Introduction to bio-mechanics)		

Course Outcomes: After completing the course, the students will be able to				
CO1:	Understand Stanford model of design thinking for solving engineering problems			
CO2:	Apply concurrent engineering practices in design			
CO3:	Analyse the quality and specification of forms and shapes using various techniques			
CO4:	Design the product using ergonomics and bio-mechanics principles in manufacturing.			

Re	ferences Books:
1	Nanua Singh, "Systems approach to computer integrated design and manufacturing", Wiley India
	Pvt. Ltd., 4435-36/7, Ansari Road, Daryaganj, New Delhi-110002
2	Karl T. Ulrich, Steven. D. Eppinger, "Product design and development", Mcgraw hill
	Publications,
3	https://nptel.ac.in/courses/112104228



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			Semester IV		
Course 7	Fitl	e: MANUFAC	FURING GUIDELINES FOR PRODUCT	DF	ESIGN
			(MOOC Course)		
Course Code	:	21ME4A3	CIE Marks	•••	****
Credits: L:T:P	:	2:0:0	SEE Marks	•••	100 Marks
Total Hours	:	30 Hrs	SEE Duration	:	3 Hours

Unit - I	10 Hrs
Product Design: Basics, Introduction of Manufacturing Processes, Manufacturing P	rocesses:
Advantages and Limitations, Process Capabilities: Basics, Engineering Materials, Prop	erties of
Materials, Selection of Materials, Applications of Engineering Materials	
Unit - II	10 Hrs
Robust Design - Design for X, Product Design for Manual Assembly, DFMA Gu	uidelines,
Ergonomics in Product Design. Selection of Processes, Process Capabilities,	
Design Guidelines for Sand Casting, Die Casting Process, Product Design Guidel	ines for
Compression Moulding and Extrusion, Extrusion and Injection Moulding, Sheet Metal	Working,
Machining, Powder Metal Processing	
Unit - III	10 Hrs
Assembly Process – Introduction to adhesives, Joining, Design Guidelines for Soldering,	

Induction Welding: Plastics, Ultrasonic Welding: Plastics, Vibration and Spin Welding: Plastics, Microwave Joining, Hole Making

Guidelines: Design for Environment, Design for Environment: Steps, Product Architecture, Rapid Prototyping, Product Design: Manufacturing Perspective.

Course Outcomes: After completing the course, the students will be able to				
CO1:	Understand advantages and limitations of various manufacturing processes.			
CO2:	Apply material selection, robust design, and process capability concepts in manufacturing			
CO3:	Explore product design guidelines for various mechanical operations			
CO4:	Design the engineering product using welding and rapid prototyping.			

References Books: 1 Product Design for Manufacture and Assembly, G. Boothroyd, P. Dewhurst, W. Knight, Marcel Dekker, University of Rhode Island Kingston, New York, USA 2 Product Design and Development, Karl T. Ulrich, Steven D. Eppinger, McGraw-Hill companies, New York, USA 3 Design for Manufacturability Handbook, James G. Bralla, McGraw-Hill companies, USA 4 Manufacturing Processes: Casting, Forming and Welding: H. S. Shan, Cambridge University Press 5 https://nptel.ac.in/courses/112107258



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		Seme	ster IV		
Course Title: ELECTRONIC PACKAGING AND MANUFACTURING (MOOC Course)					
Course Code	:	21ME4A4	CIE Marks	:	****
Credits: L:T:P	:	2:0:0	SEE Marks	:	100 Marks
Total Hours	:	30 Hrs	SEE Duration	:	3 Hours

	1	
Unit - I	10 Hrs	
Introduction - Electronic Packaging, Wafer fabrication, Levels of Packaging		
First level packaging - Package Taxonomy, Chip and chip carrier, lead frame, Interconnect	ion types	
and methods, Flip-Chip bonding, area arrays		
Second level packaging - Design and manufacture of Printed Wiring Boards, Types of circu	it boards,	
Component placement, Routing, Lamination, Solder Masks,		
Unit - II	10 Hrs	
Levels of Packaging - Third level packaging and System level integration - cables, connectors,		
chassis, display,		
Advanced Packaging - Chip Scale Packaging, Multi-chip Module, Stacked Package, S	ystem in	
package (SIP), system on chip (SOC) Specialized packages (RF, MEMS, Sensors, Harsh		
Environments, Wearable/Flexible)		
Unit - III	10 Hrs	
Mechanical Design - Vibration analysis, Theorem of Castigliano; Fatigue and creep	analysis,	
Thermal Design - Basics of heat transfer, Thermal Resistance, Thermal Interface Materi	als, Heat	
spreaders and Heat sinks, System level thermal challenges, modeling, and analysis,		

Reliability - Design for reliability, Life cycle, Failure Modes and Mechanisms, Reliability, Metrology and Analysis, Accelerated Degradation Modeling, Environmental Stress Screening.

Course	Outcomes: After completing the course, the students will be able to
CO1:	Understand the basics of electronic package manufacturing methods.
CO2:	Apply primary, secondary, and advanced packaging techniques for special electronic
	components
CO3:	Analyse mechanical and thermal design parameters in electronic packaging and
	manufacturing
CO4:	Test reliability, failure modes and mechanisms for electronic packaging durability

References Books:		
1	https://nptel.ac.in/courses/112105267	
2		



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Semester IV **Course Title: WASTE TO ENERGY CONVERSION** (MOOC Course) **** **Course Code** 21ME4A5 **CIE Marks** : 1 Credits: L:T:P **SEE Marks** : 2:0:0 **100 Marks** ÷ **Total Hours** 30 Hrs **SEE Duration 3 Hours** : :

Unit - I	10 Hrs	
Introduction - characterization of wastes, Energy production form wastes through inclusion	neration,	
energy production through gasification of wastes		
Unit - II	10 Hrs	
Energy production through pyrolysis and gasification of wastes, syngas utilization, Densification of		
solids, efficiency improvement of power plant and energy production from waste plastics,		
Energy production form wastes Plastic, gas cleanup.		
Unit - III	10 Hrs	
Energy production from organic wastes through anaerobic digestion and fermentation, introduction		
to introduction to microbial fuel cells,		

Energy production from wastes through fermentation and transesterification, Cultivation of algal biomass from wastewater and energy production from algae

Course	Course Outcomes: After completing the course, the students will be able to		
CO1:	Understand the principles of waste to energy conversion.		
CO2:	Apply various thermal processes for gas production		
CO3:	Compare different techniques for organic and inorganic waste conversion to energy		
CO4:	Development of biological methods to produce gas / energy from waste.		

Ref	References Books:					
1	Rogoff, M.J. and Screve, F., "Waste-to-Energy: Technologies and Project Implementation",					
	Elsevier Store					
2	Young G.C., "Municipal Solid Waste to Energy Conversion processes", John Wiley and Sons					
3	Harker, J.H. and Backhusrt, J.R., "Fuel and Energy", Academic Press Inc					
4	EL-Halwagi, M.M., "Biogas Technology- Transfer and Diffusion", Elsevier Applied Science					
5	Hall, D.O. and Overeed, R.P.," Biomass - Renewable Energy", John Willy and Sons					
6	Mondal, P. and Dalai, A.K. eds., 2017. Sustainable Utilization of Natural Resources. CRC Press					
7	https://nptel.ac.in/courses/103107125					



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			Semester IV		
Course Ti	itle:	THEORY AN	ID PRACTICE OF NON-DESTRUCTIVE	TF	ESTING
			(MOOC Course)		
Course Code	:	21ME4A6	CIE Marks	•••	****
Credits: L:T:P	:	2:0:0	SEE Marks	•••	100 Marks
Total Hours	:	30 Hrs	SEE Duration	:	3 Hours

Unit - I	10 Hrs
Introduction to NDT, Visual Optical methods, Dye penetrant testing, Basic principle, Typ	es of dye
and methods of application, Developer application and Inspection. Magnetic particle testin	ng, Basic
theory of magnetism, Magnetization methods, Field indicators, Particle application, Inspecti	on.
Unit – II	10 Hrs
Eddy current testing, Basic principle; Faraday's law, Inductance, Lenz's law, Self and	d Mutual
Inductance, Impedance plane, Inspection system and probes, System calibration.	
Ultrasonic testing: Basics of ultrasonic waves, Pulse and beam shapes, Ultrasonic transduc	ers. Test
method, Distance and Area calibration, Weld inspection by UT.	
Unit - III	10 Hrs
Acoustic emission testing: Basic principle, Sources of acoustic emission, Source part	rameters,
Kaiser-Felicity theory, Equipment and Data display, Source location schemes.	
Radiography: X-rays and their properties, X-ray generation, X-ray absorption and	l atomic
scattering. Image formation, Image quality, Digital Radiography, Image interpretation, I	Radiation
Shielding. Comparison and selection of NDT methods.	

Course Outcomes: After completing the course, the students will be able to				
CO1:	Understand various techniques used to predict defects in the components.			
CO2:	Apply electrical electronic principle / component in design of non-destructive test rigs			
CO3:	Analyse ultrasonic principles to determine depth and source of defects.			
CO4:	Compare electromagnetic principles in advanced non-destructive systems.			

Ref	References Books:		
1	Non-destructive Testing, Louis Cartz, ASM International		
2	Non-destructive Evaluation and Quality Control, ASM Handbook, Vol. 17		
3	https://www.nde-ed.org		
4	https://nptel.ac.in/courses/113106070		



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Semester IV Course Title: SOLAR PHOTOVOLTAICS: PRINCIPLES, TECHNOLOGIES & MATERIALS (MOOC Course)

Course Code	:	21ME4A7	CIE Marks	:	****
Credits: L:T:P	:	2:0:0	SEE Marks	:	100 Marks
Total Hours	:	30 Hrs	SEE Duration	:	3 Hours

Unit - I	10 Hrs
Introduction - Solar radiation fundamentals, Basic physics of semiconductors	
Unit - II	10 Hrs
Working Principle - Carrier transport, generation and recombination in semico	nductors,
Semiconductor junctions,	
Essential characteristics of solar photovoltaic devices	
Unit - III	10 Hrs
Generation of Solar cells - First Generation Solar Cells, Advantages and Limitations	, Second
Generation Solar Cells,	
Generation of Solar cells - Third Generation Solar Cells, Advantages and Limitations, App	plications
and future advancements	

Course	Course Outcomes: After completing the course, the students will be able to				
CO1:	Understand fundamentals of solar radiation and materials for solar cells.				
CO2:	Apply carrier transportation, generation and recombination and junction of semiconductors				
	for solar cell application				
CO3:	Investigate characteristics of solar cell performance				
CO4:	Explore various generations of solar cells in domestic and industrial applications.				

Ref	References Books:		
1	Handbook of Photovoltaic Science and Engineering. Eds. A. Luque and S. Hegedus, Wiley		
2	The Physics of Solar Cells, Jenny Nelson, Imperial College Press		
3	Thin Films Solar Cells, K.L. Chopra, McGraw Hill		
4	Physics of Solar Cells: From Basic Principles to Advanced Concepts by Peter Wurfel		
5	Photovolatics Materials by R.H. Bube		
6	https://nptel.ac.in/courses/113104084		



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Semester IV					
Course Title: SURFACE ENGINEERING OF NANOMATERIALS					
			(MOOC Course)		
Course Code	:	21ME4A8	CIE Marks	:	****
Credits: L:T:P	:	2:0:0	SEE Marks	:	100 Marks
Total Hours	:	30 Hrs	SEE Duration	:	3 Hours

Unit - I 10 Hrs					
Introduction - Tribology & its classification, Friction tribology, Wear & corrosion, Lubrication,					
Effect of tribology on surface of nanomaterials, Conventional surface engineering, Types of surface					
modifications, Physical modifications, Chemical modifications, Application.					
Unit - II 10 Hrs					
Deposition and surface modification methods - Physical vapor deposition, Chemical vapor					
deposition, Advanced surface modification practices, Advantages of deposition for surface					
modification, Synthesis, processing and characterization of nano-structured coatings, Functional					
coatings, Advanced coating practices, Characterization of nano-coatings, Applications					
Characteristics - Need for advanced methods of surface and coating testing, Size dependency in					
nanostructures of nano coatings, Size effect in electrochemical properties of nanostructured					
coatings, Size effect in mechanical properties of nanostructured coatings, Size effect in physical					
and other properties of nanostructured coatings					
Unit - III 10 Hrs					
Thin Film technology - surface engineering of nanomaterials, Sputtering techniques, Evaporation					
processes, deposition through gas phase techniques, Liquid phase techniques,					
Microencapsulation: Processes, Microencapsulation: Kinetics of release, Plating of nano					
composite coatings, Advantages of microencapsulation over other conventional methods,					
Current trends in surface modification of nanomaterials, Modified Nanomaterials: In-use for					
consumer products, Main problems in synthesis of modified nano materials					
Course Outcomes: After completing the course, the students will be able to					

	r 8
CO1:	Understand basics of surface engineering and tribological properties of nano structures.
CO2:	Explore nano powder synthesis and surface modification to improve tribological properties
CO3:	Analyse importance of surface nano coating, thin films for various applications
CO4:	Apply various methods for nano component process for developing consumer product.

R	eferences Books:
1	Handbook of thin film deposition processes and techniques Edited by Krishna Seshan, William
	Andrew Publishing Norwich, New York, USA
2	Nanomaterials and Surface Engineering, Edited by Jamal Takadoum, John Wiley & Sons, Inc.,
	USA
3	https://nptel.ac.in/courses/113107075

ಬಳಕೆ ಕನ್ನಡ - baLake Kannada (Kannada for Usage)						
ಕನ್ನಡ ಕಲಿಕೆಗಾಗಿ <u>ನಿಗದಿ</u> ಪಡಿಸಿದ ಪಠ್ಯಪುಸ್ತಕ - (Prescribed Textbook to Learn Kannada)						
ವಿಷಯ ಸಂಕೇತ (Cour Code)	rse 21KBK39/49	ి నిర అం Ev	ರಂತರ ಆಂತರಿಕ ಮೌಲ್ಯಮಾಪನದ ಂಕಗಳು (Continuous Internal valuation Marks)	50		
ಒಂದು ವಾರಕ್ಕೆ ಬೋಧನ (Teaching Hours / W (L:T:P: S)	ಗಾ ಅವಧಿ Teek 0:2:0:1	ಸಂ ಅಂ Ez	ಮಿಸ್ಟರ್ ಅಂತ್ಯದ ಪರೀಕ್ಷೆಯ ಂಕಗಳು (Semester End xamination Marks)	50		
ಒಟ್ಟು ಬೋಧನಾ ಅವರ Total Hours of Ped	ಧಿ 25 ಗಂಟೆಗಳು lagogy	201	ಟ್ಟು ಅಂಕಗಳು (Total Marks)	100		
ಕ್ರೆಡಿಚ್ಸ್ (Credits)	01	ಪ	ರೀಕ್ಷೆಯ ಅವಧಿ (Exam Hours)	01 ಗಂಚೆ		
ಬಳಕೆ ಕನ್ನಡ ಪಠ್ಯದ ಕಲಿ • To hea • To • To • To	ಕೆಯ ಉದ್ದೇಶಗಳು (Course o Create the awareness r althy life. o enable learners to Listo o speak, read and write l o train the learners for co	Learning Objectives): egarding the necessity of en and understand the K Kannada language as per prrect and polite conserv	e of learning local language for c annada language properly. r requirement. vation.	omfortable and		
ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ	ವ್ಯವಸ್ಥೆ (Teaching-Learnii	ng Process - General Inst	ructions) :			
These are sample Str 1. ಬಳಕೆ ಕನ್ನಡವನ 2. ಪ್ರಮುಖ ಅಂಶಗ	ategies, which teacher ca ನ್ನು ತರಗತಿಯಲ್ಲಿ ಶಿಕ್ಷಕರು ಬೊಳ ಳ ಚಾರ್ಟ್ ಗಳನ್ನು ತಯಾರಿಸ	n use to accelerate the attai ಧಿಸಲು ವಿಟಿಯು ಸೂಚಿಸಿರುವ ನ ಲು ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಉತ್ತೇಜಿಸ	inment of the various course outco ಪಠ್ಯಪುಸ್ತಕವನ್ನು ಉಪಯೊಗಿಸಬೇಕು. ಬವುದು ಮತ್ತು ತರಗತಿಯಲ್ಲಿ ಅವುಗಳನ್ನು	omes. ಚರ್ಚಿಸಲು		
ಅವಕಾಶ ಮಾಡಿಕೊಡುವುದು.						
3. ಪ್ರತಿ ವಿದ್ಯಾರ್ಥಿ ನ ಸಂಬಂದಪಟಂತ	ಪುಸ್ತಕವನ್ನು ತರಗತಿಯಲ್ಲಿ ಬಳಕ ತೆ ಪೂರಕ ಚಟುವಟಿಕೆಗಳಿಗೆ ತೊ	ುವಂತೆ ನೋಡಿಕೊಳ್ಳುವುದು ವ ಡಗಿಸತಕ್ತದು.	ಹಿತ್ತು ಪ್ರತಿ ಪಾಠ ಮತ್ತು ಪ್ರವಚನಗಳ ಮು	ಾಲ ಅಂಶಗಳಿಗೆ		
1						
್ಶ ಕೇಳಲು ಮತ್ತು	್ರ ಲಧ್ಯಯನದಲಿ ತೊಡಗಲು ಅಸ್	್ಶೆ ² ರ ಮಕೂಲವಾಗುತದೆ.	શું જ શ	2		
2. ಭಾಷಾಕಲಿಕೆಯ ಪ್ರಯೋಗಾಲಯದ ಮುಖಾಂತರ ಬಹುಬೇಗ ಕನ್ನಡ ಭಾಷೆಯನ್ನು ಕೆಲಿಯೆಲು ಅನುಕೊಲವಾಗುವಂತೆ ಕಾರ್ಯಚಟುವಟಿಕೆಗಳನ್ನು ಮತ್ತು ಕ್ರಿಯಾ ಯೋಜನೆಗಳನ್ನು ರೂಪಿಸುವುದು.						
Module-1						
 Introduction, Necessity of learning a local language. Methods to learn the Kannada language. Easy learning of a Kannada Language: A few tips. Hints for correct and polite conservation, Listening and Speaking Activities Key to Transcription. ajudge, ಸ್ವಾಮ್ಯ ಸೂಚಕ/ಸಂಬಂಧಿತ ಸಾರ್ವನಾಮಗಳು ಮತ್ತು ಪ್ರಶ್ನಾರ್ಥಕ ಪದಗಳು - Personal Pronouns, Possessive Forms, Interrogative words 						
ಕಲಿಕಾ ವಿಧಾನ ವಾಧ್ಯಮದ ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಖಾಂತರ ಚರ್ಚಿಸುವುದು.						

Module-2				
1. ನಾಮ	ಪದಗಳ ಸಂಬಂಧಾರ್ಥಕ ರೂಪಗಳು, ಸಂದೇಹಾಸ್ಪದ ಪ್ರಶ್ನೆಗಳು ಮತ್ತು ಸಂಬಂಧವಾಚಕ ನಾಮಪದಗಳು - Possessive forms			
of nouns, dubitive question and Relative nouns				
2. ៧ឆ, រ	ಪರಿಮಾಣ ಮತ್ತು ವರ್ಣಬಣ್ಣ ವಿಶೇಷಣಗಳು, ಸಂಖ್ಯಾವಾಚಕಗಳು Qualitative, Quantitative and Colour Adjectives,			
Num	erals			
3. Toda	ರೂಪಗಳು ಮತ್ತು ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯಗಳು – ಸಪ್ತಮಿ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯ – (ಆ, ಅದು, ಅವು, ಅಲ್ಲಿ) lictive Forms Locative Case			
ಬೋಧನೆ ಮತ್ತು	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಚ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ			
ಕಲಿಕಾ ವಿಧಾನ	ಮಾಧ್ಯಮದ ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಖಾಂತರ ಚರ್ಚಿಸುವುದು.			
Module-3				
1. జికుర్తి వి	ಭಕ್ತಿ ಪ್ರತ್ಯಯದ ಬಳಕೆ ಮತ್ತು ಸಂಖ್ಯಾವಾಚಕಗಳು – Dative Cases, and Numerals			
4. ಸಂಖ್ಯಾಗುಣ	ವಾಚಕಗಳು ಮತ್ತು ಬಹುವಚನ ನಾಮರೂಪಗಳು – Ordinal numerals and Plural markers			
5. ನ್ಯೂನ /	ನಿಷೇಧಾರ್ಥಕ ಕ್ರಿಯಾಪದಗಳು ಮತ್ತು ವರ್ಣ ಗುಣವಾಚಕಗಳು			
0	Defective / Negative Verbs and Colour Adjectives			
 ಬೋಧನೆ ಮತ್ತು	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ			
ಕಲಿಕಾ ವಿಧಾನ	ಮಾಧ್ಯಮದ ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಖಾಂತರ ಚರ್ಚಿಸುವುದು.			
Module-4				
1 ಅಪ್ಪಣೆ /	ಒಪ್ಪಿಗೆ, ನಿರ್ದೇಶನ, ಪ್ರೋತ್ಸಾಹ ಮತು ಒತ್ತಾಯ ಆರ್ಥರೂಪ ಪದಗಳು ಮತ್ತು ವಾಕ್ಯಗಳು			
Perm 2. ಸಾಮಾನ	ission, Commands, encouraging and Urging words (Imperative words and sentences) ಸ್ಯ ಸಂಭಾಷಣೆಗಳಲ್ಲಿ ದ್ವಿತೀಯ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯಗಳು ಮತ್ತು ಸಂಭವನೀಯ ಪ್ರಕಾರಗಳು			
Accus	ative Cases and Potential Forms used in General Communication			
3. "ಇರು ಮತ್ತ	ಇರಲ್ಲ" ಸಹಾಯಕ ಕ್ರಿಯಾಪದಗಳು, ಸಂಭಾವ್ಯಸೂಚಕ ಮತ್ತು ನಿಷೇಧಾರ್ಥಕ ಕ್ರಿಯಾ ಪದಗಳು - Helping Verbs			
"iru and i ெ கீலுிர் ம	ralla", Corresponding Future and Negation Verbs			
ರೆ. ಹಾಂತರ (ನ ನಿಷೇಧಾ)	ರ್ಶಕ ಪದಗಳ ಬಳಕೆ- Comparitive, Relationship, Identification and Negation Words			
ಬೋಧನೆ ಮತ್ತು	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಚ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ			
ಕಲಿಕಾ ವಿಧಾನ	ವಾಧ್ಯಮದ ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಖಾಂತರ ಚರ್ಚಿಸುವುದು.			
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 - Format	ion of Past, Future and Present Tense Sentences with Verb Forms			
3. Kannada Vocabulary List : ಸಂಭಾಷಣೆಯಲ್ಲಿ ದಿನೋಪಯೋಗಿ ಕನ್ನಡ ಪದಗಳು - Kannada Words in Conversation				
ಬೋಧನೆ ಮತ್ತು	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ			
ಕಲಿಕಾ ವಿಧಾನ	ಮಾಧ್ಯಮದ ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಖಾಂತರ ಚರ್ಚಿಸುವುದು.			

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.
 - 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:

2.

Three Tests each of **20 Marks (duration 01 hour**)

- a. First test at the end of 5^{th} week of the semester
- b. Second test at the end of the 10^{th} week of the semester
- c. Third test at the end of the 15^{th} 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.

ಸಮಿಸ್ಟರ್ 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.

BE - III/IV Semester - Common to all

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ							
ವಿಷಯ ಸಂಕೇತ (Course Code)	21KSK39/49	ನಿರಂತರ ಆಂತರಿಕ ಮೌಲ್ಯಮಾಪನದ					
		ಅಂಕಗಳು	50				
ಒಂದು ವಾರಕ್ಕೆ ಬೋಧನಾ ಅವಧಿ		ಸೆಮಿಸ್ಟರ್ ಅಂತ್ಯದ ಪರೀಕ್ಷೆಯ	50				
(Teaching Hours / Week (L:T:P: S)	0:2:0:1	ಅಂಕಗಳು	50				
ಒಟ್ಟು ಬೋಧನಾ ಅವಧಿ	25 ಗಂಟೆಗಳು	2,63) ಅಂಕಗಳು	100				
Total Hours of Pedagogy			100				
ಕ್ರೆಡಿಟ್ಸ್ (Credits)	01	ಪರೀಕ್ಷೆಯ ಅವಧಿ	01 ಗಂಟೆ				
ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಪಠ್ಯದ ಕಲಿಕೆಯ ಆ	ಉದ್ದೇಶಗಳು:						
1. ವೃತ್ತಿಪರ ಪದವಿ ವಿದ್ಯಾರ್ಥಿಗ ಮಾಡಿಕೊಡುವುದು	ಳಾಗಿರುವುದರಿಂದ ಕನ್ನಡ ಭಾಷೆ, ಸ	ಾಹಿತ್ಯ ಮತ್ತು ಕನ್ನಡದ ಸಂಸ್ಕೃತಿಯ	ು ಪರಿಚಯ				
ಂ ಕನನ ಪ್ರಾಸಿತನ ಸರಾನ ಇ	ನವನ ಅವು ೩ ಸಂಸಂ ನುತು ಅವ		ದಿನನ್ನು ೩				
2. ರನ್ನಡ ನಾಹತ್ಯದ ಪ್ರಧಾನ ಧ	പ്പ പ്രാപ്പാംഗ് നിന്നു നിന്നും നനും നിന്നും നിന്ന		ക്ഷാവന്ന				
ಎದ್ಯಾರ್ಥಗಳಲ್ಲಿ ಸಾಹತ್ಯ ಮತ್ತು	ಸಂಸ್ಕೃತಿಯ ಬಗ್ಗೆ ಅಂದು ಹಾಗೂ ಆಸಕ್ತ	ಯನ್ನು ಮೂಡನುವುದು.					
3. ತಾಂತ್ರಕ ವ್ಯಕ್ತಿಗಳ ಪರಚಯವನ	ನ್ನು ಹಾಗೂ ಅವರುಗಳ ಸಾಧಸಿದ ಎಷಯ	ಗಳನ್ನು ಪರಚಯಸುವುದು.					
4. ಕನ್ನಡ ಶಬ್ದಸಂಪತ್ತಿನ ಪರಿಚಯ	ಮತ್ತು ಕನ್ನಡ ಭಾಷೆಯ ಬಳಕೆ ಹಾಗೂ ಕನ	ನ್ನಡದಲ್ಲಿ ಪತ್ರ ವ್ಯವಹಾರವನ್ನು ತಿಳಿಸಿಕೆ	ಾಡುವುದು.				
ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವ್ಯವಸ್ಥೆ (Teaching	-Learning Process - General Inst	ructions) :					
These are sample Strategies, which 1. ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡವನ್ನು ಬೋಟ	These are sample Strategies, which teacher can use to accelerate the attainment of the course outcomes. 1. ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡವನ್ನು ಬೋಧಿಸಲು ತರಗತಿಯಲ್ಲಿ ಶಿಕ್ಷಕರು ಪ್ರಸುತ ಪುಸಕ ಆಧಾರಿಸಿ ಬಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನವನ್ನು						
ಅನುಸರಿಸುವುದು. ಪ್ರಮುಖ ಅಂಬ	ಅನುಸರಿಸುವುದು. ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಚ್ ಗಳನ್ನು ತಯಾರಿಸಲು ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಪ್ರೇರೇಪಿಸುವುದು ಮತು ತರಗತಿಯಲಿ						
) ಅವುಗಳನ್ನು ಚರ್ಚಿಸಲು ಅವಕಾಶ ಪ	ಯಾಡಿಕೊಡುವುದು.						
ಮತ್ತು ಕಥೆ ಕಾವ್ಯಗಳ ಮೂಲ ಅಂಬ	್ ್ ್ ್ ್ ್ ್ ್ ್ ್ ್ ್ ್ ್ ್ ್ ್ ್ ್						
ವಿಮರ್ಶಾತ್ಮಕ ವಿಷಯಗಳನ್ನು ಟಿಪಿ	ಟಿ, ಡಿಜಿಟಲ್ ಮಾಧ್ಯಮಗಳ ಮುಖಾಂತರ ವಿ	ಶ್ಲೇಷಿಸುವುದು.					
3. ನವೀನ ಮಾದರಿಯ ಸಾಹಿತ್ಯ ಬೋಧನೆಗೆ ಸಂಬಂಧಪಟ್ಟ ವಿಧಾನಗಳನು ಶಿಕ್ಷಕರು ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಅನುಕೂಲವಾಗುವ ರೀತಿಯಲಿ							
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 ಪ್ರೋ. ವಿ. ಕೇಶವಮೂರ್ತಿ							
ಬೋಧನೆ ಮತ್ತು ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಚ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ							
ಕಲಿಕಾ ವಿಧಾನ ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವ	ಕಾ ವಿಧಾನ ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಖಾಂತರ ಚರ್ಚಿಸುವುದು.						

ಘಟಕ -2 ಆಧುನಿಕ ಪೂರ್ವದ ಕಾವ್ಯ ಭಾಗ

- 1. ವಚನಗಳು : ಬಸವಣ್ಣ, ಅಕ್ಕಮಹಾದೇವಿ, ಅಲ್ಲಮಪ್ರಭು, ಆಯ್ದಕ್ಕೆ ಮಾರಯ್ಯ, ಜೇಡರದಾಸಿಮಯ್ಯ, ಆಯ್ದಕ್ಕೆ ಲಕ್ಕಮ್ಮ,
- 2. ಕೀರ್ತನೆಗಳು : ಅದರಿಂದೇನು ಫಲ ಇದರಿಂದೇನು ಫಲ ಪುರಂದರದಾಸರು
 - ತಲ್ಲಣಿಸದಿರು ಕಂಡ್ಯ ತಾಳು ಮನವೇ ಕನಕದಾಸರು
- 3. ತತ್ವಪದಗಳು : ಸಾವಿರ ಕೊಡಗಳ ಸುಟ್ಟು ಶಿಶುನಾಳ ಶರೀಫ

ಬೋಧನೆ ಮತ್ತು ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ

ಕಲಿಕಾ ವಿಧಾನ 🔰 ಮಾಧ್ಯಮದ ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಖಾಂತರ ಚರ್ಚಿಸುವುದು.

ಘಟಕ -3 ಆಧುನಿಕ ಕಾವ್ಯಭಾಗ

- 1. ಡಿವಿಜಿ ರವರ ಮಂಕುತಿಮ್ಮನ ಕಗ್ಗದಿಂದ ಅಯ್ದ ಕೆಲವು ಭಾಗಗಳು
- 2. ಕುರುಡು ಕಾಂಚಾಣ : ದಾ.ರಾ. ಬೇಂದ್ರೆ
- 3. ಹೊಸಬಾಳಿನ ಗೀತೆ : ಕುವೆಂಪು

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

ಘಟಕ -4 ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯ

- 1. ಡಾ. ಸರ್. ಎಂ. ವಿಶೈೇಶ್ವರಯ್ಯ : ವ್ಯಕ್ತಿ ಮತ್ತು ಐತಿಹ್ಯ ಎ ಎನ್ ಮೂರ್ತಿರಾವ್
- 2. ಕರಕುಶಲ ಕಲೆಗಳು ಮತ್ತು ಪರಂಪರೆಯ ವಿಜ್ಞಾನ : ಕರೀಗೌಡ ಬೀಚನಹಳ್ಳಿ

ಬೋಧನೆ ಮತ್ತು 🛛 ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಚ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ

ಕಲಿಕಾ ವಿಧಾನ 🛛 ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಖಾಂತರ ಚರ್ಚಿಸುವುದು.

ಘಟಕ -5 ಕಥೆ ಮತ್ತು ಪ್ರವಾಸ ಕಥನ

- 1. ಯುಗಾದಿ : ವಸುಧೇಂದ್ರ
- 2. ಮೆಗಾನೆ ಎಂಬ ಗಿರಿಜನ ಪರ್ವತ : ಹಿ.ಚಿ. ಬೋರಲಿಂಗಯ್ಯ

ಬೋದನೆ ಮತು	ಪುಸಕ ಆದಾರಿತ ಬಾಕ್	ಬೋರ್ಡ್ ವಿದಾನ.	ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ (ಗಳನು ಬಳಸುವುದು.	ಪಿಪಿಟಿ ಮತು ದ್ರಶ.

ಕಲಿಕಾ ವಿಧಾನ 🛛 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 5^{th} week of the semester
- b. Second test at the end of the $10^{th}\,week$ of the semester
- c. Third test at the end of the 15^{th} 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.ಚೆ.ಬೋರಲಿಂಗಯ್ಯ ಮತ್ತು ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ,

ಪ್ರಸಾರಾಂಗ, ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಬೆಳಗಾವಿ.



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Semester: IV						
Course Title: National Service Scheme						
	(Practical)					
Course Code	:	21HSAE46A	CIE	:	50 Marks	
Credits: L:T:P	:	0:0:1	SEE	:	50 Marks	
Total Hours	:	L + T + 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.
- Students should be ready to sacrifice some of the timely will and wishes to achieve serviceoriented 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 ONE NSS-CAMP



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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. EXPERIENTIAL LEARNING Presentation 2 (phase 2)	10 10	****				
Content development, strategies for implementationmethodologies.						
Case Study-based Teaching-Learning	10	Implementation				
Sector wise study & consolidation	10	strategies of the				
Video based seminar (4-5 minutes per student)	10	project with report				
TOTAL MARKS FOR THE COURSE	50 MARKS	50 MARKS				



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Semester: IV							
Course Title: National Cadet Corps							
(Practical)							
Course Code	:	21HSAE46B		CIE	:	50 Marks	
Credits: L: T:P	:	0:0:1		SEE	:	50 Marks	
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, V	ishram,
Aram Se, Murdna, Kadvar Sizing, Teen Line Banana, Khuli Line, Nikat Line, Khade Khade	salute
Karna	

Unit 23 HrsWeapon Training (WT): Introduction & Characteristics of 7.62 Self Loading rifle, Identification of
rifle parts

Unit 3
Adventure activities: Trekking and obstacle course

Unit 4

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	Course Outcomes: Cadets will be able to: -						
CO1	Understand that drill as the foundation for discipline and to command a group for common						
	goal.						
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.						

Refer	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				

3 Hrs

2 Hrs



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



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

Introduction of Physical Education and Sports							
General & Spe	General & Specific warm up exercises						
Conditioning e	xercises						
Any 2 Major G	ames						
Intramural Con	npetitions						
	Choose any one ac	cording to seria	al no				
1. Kho-Kho	Giving Kho, Single chain, Pole	6. Kabaddi	Hand touch, Chain hold, Ankle				
	dive, Pole turning, 3-6 Up hold, Thigh hold, Getting bor						
2. Throwball	Service, Receive, Spin pass,	7. Volleyball	Attack, Block, Service, Upper				
	Simple pass, Jump throw hand pass, Lower hand pass						
3. Netball	Step with ball, Shooting,	8. Handball	Step with ball, Shooting,				
	Passing, Blocking Passing, Blocking, Dribbling						
4. Softball	Catching, Pitching, Slugging,	9. Football	Dribbling, Chest Drop, Ball				
	Base Running, Stealing Control, Thigh Drop, Shooting						
5. Ball	5. Ball Service, Fore hand receive, Back 10. Table Service, Fore hand receive, Back						
badminton	Dadmintonhand receive, Spin smash, RallyTennishand 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						
005	Education and Sports events at schools and community level						

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

Refe	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			



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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

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ASSESSMENT AL	ND EVALUATION PATTERN IE-50 MARKS	
Activity book- 10 marks		
QUIZZES		
Quiz-I	Each quiz is evaluated for 10	
Quiz-II marksadding up to 20 MARKS.		
Test – I	Demonstration of skills is evaluated	
Test – II for10 marks adding up to 20 MARKS.		
ASSESSMENT A	ND EVALUATION PATTERN	
S	EE-50 MARKS	
Practical	30 marks	
Viva voce	20 marks	
Total	50 marks	

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

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Semester: IV **Course Title: Music** (Practical) **Course Code 21HSAE46D** CIE 50 Marks : : Credits: L:T:P SEE **50 Marks** 0:0:1 : **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.

Content

3. Students should have participated in musical events and have basic knowledge on how to present their music.

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 by the 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		

13 Hours



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

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13 Hours



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Semester: IV						
		0	Course Title: Dance			
	(Practical)					
Course Code	:	21HSAE46D		CIE	:	50 Marks
Credits: L:T:P		0:0:1		SEE	:	50 Marks
Total Hours	:	13P		SEE Duration	:	2 Hours
I otal 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.
- 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.

Content

- 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			

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

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Oniversity, Delagavi						
		:	Semester: III			
	Course Title: Lights Camera Drama					
			(Practical)			
Course Code	:	21HSAE46D		CIE	:	50 Marks
Credits: L:T:P	:	0:0:1		SEE	:	50 Marks
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 Hou

1. Break the ICE

- 2. Introduction to freedom Talk to each and every single person for a period of 5 complete minutes. This is aimed at 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 artof 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

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.		

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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 wonoutside 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 20mins 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			
Interpretation of Script	10	strategies of the			
Performance based seminar (20 mins long)	10	report			
TOTAL MARKS FOR THE COURSE	50 MARKS	50 MARKS			

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Semester: IV						
Course Title: Art						
(Practical)						
Course Code	:	21HSAE46E	Cl	E	:	50 Marks
Credits: L:T:P		0:0:1	SE	EE	:	50 Marks
Total Hours	:	13P	SE	EE 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 using any 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	10	****	
Presentation 2 (phase 2)			
Case Study-based Teaching-Learning	10	Implementation	
Sector wise study & consolidation	10	strategies of the project with	
Video based seminar (4-5 minutes per student)	10	report	
TOTAL MARKS FOR THE COURSE	50 MARKS	50 MARKS	

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Semester: IV **Course Title: Photography** (Practical) **Course Code 21HSAE46E** CIE 50 Marks : : Credits: L:T:P SEE **50 Marks** 0:0:1 : **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 CIE evaluation.

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		

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

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


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Semester: IV **Course Title: Bridge Course – C Programming** (Theory) (Common to all Branches) 21DCS37 **Course Code** CIE 50 Marks : : Credits: L:T:P 2:0:0 SEE : : ---**Total Hours** : **30L SEE Duration** : 2 Hours

Unit-I

08 Hrs

Introduction-Perspectives

with examples.

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 – II10 HrsOperators: 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 Multidimension	nal Array)

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.





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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.	
•	·	

Refe	Reference Books	
1.	Programming in C, P. Dey, M. Ghosh, 2011, 2 nd 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, 2 nd Edition,	
	Prentice Hall, ISBN (13): 9780131103627.	
4	Turbo C: The Complete Reference, H. Schildt, 2000, 4th Edition, Mcgraw Hill Education,	
4.	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.





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ASSESSMENT AND EVALUATION PATTERN		
	CIE	SEE
WEIGHTAGE	100%	
QUIZZES		
Quiz-I	Each quiz is evaluated for 10	
Quiz-II	marks adding up to 10 MARKS.	
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	
Test – II	marks. Final test marks will	
	be reduced to 30 MARKS	
EXPERIENTIAL LEARNING	10	
TOTAL MARKS FOR THE COURSE	50	

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		Sem	ester: IV		
Universal Human Values 2 (Theory & Practical)					
Course Code	:	21HSU48	CIE	:	50 Marks
Credits: L:T:P	:	2:0:0	SEE	:	50 Marks
Total Hours	:	28 Hrs	SEE Duration	:	2.00 Hours

Unit-I05 HrsCourse 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

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 –III06 HrsUnderstanding 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

06 Hrs

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Unit –IV	05 Hrs
Understanding Harmony in the Nature and Existence - Whole existence as C	Coexistence:
Understanding the harmony in the Nature, Interconnectedness and mutual fulfilment amo	ong 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

Ref	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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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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Curriculum Design Process

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Final CO Attainment Process



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74

PROGRAM OUTCOMES (POs)

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization for the solution of complex engineering problems.

2. **Problem analysis:** Identify, formulate, research literature, and analyze 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 design system 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 solutions in 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 teamwork:** 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.