

## Undergraduate Programs



**Bachelor of Engineering (B.E) in** 

## Electronics & Instrumentation Engineering

Scheme and Syllabus of III & IV Semester (2022 Scheme)

B.E. Programs: AS, BT, CH, CS, CS - AI, CS - CD, CS - CY, CV, EC, EE, EI, ET, IM, IS, ME. M. Tech (13) MCA, M.Sc. (Engg.) Ph.D. Programs: All Departments are recognized as Research Centres by VTU Except AI & AS

2024

		CURR	ICULUM	STRUC	TURE
<b>999</b> <sup>TH</sup> NIRF RANKING IN ENGINEERING (2024)	1501+ TMES HIGHER EDUCATION WORLD UNIVERSITY BAINKINGS-2025 (ASIA) 501-600	61 CREE PROFESSIO CORES (PC)	NAL		3 CREDITS
	BEST PRIVATE ENGINEERING UNIVERSITY (SOUTH) BY ZEE DIGITAL	22 ENGINEERING SCIENCE		redits f work / Hip	12 OTHER ELECTIVES
1001+ SUBJECT RANKING (ENGINEERING)	801+ SUBJECT RANKING (COMPUTER SCIENCE)	12 PROFESSIONAL ELECTIVES	12 HUMANITIE SOCIAL SC	S &.	160
<b>IIRF 2023</b> ENGINEERING RANKING INDIA NATIONAL RANK-10 STATE RANK - 2 ZONE RANK - 5	QS-IGUAGE DIAMOND UNIVERSITY RATING (2021-2024)	*ABILITY ENHANCEN UNIVERSAL HUMAN INDIAN KNOWLEDG	MENT COURSE	S (AEC), ),	CREDITS TOTAL
17 Centers of Excellence	Centers of Competence	MOUS: 90 INSDUSTF INSTITUTI	RIES / AG		IIC & ABROAD
212 Publications On Web Of Science	669 Publications Scopus (2023 - 24)				
1093 Citations	70 Patents Filed	EXECU RS.40 ( SPONS RESEAR	CRORI ORED RCH P	ES W ROJ	ORTH ECTS &
Skill Based Laboratories Across Four Semesters	Patents Granted 6 1 Published Patents	CONSU SINCE :			/ORKS



Mysore Road, RV Vidyaniketan Post, Bengaluru - 560059, Karnataka, India

# **ELECTRONICS & INSTRUMENTATION ENGINEERING**

# **DEPARTMENT VISION**

Achieving academic excellence in Instrumentation Technology bv adopting interdisciplinary research with a focus on sustainable and inclusive technologies

## **DEPARTMENT MISSION**

- 1. To create an environment for students to excel in domain areas and get motivated to involve in interdisciplinary research by utilizing state of the art infrastructure.
- 2. To impart technical knowledge, encourage experiential learning and develop future professional leaders.
- 3. To establish industry-academia networking and develop industry-ready students and future entrepreneurs, to meet societal & industrial challenges.
- 4. To motivate lifelong learning and research in sustainable technologies to find improved solutions for the betterment of society.



# **PROGRAM EDUCATIONAL OBJECTIVES**

- **PEO1:** Apply Instrumentation, Electronics, Controls and Automation concepts to develop technical solutions for industrial problems.
- **PEO2:** Exhibit competency in adapting to various industrial challenges and work in inter-disciplinary projects with team spirit and professional ethics for achieving Organizational goals.
- **PEO3:** Pursue higher education in technology or management and achieve professional excellence by imbibing leadership qualities and communication skills.
- **PEO4:** Become entrepreneurs with a focus on sustainable technologies and develop innovative solutions to meet industrial and societal needs.



# **PROGRAM SPECIFIC OUTCOMES**

- **PSO1:** Design, analyze and practice the instrumentation, controls and automation concepts and techniques required for industrial and/or research pursuits resulting in product development, publications or patents.
- **PSO2:** Demonstrate the knowledge of basic science, mathematics, electronic system design and programming for real-time applications, towards developing industrial solutions and become technology leaders of future.

## LEAD SOCIETY

International Society of Automation (ISA)



#### RV College of Engineering<sup>®</sup> Mysore Road, RV Vidyaniketan Post, Bengaluru - 560059, Karnataka, India

# 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.	РҮ	Physics
9.	СҮ	Chemistry
10.	MA	Mathematics
11.	AS	Aerospace Engineering
12.	AI & ML	Artificial Intelligence & Machine Learning
13.	BT	Biotechnology
14.	СН	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



#### **INDEX**

		III Semester	
Sl. No.	Course Code	Course Title	Page No.
1.	MA231TA	Linear Algebra, Fourier Transforms and Statistics	1
2.	CV232TA/ ME232TB/ BT232TC	Environment & Sustainability/ Material Science for Engineers/ Bio Safety Standards & Ethics	3
3.	EI233AI	Linear Integrated Circuits and Applications	9
4.	EC234AI	Analysis and Design of Digital Circuits withHDL	12
5.	EI235AT	Control Engineering	15
6.	HS237LX	Ability Enhancement Course	17
7.	CS139AT	Bridge Course: C Programming	33

		IV Semester	
Sl.No.	Course Code	Course Title	Page No.
1	MA241TA	Probability Theory and Linear Programming	36
2	CV242TA/ ME242TB/ BT242TC	Environment & Sustainability/ Material Science for Engineers / Bio Safety Standards & Ethics	38
3	EI243AI	Microcontroller & Programming	44
4	EC244AI	Signals & Systems	47
5	EI245AT	Sensors And Actuators	50
6	XX246XT	Professional Elective Courses-Group A	NPTEL
7	EI247DL	Design Thinking Lab	52
8	HS248AT	Universal Human Values	54
9	MAT149AT	Bridge Course: Mathematics	56



## **Bachelor of Engineering in**

## **ELECTRONICS AND INSTRUMENTATION ENGINEERING**

				l	II SE	MESTER							
SI. No.	Course Code	Course Title	C	redit	Allo	cation	BoS	Category	Max M		SEE	Max M SE	
			L	Т	Р	Total			Theory	Lab	Duration	Theory	Lab
1	MA231TA	Linear Algebra, Fourier Transforms and Statistics	3	1	0	4	MAT	Theory	100	****	3	100	****
2	CV232TA/ ME232TB/ BT232TC	Environment & Sustainability/ Material Science for Engineers/ Bio Safety Standards and Ethics	3	0	0	3	CV/ ME/ BT	Theory	100	****	3	100	***
3	EI233AI	Linear Integrated Circuits and Applications (Common to EI, ET)	3	0	1	4	EI	Theory & Lab	100	50	3	100	50
4	EC234AI	Analysis and Design of Digital Circuits with HDL (Common to EC, EI, ET, EE)	3	0	1	4	EC	Theory & Lab	100	50	3	100	50
5	EI235AT	Control Engineering	3	1	0	4	EI	Theory	100	****	3	100	****
6	HS237LX	Ability Enhancement Courses- Group C	0	0	2	2	HS	Lab	****	50	2	****	50
7	CS139AT	Bridge Course: C Programming	2	0	0	AUDIT	CS	AUDIT Course	50	***	***	***	***
		Total				21							



S1. No.	BoS	Course Code	Course Title	Common to
	MAT	MA231TA	Linear algebra, fourier transforms and statistics	EC, EE, EI, ET
	MAT	MA231TB	Statistics, laplace transform and numerical methods	AS, BT, CH, IM, ME
1	MAT	MA231TC	Linear algebra and probability theory	CD, CS, CY, IS
	MAT	MA231TD	Applied mathematics for civil engineering	CV
	MAT	MA231TE	Mathematics for artificial intelligence & machine learning	AI & ML

(St	udent		Group A: Basket Courses any ONE COURSE out of THREE CO & SE out of remaining courses in EV		DD Sem
Sl. No.	BoS	Course Code	Course Title	Category	Credits
	CV	CV232TA	Environment & Sustainability	Theory	3
2	ME	ME232TB	Material Science for Engineers	Theory	3
	BT	BT232TC	Bio Safety Standards and Ethics	Theory	3

		G	roup C: Ability Enhancement Courses		
Sl. No.	BoS	Course Code	Course Title	Category	Credits
	HS	HS237LA	National Service Scheme	LAB	2
	HS	HS237LB	National Cadet Corps	LAB	2
	HS	HS237LC	Physical Education: Sports & Athletics	LAB	2
6	HS	HS237LD	Music	LAB	2
0	HS	HS237LE	Dance	LAB	2
	HS	HS237LF	Theater (Light Camera & Action)	LAB	2
	HS	HS237LG	Artwork & Painting	LAB	2
	HS	HS237LH	Photography & Film Making	LAB	2



### **Bachelor of Engineering in**

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				]	V SE	MESTER							
SI. No.	Course Code	Course Title	C	redit	Allo	cation	BoS	Category	Max M		SEE	Max N SE	
			L	Т	Р	Total			Theory	Lab	Duration	Theory	Lab
1	MA241TA	Probability Theory and Linear Programming	3	0	0	3	MAT	Theory	100	****	3	100	****
2	ME242TB/ BT242TC	Environment & Sustainability/ Material Science for Engineers/ Bio Safety Standards and Ethics	3	0	0	3	CV/ ME/ BT	Theory	100	****	3	100	****
3	EI243AI	Microcontroller & Programming (Common to EI, EC, EE, ET)	3	0	1	4	EI	Theory & Lab	100	50	3	100	50
4	EC244AI	Signals & Systems (Common to EC, EI)	3	0	1	4	EC	Theory & Lab	100	50	3	100	50
5	EI245AT	Sensors and Actuators	3	0	0	3	EI	Theory	100	****	3	100	****
6		Professional Elective Courses – Group B	2	0	0	2	EI	NPTEL	50	****	3	50	****
7	EI247DL	Design Thinking Lab	0	0	2	2	EI	Lab	****	50	2	****	50
8	HS248AT	Universal Human Values	2	0	0	2	HS	Theory	50	****	2	50	****
9	MAT149AT	Bridge Course: Mathematics	2	0	0	AUDIT	MAT	AUDIT Course	50	***	***	***	***
		Total				23							

RV College of Engineering®

Mysore Road, RV Vidyaniketan Post, Bengaluru - 560059, Karnataka, India



#### Group A: Basket Courses (Students can select any ONE COURSE out of THREE COURSES in ODD Sem & ONE COURSE out of remaining courses in EVEN Sem)

Sl. No.	BoS	Course Code	Course Title	Category	Credits
	CV	CV242TA	Environment & Sustainability	Theory	3
2	ME	ME242TB	Material Science for Engineers	Theory	3
	BT	BT242TC	Bio Safety Standards and Ethics	Theory	3

		Р	rofessional Elective Courses-Grou	p B	
SI. No.	BoS	Course Code	Course Title	Category	Credits
	IM	IM246TA	Data Science for Engineers (Common to EI, <b>IM</b> )	NPTEL	2
	EE	EE246TB	Programming, Data structures and algorithms using Python (Common to EI, EC, <b>EE</b> , ET)	NPTEL	2
6	EI	EI246TC	Introduction to Machine Learning (Common to <b>EI</b> , EC, IM)	NPTEL	2
	EI	EI246TD	Hardware modelling using Verilog	NPTEL	2
	EI	EI246TE	Power Plant Engineering	NPTEL	2



			Semester: III			
	LINEAR A	LGEBRA, FOU	RIER TRANSFORMS	AND STATISTI	CS	
		Category: PRO	FESSIONAL CORE C	OURSE		
		(Comm	on to EC, EE, EI, ET)			
			(Theory)			
<b>Course Coo</b>	de :	MA231TA	(	CIE	: 10	00 Marks
Credits: L:	<b>T:P</b> :	3:1:0	S	SEE	: 10	00 Marks
Total Hour	s :	45L+30T	S	SEE Duration	: 03	3 Hours
		l	U <b>nit-I</b>			09 Hrs
Linear Alg	ebra - I:					
Vector space	ces, subspaces	, linear depender	ice and independence,	basis, dimension,	four f	undamenta
subspaces, r	rank-nullity the	eorem. Linear trar	sformations - matrix rep	presentation, kerne	el and in	mage
<b>•</b>	•		on, projection, and rotat			•
MATLAB.		·		1		·
		U	nit — II			09 Hrs
Linear Alg	ebra - II:					
0		matrices, orthog	onal and orthonormal b	bases, Gram-Schm	nidt pro	ocess, OR-
			values and Eigen vectors			
a matrix (sv		ces) and singular	value decomposition. Im	plementation usin	g MAT	LAB.
a matrix (sy			value decomposition. Im	plementation usin	g MAT	
			nit –III	plementation usin	ig MAT	TLAB. 09 Hrs
Fourier Sei	ries:	U	nit –III	-	-	09 Hrs
Fourier Ser Introductior	ries: 1, periodic fund	Uiction, even and od	nit –III d functions. Dirichlet's d	conditions, Euler 1	formula	<b>09 Hrs</b> ae for
Fourier Ser Introduction Fourier seri	ries: n, periodic fund les, complex F	U ction, even and oc ourier series, pro	nit –III ld functions. Dirichlet's blems on time periodic	conditions, Euler 1	formula	<b>09 Hrs</b> ae for
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Fourier Ser Introductior Fourier seri cosine serie	ries: n, periodic fund les, complex F s. Harmonic an	U ction, even and oc ourier series, pro nalysis. Implement	nit –III ld functions. Dirichlet's blems on time periodic	conditions, Euler 1	formula	<b>09 Hrs</b> ae for
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CO3:	Analyze the solution of the problems obtained from appropriate techniques of linear algebra, statistics, Fourier transforms and Fourier series to the real - world problems and optimize the solution.
<b>CO4:</b>	Interpret the overall knowledge of linear algebra, statistics, Fourier series and Fourier transforms gained to demonstrate the problems arising in many practical situations.



Referen	Reference Books					
1	Linear Algebra and its Applications, David C. Lay, 3 <sup>rd</sup> Edition, 2002, Pearson Education India, ISBN-13: 978-81-7758-333-5.					
2	Linear Algebra with Applications, Steven J. Leon, 9 <sup>th</sup> Edition, 2014, Pearson, ISBN: 13:978-0321962218.					
3	The Fast Fourier Transform- An Introduction to its Theory and Applications, E. Oran Brigham, 1 <sup>st</sup> Edition, 1973, Prentice Hall, Inc., ISBN: 13-978-0133074963.					
4	Higher Engineering Mathematics, B.S. Grewal, 44 <sup>th</sup> Edition, 2015, Khanna Publishers, ISBN: 978-81-933284-9-1.					

R	UBRIC FOR THE CONTINUOUS INTERNAL EVALUATION (THEORY)	
#	COMPONENTS	MARKS
1.	QUIZZES: Quizzes will be conducted in online/offline mode. TWO QUIZZES will be conducted & Each Quiz will be evaluated for 10 Marks. THE SUM OF TWO QUIZZES WILL BE THE FINAL QUIZ MARKS.	20
2.	<b>TESTS:</b> Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). THREE tests will be conducted (Two regular tests & One optional Improvement test). Each test will be evaluated for 50 Marks, adding upto 100 Marks. <b>FINAL TEST MARKS WILL BE REDUCED TO 40 MARKS.</b>	40
3.	<b>EXPERIENTIAL LEARNING:</b> Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning (05), Program specific requirements (05), Video based seminar/presentation/demonstration (10), MATLAB (20). ADDING UPTO 40 MARKS.	40
	MAXIMUM MARKS FOR THE CIE THEORY	100

	<b>RUBRIC FOR SEMESTER END EXAMINATION (THEORY)</b>					
Q. NO.	CONTENTS	MARKS				
	PART A					
1	Objective type questions covering entire syllabus	20				
	<b>PART B</b> (Maximum of TWO Sub-divisions only)					
2	Unit 1: (Compulsory)	16				
3 & 4	Unit 2: Question 3 or 4	16				
5&6	Unit 3: Question 5 or 6	16				
7 & 8	Unit 4: Question 7 or 8	16				
9 & 10	Unit 5: Question 9 or 10	16				
	TOTAL	100				



			Semester: III			
			ONMENT AND SUST			
Category: Basket Courses - Group A						
		(	Common to all Progra	ams)		
			(Theory)			1
Course Code	:	CV232TA		CIE	:	100 Marks
Credits: L:T:P	:	03:00:00		SEE	:	100 Marks
<b>Total Hours</b>	:	45L		SEE Duration	:	03 Hrs
			Unit-I			10 Hrs
ENVIRONMENT						
Definition, scope a	and in	portance of envi	ronment – need for pub	lic awareness. Eco-system	n and 1	Energy flow–
ecological success	ion. T	ypes of biodivers	sity: genetic, species and	d ecosystem diversity– va	lues of	biodiversity,
threats to biodiver	sity: 1	habitat loss, poad	ching of wildlife, man-	wildlife conflicts - endar	ngered	and endemic
species of India –	conse	rvation of biodiv	ersity.			
ENVIRONMENT	TAL H	POLLUTION	-			
Causes, Effects ar	nd Pre	eventive measure	s of Water, Soil, Air an	nd Noise Pollutions. Soli	d, Haz	ardous and E-
Waste manageme						
Occupational Hea	lth an	d Safety Manag	ement system (OHASN	MS). Environmental		
protection, Enviro						
1 /		•	Unit–II			09 Hrs
<b>RENEWABLE S</b>	OUR	CES OF ENER	GY			
				Need of new sources. D	ifferen	t types of
new energy source						of the second
		cycle emission a	nd sequestration Greer	n Engineering: Sustainabl	e urbar	nization-
Socioeconomical a					e arear	illution
				Fidal energy conversion.	Concer	ot origin and
power plants of ge			tan energy resources, r		conce	, ongin und
		05	Unit-III			09 Hrs
SUSTAINABILI	ТҮ А	ND MANAGEN	/IENT			
Introduction to E	Inviro	nmental Econor	nics, Environmental A	Audit, Development, GI	DP, Su	stainability -
				of sustainability - from		
			goals and protocols.	· · · · · · · · · · · · · · · · · · ·		······································
2		· · ·		tems thinking and design	of cvc	lical systems.
2		Ų		ally apply these concepts	•	•
			d & Forests, Waste mai			
8,	,		Unit–IV			09 Hrs
Sustainable Deve	lonm	ent Goals - tar		ntervention areas Climat	e chan	
	-		-	Concept of Carbon Cred		-
Environmental ma			and possible solutions.	concept of curbon cred	it, Curo	on rootprint.
SUSTAINABILI						
			omy ISO 1/1000 Series	Material Life cycle asses	ement	Environmenta
		A	•	een materials, Energy e		
transports.	n. 5u	sumatic natital	. Green bundings, Of	con materiais, Energy e		y, Sustainable
umspons.			Unit-V			08 Hrs
Cornorate Social	Roci	nonsihility (CSI		nition of CSR, History &		
				nship, CSR-an overlappi		
				between CSR and Co		
					porate	governance,
	environmental aspect of CSR; Chronological evolution of CSR in India. Sustainability Reporting: Flavor of GRI, Dow Jones Sustainability Index, CEPI. Investor interest in					
	ontin	a. Flavor of C	PI Dow Iones Susta	inability Indox CEDI	Invort	or intoract in
Sustainability.	portin	g: Flavor of G	RI, Dow Jones Susta	ainability Index, CEPI.	Invest	or interest in



Course Outcomes: After completing the course, the students will be able to:					
<b>CO1</b> Understand the basic elements of Environment and its Biodiversity.					
CO2	Explain the various types of pollution and requirement for sustainable strategy for present scenario.				
CO3	Evaluate the different concepts of sustainability and its significance for welfare of all life forms.				
CO4	Recognize the role of Corporate social responsibility in conserving the Environment.				

Refer	Reference Books				
1.	Environmental Science and Engineering, Benny Joseph, Tata McGraw-Hill, New Delhi, 2016. ISBN-13-978-9387432352.				
2.	Introduction to Environmental Engineering and Science, Gilbert M.Masters, Wendell P Ela, 3 <sup>rd</sup> Edition, Pearson Education, 2006. ISBN-13- 978-0132339346.				
3.	Environment Impact Assessment Guidelines, Notification of Government of India, 2006.				
4. A Handbook of Corporate Governance and Social Responsibility (Corporate Social Respons David Crowther and Guler Aras, Gower Publishing Ltd, ISBN-13- 978-0566088179.					

RUBRIC FOR THE CONTINUOUS INTERNAL EVALUATION (THEORY)			
#	COMPONENTS	MARKS	
1.	<b>QUIZZES:</b> Quizzes will be conducted in online/offline mode. TWO QUIZZES will be conducted & Each Quiz will be evaluated for 10 Marks. <b>THE SUM OF TWO QUIZZES WILL BE THE FINAL QUIZ MARKS.</b>	20	
2.	<b>TESTS:</b> Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). TWO tests will be conducted. Each test will be evaluated for 50 Marks, adding upto 100 Marks. <b>FINAL TEST MARKS WILL BE REDUCED TO 40 MARKS.</b>	40	
3.	<b>EXPERIENTIAL LEARNING:</b> Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning (10), Program specific requirements (10), Video based seminar/presentation/demonstration (20) <b>Phase 2 will be done in the exhibition mode (Demo/Prototype/any outcome). ADDING UPTO 40 MARKS</b> .	40	
	MAXIMUM MARKS FOR THE CIE THEORY	100	

	RUBRIC FOR SEMESTER END EXAMINATION (THEORY)					
Q. NO.	CONTENT	MAR KS				
	PART A					
1	Objective type questions covering entire syllabus	20				
	PART B (Maximum of TWO Sub-divisions only)					
2	Unit 1 : (Compulsory)	16				
3 & 4	Unit 2 : Question 3 or 4	16				
5&6	Unit 3 : Question 5 or 6	16				
7 & 8	Unit 4 : Question 7 or 8	16				
9 & 10	Unit 5: Question 9 or 10	16				
	TOTAL	100				



			Semester: III								
			LS SCIENCE FOR ENGIN								
Category: Basket Courses - Group A (Common to all Programs)											
		(U	(Theory)								
Course Code	:	ME232TB		CIE	:	100 Marks					
Credits: L:T:P	:	3:0:0		SEE	:	100 Marks					
Total Hours	:	40L		SEE Duration	:	3 Hours					
			Unit-I	·		06 Hrs					
The Fundamenta	ls o	f Materials									
			f atomic and molecular bonds								
			bridization. Energy bands in n								
			ations. Types of materials: po	olymers, metals and	i allo	ys, ceramics,					
semiconductors, c	om	posites.				10 11					
			Unit – II			10 Hrs					
Material behavio			1	·····	·						
			hermoelectric effects, heat ca								
		-	roperties: dielectric behaviour rroelectricity, piezoelectricity	-	-						
			l Properties: Stress-strain d		-						
			ation, impact energy, fracture			ation, plastic					
deformation, nara		, viscoelastie deform	Unit –III	touginiess, iutigue.		10 Hrs					
Materials and th	oir (	Annlications				101115					
			cs, structural materials, ferro	us allovs, nonferro	us al	lovs, cement.					
		-	s: thermosets and thermop	-		-					
			ng materials, biomaterials, pro								
			Unit –IV	*		07 Hrs					
Heat Treatment											
Post processing h	eat	treatment of electron	ic devices: thermal oxidation	, diffusion, rapid th	nerma	al processing.					
					eatme	Heat treatment of ferrous materials: annealing, spheroidizing, normalizing, hardening, tempering. formation of austenite, construction of Time Temperature Transformation (TTT) curves. Special heat treatment processes:					
carburizing, nitrid	carburizing, nitriding, cyaniding, flame, and induction hardening. Defects in heat treatment.										
	mg,	8,		s in neat ireatinent.		-					
Nanomaterials	mg,		Unit-V	s in neat treatment.		07 Hrs					
•		· · ·	Unit-V			07 Hrs					
lithography. Nano porous materials: zeolites, mesoporous materials, carbon nanotubes, graphene, nano FRPs,						07 Hrs					
	mat	erials: ball milling, so rous materials: zeolito	Unit-V ol-gel, vapour deposition grow es, mesoporous materials, car	th, pulse laser, magon nanotubes, gra	hene	07 Hrs on sputtering, e, nano FRPs,					
nano fabrics, bior	mat poi	erials: ball milling, so rous materials: zeolito bable and bio-erodal	Unit-V bl-gel, vapour deposition grow es, mesoporous materials, car ble materials, nano ceramic, r	/th, pulse laser, mag oon nanotubes, graj ano glasses, nano	ohene biom	07 Hrs on sputtering, e, nano FRPs, aterials, nano					
nano fabrics, bior implant associated	mat poi	erials: ball milling, so rous materials: zeolito bable and bio-erodal	Unit-V ol-gel, vapour deposition grow es, mesoporous materials, car	/th, pulse laser, mag oon nanotubes, graj ano glasses, nano	ohene biom	07 Hrs on sputtering, e, nano FRPs, aterials, nano					
nano fabrics, bior	mat poi	erials: ball milling, so rous materials: zeolito bable and bio-erodal	Unit-V bl-gel, vapour deposition grow es, mesoporous materials, car ble materials, nano ceramic, r	/th, pulse laser, mag oon nanotubes, graj ano glasses, nano	ohene biom	07 Hrs on sputtering, e, nano FRPs, aterials, nano					
nano fabrics, bior implant associated microscopy.	mat poi esor 1 m	erials: ball milling, so rous materials: zeolito bable and bio-erodal aterials. Characterisa	Unit-V bl-gel, vapour deposition grow es, mesoporous materials, car ble materials, nano ceramic, r tion of nano structures, spect	7th, pulse laser, mag bon nanotubes, graj ano glasses, nano roscopic technique	ohene biom	07 Hrs on sputtering, e, nano FRPs, aterials, nano					
nano fabrics, bior implant associated microscopy.	mate por esor 1 m s: A	erials: ball milling, so rous materials: zeolito bable and bio-erodal aterials. Characterisa	Unit-V ol-gel, vapour deposition grow es, mesoporous materials, car ole materials, nano ceramic, r tion of nano structures, spect course, the students will be	th, pulse laser, mag bon nanotubes, grap ano glasses, nano roscopic technique able to:	ohene biom	07 Hrs on sputtering, e, nano FRPs, aterials, nano					
nano fabrics, bior implant associated microscopy. Course Outcome CO1 Understar	mat por esor 1 m s: A d th	erials: ball milling, so rous materials: zeolito bable and bio-erodal aterials. Characterisa <b>After completing the</b> ne classification of ma	Unit-V bl-gel, vapour deposition grow es, mesoporous materials, car ble materials, nano ceramic, r tion of nano structures, spect course, the students will be aterials, their atomic structure,	on nanotubes, grap ano glasses, nano roscopic technique able to: and properties.	ohene biom	07 Hrs on sputtering, e, nano FRPs, aterials, nano					
nano fabrics, bior implant associated microscopy. Course Outcome CO1 Understar CO2 Investigat	mat por esor 1 m s: A d th e th	erials: ball milling, so rous materials: zeolito bable and bio-erodal aterials. Characterisa <b>fter completing the</b> he classification of ma e properties and appli	Unit-V ol-gel, vapour deposition grow es, mesoporous materials, car ole materials, nano ceramic, r tion of nano structures, spect course, the students will be aterials, their atomic structure, cations of different materials.	on nanotubes, grap ano glasses, nano roscopic technique able to: and properties.	ohene biom	07 Hrs on sputtering, e, nano FRPs, aterials, nano					
nano fabrics, bior implant associated microscopy. Course Outcome CO1 Understan CO2 Investigat CO3 Analyse t	mat por esor 1 m s: A d th e the	erials: ball milling, so rous materials: zeolito bable and bio-erodal aterials. Characterisa <b>After completing the</b> ne classification of ma e properties and appli ffect of different heat	Unit-V ol-gel, vapour deposition grow es, mesoporous materials, car ole materials, nano ceramic, r tion of nano structures, spect course, the students will be aterials, their atomic structure, cations of different materials.	oth, pulse laser, mag bon nanotubes, graj lano glasses, nano roscopic technique able to: and properties.	biom s, au	07 Hrs on sputtering, e, nano FRPs, aterials, nano tomatic force					



Refe	Reference Books				
1.	Material Science and Engineering, William D Callister, 6 <sup>th</sup> Edition, 1997, John Wiley and Sons, ISBN: 9812-53-052-5.				
2.	Introduction to Physical Metallurgy, Sydney H Avner, 1994, Mc. Graw Hill Book Company, ISBN: 0-07-Y85018-6.				
3.	Material Science and Engineering, William F Smith, 4 <sup>th</sup> Edition, 2008, Mc. Graw Hill Book Company, ISBN: 0-07-066717-9.				
4.	Nanomaterials: Synthesis, Properties and Applications, A.S. Edelstein and R.C. Cammarata, CRC Press 1996, ISBN:978-0849322749.				

<b>RUBRIC FOR THE CONTINUOUS INTERNAL EVALUATION (THEORY)</b>			
#	COMPONENTS	MARKS	
1.	<b>QUIZZES:</b> Quizzes will be conducted in online/offline mode. TWO QUIZZES will be conducted & Each Quiz will be evaluated for 10 Marks. <b>THE SUM OF TWO QUIZZES WILL BE THE FINAL QUIZ MARKS.</b>		
2.	<b>TESTS:</b> Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). TWO tests will be conducted. Each test will be evaluated for 50 Marks, adding upto 100 Marks. <b>FINAL TEST MARKS WILL BE REDUCED TO 40 MARKS.</b>	40	
3.	<b>EXPERIENTIAL LEARNING:</b> Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning (10), Program specific requirements (10), Video based seminar/presentation/demonstration (20). Phase 2 will be done in the exhibition mode (Demo/Prototype/any outcome). ADDING UPTO 40 MARKS.	40	
MAX	MUM MARKS FOR THE CIE THEORY	100	

	<b>RUBRIC FOR SEMESTER END EXAMINATION (THEORY)</b>				
Q. NO.	CONTENTS	MARKS			
	PART A				
1	Objective type questions covering entire syllabus	20			
	PART B (Maximum of TWO Sub-divisions only)				
2	Unit 1 : (Compulsory)	16			
3 & 4	Unit 2 : Question 3 or 4	16			
5&6	Unit 3 : Question 5 or 6	16			
7&8	Unit 4 : Question 7 or 8	16			
9 & 10	Unit 5: Question 9 or 10	16			
	TOTAL	100			



			Semester: III			
		BIOS	SAFETY STANDARDS AN	ND ETHICS		
		C	ategory: Basket Courses - (	Group A		
			(Common to all Program	ns)		
			(Theory)			
Course Code	:	BT232TC		CIE	:	100 Marks
Credits: L:T:P	:	3:0:0		SEE	:	100 Marks
<b>Total Hours</b>	:	45L		SEE Duration	:	03 Hrs
			Unit-I			09 Hrs
<b>Biohazards</b> , <b>Bio</b>	safet	y levels and cal	pinets: Introduction to Bioh	azards, Biological Sa	fety l	evels, Biosafety
•		• •	o safety cabinets. Various p		of Bi	osafety cabinets
(Materials used fo	r fab	rication, sensors,	filters, pumps, compressors)			_
			Unit – II			08 Hrs
<b>Biosafety Guidel</b>	ines:	Biosafety guide	lines of Government of Indi	a, GMOs & LMOs, R	Roles	of Institutional
Biosafety Commit	tee, l	RCGM (Review	Committee on Genetic Mani	pulation), GEAC (Ger	netic l	Engg Approval
			in food and agriculture.	Overview of Nationa	al Re	egulations and
relevant Internatio	nal A	Agreements inclu	ding Cartagena Protocol.			
			Unit –III			10 Hrs
Food safety stand	dards	s: FSSAI (Food	Safety and Standards Autho	rity of India), Functio	ons, L	icense, types of
FSSAI Licences a	nd co	ompliance rules.				
• •		· ·	food microbiology and over		athog	gens, sources of
			materials, water, air, equipme			
			age and Foodborne disease			
	-	•	uman nutrition, Food Analys	6	ral pr	inciples of food
safety managemen	nt sys	tems, Hazard Ar	alysis Critical Control Point	(HACCP).		
			Unit –IV			09 Hrs
Food Preservatio						
			es, Good Manufacturing Pr	ractices HACCP, Go	ood p	roduction, and
processingpractice						
			ods and their underlying			00
methods/principle	s. Ov	erview of food p	ackaging methods and princi	iples including novel p	баска	
			Unit-V			09 Hrs
Food safety and	Ethic	s: Food Hazards	, Food Additives, Food Aller	gens Drugs, Hormone	s, and	1 Antibiotics in
			odborne Illness, Consumer	•	nd, Fo	ood Production
			, The Role of Food Preservat			
Ethics: Clinical et	hics,	Health Policy, R	esearch ethics, ethics on Ani	mals. Biosafety and B	ioeth	ics.
Course Outcome	s: Af	ter completing t	he course, the students will	be able to:		
CO1 Have a com	preh	ensive knowledg	e of Biohazards and bio safe	ty levels		
CO2 Understand	the b	biosafety guidelir	nes and their importance to t	he society		
			to the Food standards Hygi		nd no	oking

CO3 Acquire knowledge with respect to the Food standards, Hygiene, food processing and packing

**CO4** Appreciate the food safety, Ethics, biosafety and bio ethics



Ref	Reference Books					
1.	IPR, Biosafety and Bioethics, Deepa Goel, Shomini Parashar 1 <sup>st</sup> Edition, 2013, ISBN: 978-8131774700.					
2.	The Food Safety, Cynthia A Roberts, Oryx Press, 1st Edition, 2001, ISBN: 1–57356–305–6.					
3.	Food Safety Management Systems, Hal King, Springer Cham, 2020, ISBN: 978-3-030-44734-2.					
4.	Bioethics: The Basics, Routledge, Alastair V. Campbell, 2 <sup>nd</sup> edition, 2017, ISBN: 978-0415790314.					

RUBRIC FOR THE CONTINUOUS INTERNAL EVALUATION (THEORY)			
#	COMPONENTS	MARKS	
1.	<b>QUIZZES:</b> Quizzes will be conducted in online/offline mode. TWO QUIZZES will be conducted & Each Quiz will be evaluated for 10 Marks. <b>THE SUM OF TWO QUIZZES WILL BE THE FINAL QUIZ MARKS.</b>	20	
2.	<b>TESTS:</b> Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). TWO tests will be conducted. Each test will be evaluated for 50 Marks, adding upto 100 Marks. <b>FINAL TEST MARKS WILL BE REDUCED TO 40 MARKS.</b>	40	
3.	<b>EXPERIENTIAL LEARNING:</b> Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning (10), Program specific requirements (10), Video based seminar/presentation/demonstration (20) <b>ADDING UPTO 40 MARKS</b> .	40	
	MAXIMUM MARKS FOR THE CIE THEORY	100	

<b>RUBRIC FOR SEMESTER END EXAMINATION (THEORY)</b>				
Q. NO.	CONTENTS	MARKS		
	PART A			
1	Objective type questions covering entire syllabus	20		
	PART B (Maximum of TWO Sub-divisions only)			
2	Unit 1: (Compulsory)	16		
3 & 4	Unit 2: (Internal Choice)	16		
5&6	Unit 3: (Internal Choice)	16		
7 & 8	Unit 4: (Internal Choice)	16		
9 & 10	Unit 5: (Internal Choice)	16		
	TOTAL	100		



LINEAR INTEGRATED CIRCUITS AND APPLICATIONS Category: PROFESSIONAL CORE COURSE (Common to E1 and ET) (Theory and Practice) Course Code  E1233AI CIE 100+50 Marks Credits: LT:P 203:00:01 SEE 100+50 Marks Total Hours 203:45L+30P SEE Duration 203 Hrs+03 Hrs 09 Hrs 00perational Amplifier Characteristics, DC performance, characteristics of Op-Amp, AC performanc characteristics of Op-Amp, Noise, Open-loop op-amp Configurations, Closed-loop Op-Amp Configurations Differential Amplifier characteristics, DC performance, characteristics of Op-Amp, Configurations Differential Amplifier characteristics, DC performance, characteristics of Op-Amp Configurations Differential Amplifier, General description, Manufacturer's Specifications and Electrical Characteristics of the Op-Amp, Power supply Connections. Unit – II 09 Hrs Applications of Operational Amplifiers: Sign Changer, Scale Changer, Phase Shift Circuits, Voltage Follower Voltage-Controlled Voltage Source, Current Yources, Inverting current Amplifier, Current-Controlled Currer Source, Voltage to current converter, Current to Voltage Converter. Waveform Generator: Sine-wave Generators, Triangular Wave Generators, Saw tooth Wave Generators, Time IC 555-Monostable and Astable multivibrators. Operational Amplifier-Non-linear Circuits: Precision Rectifier, Analog Switches, Peak Detectors, Sample an Hold circuits, Applications. Unit – IV 09 Hrr Active Filters: Introduction, Comparison Between Passive and Active Networks, Active Network Design, Filter Approximations, General Second Order Filter with Unity Gain and Variable Gain, Design of Low-pass Filters, Suitched Converters: Analog and Digital Data Converters, Specifications of D/A Converter, Sample an Hold circuits, Applications. Unit – V 09 Hrr D/A and A/D Converters: Analog ample and Hold Circuit, A/D Converters, Specifications of A/D Converters Sample an Hold Circuits: Voltage-Converters. Secification of A/D Converters: Voltage-Converters.	Category: PROFESSIONAL CORE COURSE (Common to EI and ET) (Theory and Practice)         Course Code       :       E1233A1       CIE       :       100+50 Marks         Credits: LT:P       :       03:00:01       SEE       :       100+50 Marks         Total Hours       :       45L+30P       SEE Duration       :       03 Hrs+03 Hrs         Operational Amplifier Characteristics:       Op -Amp, Noise, Open-loop op-amp Configurations, Closed-loop Op-Amp, Configuration       209 H         Oifferential Amplifier, General description, Manufacturer's Specifications and Electrical Characteristics of t Op-Amp, Power supply Connections.       09 H         Applications of Operational Amplifiers: Sign Changer, Scale Changer, Phase Shift Circuits, Voltage Follow Voltage-Controlled Voltage Source, Current Sources, Inverting current Amplifier, Current-Controlled Curr Source, Voltage to current converter, Current to Voltage Converter.       09 H         Vaveform Generators: Sine-wave Generators, Triangular Wave Generators, Saw tooth Wave Generators, Tin IC 555-Monostable and Astable multivibrators.       09 H         Voltage Regulators: Basics of Voltage Regulator, Linear Voltage Regulator, Switched Mode Pow Supplies, Voltage Controlled Oscillators.       09 H         Voltage Regulators: Basics of Voltage Regulator, General Purpose Regulator, Switched Mode Pow Supplies, Voltage Controlled Oscillators.       09 H         Voltage Regulators: Introduction, Comparison Between Passive and Active Networks, Active Networks Design, Fill Approximati			Semester: III				
(Common to EI and ET) (Theory and Practice)         Course Code       I EI233AI       CIE       100+50 Marks         Course Code       I EI233AI       CIE       I 00+50 Marks         Course Code       I EI233AI       CIE       I 00+50 Marks         Total Hours       I 300:00       SEE Duration       I 00+50 Marks         Total Hours       I 345L+30P       SEE Duration       I 00+50 Marks         Operational Amplifier Characteristics       OP-Amp, Noise, Open-Ioop op-amp Configurations, Closed-Ioop Op-Amp, AC performance, characteristics of Op-Amp, Noise, Open-Ioop op-amp Configurations and Electrical Characteristics of the Op-Amp, Power supply Connections.       Operational Amplifiers: Sign Changer, Scale Changer, Phase Shift Circuits, Voltage Follower Voltage Controlled Voltage Source, Current Sources, Inverting current Amplifier, current-Controlled Currer Source, Voltage to current converter, Current to Voltage Converter.       Waveform Generator: Sine-wave Generators, Triangular Wave Generators, Saw tooth Wave Generators, Time IC 555-Monostable and Astable multivibrators.       Operational Amplifier: Non-Imear Circuits: Precision Rectifier, Analog Switches, Peak Detectors, Sample an Hold circuits, Applications.         Outint-IU       09 Hrs         Voltag	(Common to EI and ET) (Theory and Practice)         Course Code       :       E1233AI       CIE       :       100+50 Marks         Credits: L:T:P       :       03:00:01       SEE       :       100+50 Marks         Total Hours       :       45L+30P       SEE Duration       :       03 Hrs+03 Hrs         Operational Amplifier Characteristics:         Operational Amplifier Characteristics, DC performance, characteristics of Op-Amp, AC performancharacteristics of Op-Amp, Noise, Open-loop op-amp Configurations, Closed-loop Op-Amp Configuratio         Operational Amplifier: General description, Manufacturer's Specifications and Electrical Characteristics of top-Amp, Power supply Connections.         Unit – II       09 H         Applications of Operational Amplifiers: Sign Changer, Scale Changer, Phase Shift Circuits, Voltage Follow         Voltage Controlled Voltage Source, Current Sources, Inverting current Amplifier, Current-Controlled Curr         Source, Voltage to current converter, Current to Voltage Converter.         Waveform Generators: Basics of Voltage Regulator, Linear Voltage Regulators Unit –II       09 H         Voltage Regulators: Basics of Voltage Regulator, General Purpose Regulator, Switched Mode Pov         Suprestore Voltage Controlled Oscillators.         Operational Amplifier: Non-					)NS	5	
(Theory and Practice)         Course Code       i       IO3:00:01       CEE       :       100+50 Marks         Coredits: LT:P       :       03:00:01       SEE       :       100+50 Marks         Total Hours       :       100+50 Marks         Operational Amplifier Characteristics:       Operational Amplifier Characteristics:       Operational Amplifier Characteristics:       Operational Amplifier Characteristics, DC performance, characteristics of Op-Amp, AC performance         Ohr Junt – II       OP Hrs         Applications of Operational Amplifiers: Sign Changer, Scale Changer, Phase Shift Circuits, Voltage Follower         Voltage to current converter, Current Sources, Inverting current Amplifier, Current-Controlled Currer         Source, Current Sources, Inverting current Amplifier, Current-Controlled Currer         Source, Current Sources, Inverting current Amplifier, Current-Controlled Currer <th< th=""><th>(Theory and Practice)         Course Code       I       IO0+50 Marks         Credits: L:T:P       i       03:00:01       SEE       :       100+50 Marks         Total Hours       :       09 rational Amplifier Characteristics:       Operational Amplifier Characteristics:       Operational Amplifier, General description, Manufacturer's Specifications and Electrical Characteristics of top-Amp, Noise, Open-Loop op-Amp Configurations, Closed-Loop Op-Amp Configurations, Unit - II       Operational Amplifier:         Munit - II       Operational Amplifiers: Sign Changer, Scale Changer, Phase Shift Circuits, Voltage Follow         Voltage Controlled Vo</th><th></th><th></th><th></th><th></th><th></th><th></th><th></th></th<>	(Theory and Practice)         Course Code       I       IO0+50 Marks         Credits: L:T:P       i       03:00:01       SEE       :       100+50 Marks         Total Hours       :       09 rational Amplifier Characteristics:       Operational Amplifier Characteristics:       Operational Amplifier, General description, Manufacturer's Specifications and Electrical Characteristics of top-Amp, Noise, Open-Loop op-Amp Configurations, Closed-Loop Op-Amp Configurations, Unit - II       Operational Amplifier:         Munit - II       Operational Amplifiers: Sign Changer, Scale Changer, Phase Shift Circuits, Voltage Follow         Voltage Controlled Vo							
Course Code       :       E1233AI       CIE       :       100+50 Marks         Credits: LT:P       :       03:00:01       SEE       :       100+50 Marks         Total Hours       :       45L+30P       SEE Duration       :       03 Hrs+03 Hrs         Unit-I       09 Hrs         Operational Amplifier Characteristics:         Operational Amplifier characteristics.       OC performance, characteristics of Op-Amp, AC performance, characteristics of Op-Amp, Noise, Open-loop op-amp Configurations, Closed-loop Op-Amp Configurations         Differential Amplifier, General description, Manufacturer's Specifications and Electrical Characteristics of the Op-Amp, Power supply Connections.       09 Hrs         Applications of Operational Amplifiers: Sign Changer, Scale Changer, Phase Shift Circuits, Voltage Follower Voltage Controlled Voltage Source, Current Sources, Inverting current Amplifier, Current-Controlled Currer Source, Voltage to current converter, Current to Voltage Converter.       09 Hrs         Voltage Controlled Voltage Segulator, Linear Voltage Regulators Using Op-amps, IC Voltage Regulators.       09 Hrs         Voltage Controlled Oscillators.       09 Hrs         Voltage Controlled Oscillators.       09 Hrs         Operational Amplifier-Non-linear Circuits: Precision Rectifier, Analog Switches, Peak Detectors, Sample an Hold circuits, Applications.       09 Hrs         Voltage Controlled Oscillators.       09 Hrs <tr< th=""><th>Course Code       :       EI233AI       CIE       :       100+50 Marks         Credits: L.T:P       :       03:00:01       SEE       :       100+50 Marks         Total Hours       :       45L+30P       SEE Duration       :       03 Hrs+03 Hrs         Unit-I       09 H         Operational Amplifier Characteristics:         Operational Amplifier Characteristics, DC performance, characteristics of Op-Amp, AC performanc characteristics of Op-Amp, Noise, Open-loop op-amp Configurations, Closed-loop Op-Amp Configuratics of Cop-Amp, Power supply Connections.       09 H         Operational Amplifier, General description, Manufacturer's Specifications and Electrical Characteristics of t Op-Amp, Power supply Connections.       09 H         Applications of Operational Amplifiers: Sign Changer, Scale Changer, Phase Shift Circuits, Voltage Follow       09 H         Voltage Controlled Voltage Source, Current Sources, Inverting current Amplifier, Current-Controlled Curr Source, Voltage to current converter, Current to Voltage Converter.       Wave Generators, Saw tooth Wave Generators, Triangular Wave Generators, Saw tooth Wave Generators, Tin IC 555-Monostable and Astable multivibrators.       09 H         Voltage Regulators: Basics of Voltage Regulator, Linear Voltage Regulator, Switched Mode Pow Supplies, Voltage Controlled Oscillators.       09 H         Voltage Controlled Oscillators.       Operational Amplifier-Non-linear Circuits: Precision Rectifier, Analog Switches, Peak Detectors, Sample a Hold circuits,</th><th></th><th>(</th><th></th><th>· ·</th><th></th><th></th><th></th></tr<>	Course Code       :       EI233AI       CIE       :       100+50 Marks         Credits: L.T:P       :       03:00:01       SEE       :       100+50 Marks         Total Hours       :       45L+30P       SEE Duration       :       03 Hrs+03 Hrs         Unit-I       09 H         Operational Amplifier Characteristics:         Operational Amplifier Characteristics, DC performance, characteristics of Op-Amp, AC performanc characteristics of Op-Amp, Noise, Open-loop op-amp Configurations, Closed-loop Op-Amp Configuratics of Cop-Amp, Power supply Connections.       09 H         Operational Amplifier, General description, Manufacturer's Specifications and Electrical Characteristics of t Op-Amp, Power supply Connections.       09 H         Applications of Operational Amplifiers: Sign Changer, Scale Changer, Phase Shift Circuits, Voltage Follow       09 H         Voltage Controlled Voltage Source, Current Sources, Inverting current Amplifier, Current-Controlled Curr Source, Voltage to current converter, Current to Voltage Converter.       Wave Generators, Saw tooth Wave Generators, Triangular Wave Generators, Saw tooth Wave Generators, Tin IC 555-Monostable and Astable multivibrators.       09 H         Voltage Regulators: Basics of Voltage Regulator, Linear Voltage Regulator, Switched Mode Pow Supplies, Voltage Controlled Oscillators.       09 H         Voltage Controlled Oscillators.       Operational Amplifier-Non-linear Circuits: Precision Rectifier, Analog Switches, Peak Detectors, Sample a Hold circuits,		(		· ·			
Credits: L:T:P       :       03:00:01       SEE       :       100+50 Marks         Total Hours       :       45L+30P       SEE Duration       :       03 Hrs+03 Hrs         Operational Amplifier Characteristics:       Operational Amplifier Characteristics:       09 Hrs       09 Hrs         Operational Amplifier, General description, Manufacturer's Specifications and Electrical Characteristics of the Op-Amp, Power supply Connections.       09 Hrs         Unit – II       09 Hrs         Applications of Operational Amplifiers: Sign Changer, Scale Changer, Phase Shift Circuits, Voltage Follower       Voltage Controlled Voltage Source, Current Sources, Inverting current Amplifier, Current-Controlled Currer         Source, Voltage to current converter, Current Sources, Inverting current Amplifier, Current-Controlled Currer       09 Hrs         Voltage Controlled Voltage Source, Current to Voltage Converter.       09 Hrs         Waveform Generator:       00 Hre         Voltage to current converter, Current to Voltage Converter.       09 Hre         Voltage Controlled Voltage Source, Current Voltage Regulators.       09 Hre         Voltage Controlled Voltage Source, Current Sources, Inverting current Amplifier, Current-Controlled Currer       09 Hre         Voltage Controlled Voltage Regulators.       09 Hre         Voltage Regulators: Basics of Voltage Regulator, Linear Voltage Regulator, Switched Mode Powe       Supplies, Voltage Controlled Osci	Credits: L:T:P       :       03:00:01       SEE       :       100+50 Marks         Total Hours       :       45L+30P       SEE Duration       :       03 Hrs+03 Hrs         Operational Amplifier Characteristics:       Operational Amplifier Characteristics:       09 H         Operational Amplifier characteristics, DC performance, characteristics of Op-Amp, AC performanc characteristics of Op-Amp, Noise, Open-loop op-amp Configurations, Closed-loop Op-Amp Configuration Differential Amplifier, General description, Manufacturer's Specifications and Electrical Characteristics of t Op-Amp, Power supply Connections.       09 H         Applications of Operational Amplifiers: Sign Changer, Scale Changer, Phase Shift Circuits, Voltage Follow Voltage-Controlled Voltage Source, Current Sources, Inverting current Amplifier, Current-Controlled Curr Source, Voltage to current converter, Current to Voltage Converter.       09 H         Vaveform Generator: Sine-wave Generators, Triangular Wave Generators, Saw tooth Wave Generators, Tin IC 555-Monostable and Astable multivibrators.       09 H         Voltage Regulators: Basics of Voltage Regulator, Linear Voltage Regulators Using Op-amps, IC Volta Regulators, three terminal Adjustable Voltage Regulator, General Purpose Regulator, Switched Mode Pov Supplice, Voltage Controlled Oscillators.       09 H         Voltage Controlled Oscillators.       09 H         Voltage Controlled Oscillators.       09 H         Voltage Regulators: Basics of Voltage Regulator, General Purpose Regulator, Switched Mode Pov Supplics, Voltage Controlled Oscillators.       09 H<	~ ~ .		· · · · · · · · · · · · · · · · · · ·				
Total Hours       :       45L+30P       SEE Duration       :       03 Hrs+03 Hrs         Unit-I       09 Hrs         Operational Amplifier Characteristics:       09 performance, characteristics of Op-Amp, AC performance, characteristics of Op-Amp, Noise, Open-loop op-amp Configurations, Closed-loop Op-Amp Configurations Differential Amplifier, General description, Manufacturer's Specifications and Electrical Characteristics of the Op-Amp, Power supply Connections.       09 Hrs         Applications of Operational Amplifiers:       Sign Changer, Scale Changer, Phase Shift Circuits, Voltage Follower Voltage-Controlled Voltage Source, Current Sources, Inverting current Amplifier, Current-Controlled Currer Source, Voltage to current converter, Current to Voltage Converter.       09 Hrs         Waveform Generator:       Sine-wave Generators, Triangular Wave Generators, Saw tooth Wave Generators, Time IC 555-Monostable and Astable multivibrators.       09 Hrs         Voltage Regulators:       Basics of Voltage Regulator, Linear Voltage Regulators Using Op-amps, IC Voltage Regulators, Sample an Hold circuits, Applications.       09 Hrs         Operational Amplifier-Non-linear Circuits:       Precision Rectifier, Analog Switches, Peak Detectors, Sample an Hold circuits, Applications.       09 Hrs         Voltage Controlled Oscillators.       09 Hrs       09 Hrs         Operational Amplifier-Non-linear Circuits: Precision Rectifier, Analog Switches, Peak Detectors, Sample an Hold circuits, Applications.       09 Hrs         Active Filters:       Int -IV	Total Hours       :       45L+30P       SEE Duration       :       03 Hrs+03 Hrs         Unit-I       09 H         Operational Amplifier Characteristics:       00 p-Amp, Noise, Open-loop op-amp Configurations, Closed-loop Op-Amp Configurations, Closed-loop Op-Amp, Configurations, Closed-loop Op-Amp Configurations proves supply Connections.       09 H         Unit – I       09 H         Applications of Operational Amplifiers: Sign Changer, Scale Changer, Phase Shift Circuits, Voltage Follow         Voltage Controlled Voltage Source, Current Sources, Inverting current Amplifier, Current-Controlled Curr Source, Voltage to current converter, Current to Voltage Converter.         Waveform Generator: Sine-wave Generators, Triangular Wave Generators, Saw tooth Wave Generators, Tin IC 555-Monostable and Astable multivibrators.         Unit –III         09 H         Voltage Regulators: Basics of Voltage Regulator, Linear Voltage Regulator, Switched Mode Pow Supplies, Voltage Controlled Oscillators.         Operational Amplifier-Non-linear Circuits: Precision Rectifier, Analog Switches, Peak Detectors, Sample a Hold circuit, Applications.         Unit –IV         09 H         Voltage Controlled Oscillators.         Operational Amplifier-Non-linear Circuits: Precision Rectifier, Analog Switches, Peak Detectors, Sample a Hold circuit, Applications.							

Course	Course Outcomes: After completing the course, the students will be able to:-				
CO1	Understand the basics of operational amplifiers.				
CO2	Analyze the performance of OPAMP and build simple circuits using OPAMP.				
CO3	Apply the concepts to design various applications of OPAMP.				
<b>CO4</b>	Design a system using various ICs for a specific application.				



Refe	erence Books
1.	Linear integrated circuits, S Shalivahanan, V S Kanchana Bhaskaran, 2018, Mc.Grawhill Publications, ISBN: 10:0-07-064818-2.
2.	Electronic Devices and Circuit Theory, Robert L.Boylestad, Louis Nashelsky, 8 <sup>th</sup> Edition, 2010, Prentice-Hall India, ISBN:81-203-2064-6.
3.	Microelectronics circuits Analysis and Design, M.H Rashid,2 <sup>nd</sup> Edition, 2011, Thomson Publication, ISBN:0-534-95174-0.
4.	Microelectronics circuits, Sedra & Smith, 5 <sup>th</sup> Edition, Oxford Publication, ISBN-13: 978-0195338836.
5.	Op-Amps and Linear Integrated Circuits, Ramakanth A Gayakwad, 4 <sup>th</sup> Edition, Pearson, ISBN-13: 978- 9353949037.

#### Laboratory Component

#### PART B

#### Practical: Hardware design and simulation of the following to be carried out.

- 1. Experimental verification of simple applications of OPAMP 741 such as inverting amplifier, non-inverting amplifier, adder/subtractor, integrator and differentiator circuits
- 2. Design and implementation of peak detector, half wave and full wave precision rectifiers using operational amplifier IC741.
- 3. Design and implementation of a Schmitt trigger circuit for given UTP & LTP using op-amp.
- 4. Design and implementation of active 2<sup>nd</sup> order low pass and high pass filters and to obtain the frequency response of the filters.
- 5. Design and implementation of astable multivibrator using 555 timer.
- 6. Design and implementation of RC phase shift oscillator by simulation and experiment.

#### PART B

#### **Innovative Experiments (IE)**

- 1. Realization of 2-bit flash type ADC.
- 2. Analysis of function generator using operational amplifier (sine, triangular, and square wave).
- 3. Analysis of voltage comparator.
- 4. Design of voltage regulator using IC 7900.
- 5. Generation of ramp wave for a given frequency using NE 555 timer.



RUBRIC FOR THE CONTINUOUS INTERNAL EVALUATION (THEORY AND F			
#	COMPONENTS	MARKS	
1.	<b>QUIZZES:</b> Quizzes will be conducted in online/offline mode. <b>TWO QUIZZES</b> will be conducted & Each Quiz will be evaluated for 10 Marks. Each quiz is evaluated for 10 marks adding up to 20 MARKS	20	
2.	<b>TESTS:</b> Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). <b>TWO tests will be conducted</b> . Each test will be evaluated for <b>50 Marks</b> , adding up to 100 Marks. <b>FINAL TEST MARKS WILL BE REDUCED TO 40 MARKS</b> .	40	
3.	<b>EXPERIENTIAL LEARNING:</b> Students will be evaluated for their creativity and practical implementation of the problem. Case study based teaching learning (10), Program specific requirements (10), Video based seminar/presentation/demonstration (10) Designing & Modeling (10) Phase 2 will be done in the exhibition mode (Demo/Prototype/any outcome). ADDING UPTO 40 MARKS.	40	
4.	<b>LAB:</b> Conduction of laboratory exercises, lab report, observation, and analysis (20 Marks), lab test (10 Marks) and Innovative Experiment/ Concept Design and Implementation (20 Marks) adding up to 50 Marks. THE FINAL MARKS WILL BE 50 MARKS.	50	
	MAXIMUM MARKS FOR THE CIE (THEORY AND PRACTICE)	150	

<b>RUBRIC FOR SEMESTER END EXAMINATION (THEORY)</b>				
Q.NO.	CONTENTS	MARKS		
	PART A			
1	Objective type of questions covering entire syllabus	20		
	<b>PART B</b> (Maximum of THREE Sub-divisions only)			
2	Unit 1: (Compulsory)	16		
3 & 4	Unit 2: Question 3 or 4	16		
5&6	Unit 3: Question 5 or 6	16		
7 & 8	Unit 4: Question 7 or 8	16		
9 & 10	Unit 5: Question 9 or 10	16		
	TOTAL	100		

	<b>RUBRIC FOR SEMESTER END EXAMINATION (LAB)</b>				
Q.NO.	CONTENTS	MARKS			
1	Write Up	10			
2	Conduction of the Experiments	30			
3	Viva	10			
	TOTAL	50			



			Semester: I	II			
AN	AL	YSIS AND I	DESIGN OF DIGIT	AL CIRCUITS WI	TH H	IDL	
		Category	y: PROFESSIONAI				
			(Theory & Pra				
			(Common to EC, El	l, ET, EE)			
Course Code	:	EC234AI		CIE	:	100+50 N	Aarks
Credits: L:T:P	:	03:00:01		SEE	:	100+50 N	Aarks
Total Hours	:	45L+30P		SEE Duration	:	03Hrs+0	3 Hrs
			Unit-I				09 Hrs
Introduction to Veril							
Verilog History, Syste							
Register and Constant.							
and Conditional. Veri							
Value Logic and Signa			-				
Driven Simulation, S			Introduction to Mo	deling Styles: Data	flow	modeling,	Behaviora
modelling, Structural	moc	lelling.					
			Unit – II				09 Hrs
Combinational Circu	ite	Design					07 1113
Arithmetic circuits, co		0	d logic functions imp	ementation using De	code	∙s/ De-Mul	tiplevers and
Multiplexers. Design							
ripple carry and carry		•	-	inputation, 1 aranter 7 K		Jubilación,	concepts of
Dataflow/Behavioura							
Verilog Data flow/Beh				orts. Top-Down Des	ign ar	nd Nested M	Aodules.
					8		100001051
			Unit –III				09 Hrs
Introduction, Latche							
Triggering of Flip F				Flop Excitation Ta	bles,	Flip-Flop	conversion
Propagation delay, set							
Synchronous Sequen			0				10.1
Introduction to FSM (		•	•	•	its, St	ate table a	nd Reduction
State Diagram, Desigr		synchronous	Counter, Programma	able mod-n counter.			
Behavioral Modeling	:	ouita in Varil	og design of supphy	nous countars using	Voril	00	
Latches and Flip Flop	Cin		og, design of synchic	mous counters using	ven	log.	
	Cir		<i>c c .</i>				
	Cir						09 Hrs
Asvnchronous Seque			Unit –IV				09 Hrs
Asynchronous Seque Design of Ripple/Asy	ntia	al Circuit De	Unit –IV esign:			lelay in Ri	
Design of Ripple/Asy	ntia nch	<b>al Circuit De</b> ronous Coun	Unit –IV esign:			lelay in Ri	
Design of Ripple/Asy Integrated Circuit Rip	ntia nch	<b>al Circuit De</b> ronous Coun	Unit –IV esign:			lelay in Ri	
Design of Ripple/Asy Integrated Circuit Rip <b>Registers:</b>	ntia nch ple	<b>al Circuit De</b> ronous Coun Counter.	Unit –IV esign: ater (mod-n counter),	Effects of Propaga	tion d		pple Counte
Design of Ripple/Asy Integrated Circuit Ripp <b>Registers:</b> Registers, Shift Regist	ntia nch ple	al Circuit De ronous Coun Counter. and Various	Unit –IV sign: ater (mod-n counter), Operations, Ring cou	Effects of Propaga	tion d		pple Counte
Design of Ripple/Asy Integrated Circuit Rip <b>Registers:</b> Registers, Shift Regist Sequence Detector and <b>Behavioral Modeling</b>	ntia nch ple ters d Se	al Circuit De ronous Coun Counter. and Various equence Gene	Unit –IV esign: ater (mod-n counter), Operations, Ring cou erators (PRBS).	Effects of Propaga	tion d		pple Counte
Design of Ripple/Asy Integrated Circuit Ripp <b>Registers:</b> Registers, Shift Regist Sequence Detector and	ntia nch ple ters d Se	al Circuit De ronous Coun Counter. and Various equence Gene	Unit –IV esign: ater (mod-n counter), Operations, Ring cou erators (PRBS).	Effects of Propaga	tion d		pple Counte
Design of Ripple/Asy Integrated Circuit Rip <b>Registers:</b> Registers, Shift Regist Sequence Detector and <b>Behavioral Modeling</b>	ntia nch ple ters d Se	al Circuit De ronous Coun Counter. and Various equence Gene	Unit –IV esign: ater (mod-n counter), Operations, Ring cou erators (PRBS). aift registers using Ve	Effects of Propaga	tion d		pple Counte er. Design of
Design of Ripple/Asy Integrated Circuit Rip <b>Registers:</b> Registers, Shift Regist Sequence Detector and <b>Behavioral Modeling</b> Design of synchronous	ntia nch ple ters d Se	al Circuit De ronous Coun Counter. and Various equence Gene	Unit –IV esign: ater (mod-n counter), Operations, Ring cou erators (PRBS).	Effects of Propaga	tion d		pple Counte
Design of Ripple/Asy Integrated Circuit Rip <b>Registers:</b> Registers, Shift Regist Sequence Detector and <b>Behavioral Modeling</b>	ntia nch ple cers d Se s co	al Circuit De ronous Coun Counter. and Various equence Gene punters and sh	Unit –IV esign: ater (mod-n counter), Operations, Ring cou erators (PRBS). aift registers using Ve Unit –V	Effects of Propagar inters, Johnson count crilog.	tion d	Serial Adde	pple Counte er. Design o <b>09 Hrs</b>



Course Outcomes: After completing the course, the students will be able to: -						
CO1	Analyze and design different types of digital circuits for area, delay and power constraints.					
CO2	Apply the knowledge of digital circuits to construct sub-systems useful for digital system designs.					
CO3	Implement digital circuits for a particular application considering performance parameters.					
CO4	Evaluate the performance of different digital systems to apply in real world applications.					

Referen	Reference Books						
1.	Verilog HDL: A Guide to Digital Design & Synthesis, Samir Palnitkar, SunSoft Press, 1 <sup>st</sup> Edition, 1996, ISBN: 978-81-775-8918-4.						
2.	Digital Logic and Computer Design, M. Morris Mano, Pearson Education Inc., 13 <sup>th</sup> Impression, 2011, ISBN: 978-81-7758-409-7.						
3.	Fundamentals of Logic Design, Charles H. Roth (Jr.), West publications, 4 <sup>th</sup> Edition, 1992, ISBN- 13: 978-0-314-92218-2.						
4.	Digital Fundamentals, Thomas Floyd, 11 <sup>th</sup> Edition, Pearson Education India, ISBN 13: 978-1-292-07598-3, 2015.						
5.	Digital Principle and Design, Donald D. Givone, Mc Graw-Hill, ISBN: 0-07-119520-3 (ISE), 2003.						

#### Laboratory Component

#### PART B

#### **Practicals:**

- 1. Truth Table verification of NOT, AND, OR, XOR, XNOR, NAND, NOR gates using IC trainer kit.
- 2. Realization of Binary Adder and Subtractor IC-7483.
- 3. Realization of Boolean Function using MUX/DEMUX (IC-74153, IC-74139.)
- 4. Design of synchronous 3-bit up/down counter using IC-7476/IC-74112 on IC trainer kit.
- 5. Realization of Binary Adder and Subtractor using Verilog
- 6. Realization of Multiplexer/Decoders/Encoder in Verilog.
- 7. Realization of D, T, JK flip flop in Verilog using behavioural modelling on FPGA board.
- 8. Design of synchronous (up/down/BCD counter in Verilog using behavioural modelling.
- 9. Design of Shift register, ring counter, Johnson counter using Verilog.
- 10. Design of Sequence generator and detector.

#### **Innovative Experiments (IE)**

- 1. Multiplier Designs (Booth, Wallace)
- 2. Basic Processor Design.



RUB	RIC FOR THE CONTINUOUS INTERNAL EVALUATION (THEORY AND P	RACTICE)
#	COMPONENTS	MARKS
1.	<b>QUIZZES:</b> Quizzes will be conducted in online/offline mode. <b>TWO QUIZZES</b> will be conducted & Each Quiz will be evaluated for 10 Marks. Each quiz is evaluated for 10 marks adding up to 20 MARKS	20
2.	<b>TESTS:</b> Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). <b>TWO tests will be conducted</b> . Each test will be evaluated for <b>50 Marks</b> , adding up to 100 Marks. <b>FINAL TEST MARKS WILL BE REDUCED TO 40 MARKS</b> .	40
3.	<b>EXPERIENTIAL LEARNING:</b> Students will be evaluated for their creativity and practical implementation of the problem. Case study based teaching learning (10), Program specific requirements (10), Video based seminar/presentation/demonstration (10) Designing & Modeling (10). Phase 2 will be done in the exhibition mode (Demo/Prototype/any outcome). ADDING UPTO 40 MARKS.	40
4.	<b>LAB:</b> Conduction of laboratory exercises, lab report, observation, and analysis (20 Marks), lab test (10 Marks) and Innovative Experiment/ Concept Design and Implementation (20 Marks) adding up to 50 Marks. THE FINAL MARKS WILL BE 50 MARKS.	50
	MAXIMUM MARKS FOR THE CIE (THEORY AND PRACTICE)	150

	<b>RUBRIC FOR SEMESTER END EXAMINATION (THEORY)</b>					
Q.NO.	CONTENTS	MARKS				
	PART A					
1	Objective type of questions covering entire syllabus	20				
	PART B (Maximum of THREE Sub-divisions only)					
2	Unit 1: (Compulsory)	16				
3 & 4	Unit 2: Question 3 or 4	16				
5&6	Unit 3: Question 5 or 6	16				
7 & 8	16					
9&10	16					
	TOTAL	100				

	<b>RUBRIC FOR SEMESTER END EXAMINATION (LAB)</b>					
Q.NO.	CONTENTS	MARKS				
1	Write Up	10				
2	Conduction of the Experiments	30				
3	Viva	10				
TOTAL						



			Semester: I					
CONTROL ENGINEERING								
Category: PROFESSIONAL CORE COURSE								
	(Theory)							
Course Code								
Credits: L:T:P	:	03:01:00		SEE	:	100 Mar	·ks	
Total Hours	:	45L+15T		SEE Duration	ı :	03 Hrs		
			Unit-I				09 Hrs	
Introduction: Definitions, Classific and time invariant, of system showing the b Modelling and Repu The transfer function	cont basic <b>rese</b> n cc	inuous and disc c structure and c ntation of Con oncept, transfer	crete time systems. different terminolog <b>trol System:</b> function of simple l loop system block	Block diagram o ies. electrical networ	f a ty ks, c gnal i	vpical clos lifferent fo flow grapi	sed loop contro	
			formula. Modelling of mechanical translational and rotational systems and their analogies.					
				al systems and the	eir an	alogies.	0.0 11	
formula. Modelling of <b>Time Response of F</b> Standard test signals order of the system, S	of m Feed , ste	echanical transl back Control S p response of fi	Unit – II Systems: irst and second orde	r systems, time de	omai	n specifica		
formula. Modelling of <b>Time Response of F</b> Standard test signals order of the system, S <b>Stability Analysis:</b>	of m F <b>eed</b> , ste Stea	back Control S p response of fi dy state error ar	Unit – II Systems: irst and second orde nd static error consta Routh Hurwitz criteri	r systems, time de ants. Effect of feed	omain dbacl	n specifica c on sensit	itions. Type and ivity.	
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formula. Modelling of <b>Time Response of F</b> Standard test signals order of the system, S <b>Stability Analysis:</b> Concept of stability, <b>Root Locus:</b>	of m Feed , ste Stea type	back Control S p response of fi dy state error an es of stability, R	Unit – II Systems: irst and second orde nd static error consta Routh Hurwitz criteri Unit –III d angle criterion, co	r systems, time de ants. Effect of feed ion, relative stabil	omain dbacl ity an	n specifica c on sensit nalysis.	itions. Type and ivity. 09 Hrs itours. Effect of	
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formula. Modelling of <b>Time Response of F</b> Standard test signals order of the system, S <b>Stability Analysis:</b> Concept of stability, <b>Root Locus:</b> Introduction, concep adding a pole/zero to <b>Introduction to free</b> Frequency domain s frequency response. <b>Frequency Domain</b>	of m Feed , ste Stea type ot of o the quer peci	back Control S p response of fi dy state error an es of stability, R magnitude and system. hcy domain: fications, conce alysis: Introduce	Unit – II Systems: irst and second orde nd static error consta Routh Hurwitz criteri Unit –III d angle criterion, co Unit –IV ept of phase margin ction to frequency d	r systems, time do ants. Effect of feed ion, relative stabil postruction of roo and gain margin	omain dbacl ity an t loci	n specifica c on sensit nalysis. , root cor relation be	tions. Type and ivity. 09 Hrs tours. Effect o 09 Hrs etween time and	
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CO1	Comprehend the different types of control systems and their building blocks							
CO2	Analyse the different systems by means of their transfer function							
CO3	Evaluate the performance of systems and assess their stability							

CO4 Create a model of the system for the desired performance parameters



Refere	Reference Books								
1.	Control System Engineering, J Nagarath and M. Gopal, 6th Edition, 2017, New age International								
	publishers, ISBN: 8122420087.								
2.	Control systems: Principles and design, M. Gopal, TMH, 4 <sup>th</sup> Edition, 2012, ISBN: 9780071333269.								
3.	Modern Control Engineering, K. Ogata, Pearson education, 5 <sup>th</sup> Edition, 2015,								
	ISBN:9789332550162.								
4.	Automatic Control Systems, Kuo B.C, 9 <sup>th</sup> Edition, 2014, Prentice Hall of India Ltd., New Delhi,								
	ISBN-13: 978-8126552337.								

<b>RUBRIC FOR THE CONTINUOUS INTERNAL EVALUATION (THEORY)</b>					
#	COMPONENTS	MAR KS			
1.	<b>QUIZZES:</b> Quizzes will be conducted in online/offline mode. TWO QUIZZES will be conducted & Each Quiz will be evaluated for 10 Marks. <b>THE SUM OF TWO QUIZZES WILL BE THE FINAL QUIZ MARKS.</b>	20			
2.	<b>TESTS:</b> Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). TWO tests will be conducted. Each test will be evaluated for 50 Marks, adding upto 100 Marks. <b>FINAL TEST MARKS WILL BE REDUCED TO 40 MARKS.</b>	40			
3.	<b>EXPERIENTIAL LEARNING:</b> Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning (10), Program specific requirements (10), Video based seminar/presentation/demonstration (20) <b>Phase 2 will be done in the exhibition mode (Demo/Prototype/any outcome). ADDING UPTO 40 MARKS</b> .	40			
	MAXIMUM MARKS FOR THE CIE THEORY	100			

	<b>RUBRIC FOR SEMESTER END EXAMINATION (THEORY)</b>						
Q. NO.	CONTENTS	MARKS					
	PART A						
1	Objective type questions covering entire syllabus	20					
	PART B (Maximum of TWO Sub-divisions only)						
2	Unit 1 : (Compulsory)	16					
3 & 4	Unit 2 : Question 3 or 4	16					
5 & 6 Unit 3 : Question 5 or 6							
7 & 8 Unit 4 : Question 7 or 8							
9 & 10	Unit 5: Question 9 or 10	16					
	TOTAL	100					



				Semester: III			
			N	ATIONAL SERVICE SCHEME(NSS)			
Cours	e Code	Γ.	HS237LA	(Practical)			50 Marks
	e Code s: L: T: P	:	0:0:2	SEE		:	
Total ]		•	26P			•	
	uisites:		-	↓		-	
-		nav	e service-orien	ted mindset and social concern.			
				work at any remote place, any time with a	available res	50	urces and prope
			r the other wor				• • • •
	dents should t time.	be r	eady to sacrific	e some of the timely will and wishes to achi	eve service	-0	riented targets
UII				Content			26 Hrs
Studen	te must taka i	un e	any one activit	y on below mentioned topics and must prepa	ara contante	f	
				of the projects and has to present strategies f			
	alsorily must a		▲	r. gregets and has to present strategreg r			
-	•		*	resentation, approach, and implementation st	rategies. (Ai	ny	one of the below
	oned activity)		I	· • • • • •	U V	2	
1. H	elping local s	cho	ools to achieve	good result and enhance their enrolment in	n Higher/teo	ch	nical/ vocationa
ec	lucation.						
			nable business	proposal for enhancing the village/ farmer in	come and a	p	proach for
	nplementation						
				anagement system for rural/ urban areas and	-		
4. Se	etting of the in	nfor	mation imparti	ng club for women leading to contribution in	social and	ec	conomic issues.
5. Sj	preading publi	ic a	wareness/ gove	ernment schemes under rural outreach progra	m. (Minimu	ın	n 5 programs)
		-		initiative of Government of India. For eg. Di			
				ike in India, Mudra scheme, Skill developme	nt programs	s e	etc
			responsibilitie				
8. Pl	lantation and a	ado	ption of plants.	Know your plants			
9. 0	rganic farmin	g, I	ndian Agricult	ure (Past, Present and Future) Connectivity for	or marketing	g	
10. W	aste managen	nen	t – Public, Priv	vate and Govt organization, 5 R's			
11. W	ater conserva	tio	n techniques –	Role of different stakeholders - Implementati	on		
12. G	ovt. School R	eju	venation and a	ssistance to achieve good infrastructure.			
13. O	rganize Natio	nal	integration ar	d social harmony events/ workshops / sem	inars. (Mini	in	num 2 programs
ar	nd ONE NSS-	CA	MP.	_			_
1			1 0	the course, the students will be able to: -			
CO1				his/her responsibilities towards society.			
CO2	Analyze the	env	rronmental and	l societal problems/ issues and will be able to	design solu	ıti	ons for the same
CO3	Evaluate the	exi	sting system a	nd to propose practical solutions for the same	for sustains	ah	le development
200	L'unaute inte	UNI	sting system a	ia to propose practical solutions for the same	101 Subuille	.0	ie de terophient.



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



			Semester: III			
NATIONAL CADET CORPS(NCC)						
			(Practical)			
<b>Course Code</b>	:	HS237LB		CIE	:	50 Marks
Credits: L:T:P	:	0:0:2		SEE	:	50 Marks
<b>Total Hours</b>	:	30P		SEE Duration	:	02 Hrs
			Unit-I	·		14 Hrs
Drill: Foot Drill- Drill ki Aam Hidayaten, Word ki Command, Savdhan, Vishram, Aram Se, Murdna, KadvarSizing, Teen Line Banana, Khuli Line, Nikat Line, Khade Khade Salute Karna						
			Unit – II			06 Hrs
Weapon Training	(WT	): Introduction	& Characteristics of 7.62 Self Lo	oading rifle, Identifica	tior	of rifle parts
Unit –III 0					06 Hrs	
Adventure activit	ies: 7	Frekking and ob	stacle course			
Unit –IV 04 Hrs					04 Hrs	
		•	opment (SSCD): Students will p nation Camp, Swachhata Abhiya	· •		

Course Outcomes: After completing the course, the students 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.			

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



ASSESSMENT AND EVALUATION PATTERN					
WEIGHTAGE	50%	50%			
	CIE	SEE			
Presentation 1- Selection of topic- (phase 1) Justification for Importance, need of the hour with surveyed data.	10	****			
<b>EXPERIENTIAL LEARNING</b> Presentation 2 (phase 2) Content development, strategies for implementation methodologies.	10	****			
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			



Semester: III						
PHYSICAL EDUCATION						
	(SPORTS & ATHLETICS)					
	(Practical)					
Course Code	:	HS237LC		CIE	:	50 Marks
Credits: L:T:P	:	00:00:02		SEE	:	50 Marks
Total Hours	:	30P		SEE Duration	:	02 Hrs
Content 30 Hrs						

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 sport / game
- 5. General awareness about sport / game, sports happenings in the college campus

CO1 U	Understand the basic principles and practices of Physical Education and Sports.
CO2 Ir	instruct the Physical Activities and Sports practices for Healthy Living.
CO3 T	Γο develop professionalism among students to conduct, organize & Officiate Physical Education
aı	and Sports events at schools and community level.

#### **Reference Books**

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



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



			Semester: III			
			MUSIC			
			(Practical)			
Course Code	:	HS237LD		CIE	:	50 Marks
Credits: L: T: P	:	0:0:2		SEE	:	50 Marks
Total Hours	:	26P		SEE Duration	:	02 Hrs
			Content			26 Hrs
1. Introduction to d	liffe	rent genres of mus	ic			

- 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 (	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.				

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



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



		Sem	ester: III		
		D	ANCE		
		( <b>P</b> )	ractical)		
Course Code	:	HS237LE	CIE	:	50 Marks
Credits: L: T: P	:	0:0:2	SEE	:	50 Marks
Total Hours	:	26P	SEE Duration	:	02 Hrs
		Contents			26 Hrs
1. Introduction	to E	Dance			<u>.</u>
2. Preparing th	e bo	dy for dancing by learning diff	erent ways to warm up.		

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

# Course Outcomes: After completing the course, the students will be able to: -CO1Understand the fundamentals of dancing.CO2Adapt to impromptu dancing.CO3Ability to pick choreography and understand musicality.CO4To 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, Jacqueline M. Smith



RV College of Engineering<sup>®</sup> Mysore Road, RV Vidyaniketan Post, Bengaluru - 560059, Karnataka, India

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



Semester: III						
	Theater (Light Camera & Action)					
			(Practical)			
Course Code	:	HS237LF		CIE	:	50 Marks
Credits: L:T:P	:	0:0:2		SEE	:	50 Marks
Total Hours	:	26P		SEE Duration	:	02 Hrs
	•		Contents	-	•	26 Hrs

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 socialanxiety, Shyness and Nervousness.

- 3. Ura
- 4. Rhythm Voice Projection, Voice Modulation, Weeping & Coughing Voice projection is the strength of speaking or singing whereby the voice is used powerfully and clearly. It is a technique employed to command respect and attention, as when a teacher talks to a class, or simply to be heard clearly, as used by an actor in a theatre.
- 5. It's Leviosa, Not Leviosaaa!
- 6. Speech work: Diction, Intonation, Emphasis, Pauses, Pitch and Volume Tempo Dialogues delivery. The art of dialogue delivery plays a vital role in in ensuring the efficacy of communication especially from thedramatic aspect of it, this unit discusses some tips to help the young actors improve their dialogue deliveryskills:
- 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 Mono acting: different types of characters

Course	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 informed					
	choices in process and performance.					
CO4	Develop an awareness and understanding of the roles and processes undertaken in contemporary					
	professional theatre practice.					

Referen	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 topic- (phase 1) Justification for Importance, need of the hour with surveyed data.	10	****			
<b>EXPERIENTIAL LEARNING</b> Presentation 2 (phase 2) Content development, strategies for implementation methodologies.	10	****			
Case Study-based Teaching-Learning	10	Implementation			
Sector wise study & consolidation	10	strategies of the project with report			
Video based seminar (4-5 minutes per student)10					
TOTAL MARKS FOR THE COURSE	50 MARKS	50 MARKS			



			Semester: III			
		A	ARTWORK & PAINTING			
			(Practical)			
Course Code	:	HS237LG	CIE		:	50 Marks
Credits: L: T: P	:	0:0:2	SEE		:	50 Marks
Total Hours	:	26P	SEE	Duration	:	02 Hrs
		Contents	S .			26 Hrs

- 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 ocreate 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 compulsorilytake 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 presentedart style.

Course (	<b>Dutcomes: After completing the course, the students will be able to: -</b>
CO1	Use lines, shapes, and colors to depict the various sentiments and moods of life and nature.
CO2	Use one's creativity to develop forms and color schemes, as well as the ability to portray them effectively
	in drawing and painting on paper.
CO3	Develop the ability to properly use drawing and painting materials (surfaces, tools and equipment, and so
	on).
CO4	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.

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



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



		Sem	ester: III		
		PHOTOGRAPH	Y & FILM MAKING		
	С	ategory: ABILITY ENHANC	CEMENT COURSE (GROUP-C)		
		(Pr	actical)		
Course Code	:	HS237LH	CIE	:	50 Marks
Credits: L: T: P	:	0:0:2	SEE	:	50 Marks
Total Hours	:	26P	SEE Duration	:	02 Hrs
		Contents			26 Hrs

- 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 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	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



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



			Semester: III			
		BRIDGE CO	DURSE: C PROGRAMMING			
			datory Audit Course)			
			-			
Course Code		CS139AT	mon to all programs) CIE		50 1	Marks
Credits: L:T:P	:		SEE	:		
Total Hours	:	2:0:0(Audit) 30L	SEE Duration	:		
Total Hours	:	Unit		:		06 Hrs
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Introduction to F						
			uter system, Programming Langua		<b>F</b> 1	1
<b>v</b>		ition of efficient progra	ms. Program Design Tools: Algor	rithms	, Flow	charts and Pseudo
codes. Types of E	rors.	Unit -	п			06 Hrs
	4	Unit -	- 11			UO HIS
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• •		0	ens, Character set in C, Keywords,	Identi	tiers, I	Basic Data Types in
		, I/O statements in C.	C · 11			
Operators in C, T	pe co	nversion and type castin	÷ ^			0 < <b>T</b>
		Unit –	-111			06 Hrs
Decision Control	and I	Looping Statements				
Introduction to de	cision	control, conditional bra	anching statements, iterative stater	nents,	Neste	d loops, Break and
continue statemen	ts, got	to statements	-			-
Arrays	. 0					
•						
Introduction, Dec	laratio	on of Arrays, Accessing	g elements of an array, Storing v	alues	in arr	ays, Operations of
			g elements of an array, Storing v element in an array. Two dimension			
Arrays- Traversin	g, Ins		g elements of an array, Storing velement in an array. Two dimension			
	g, Ins		element in an array. Two dimension			
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Refe	Reference Books				
1.	Programming in C, Reema Thareja, 2018, Oxford University Press. ISBN: 9780199492282.				
2.	The C Programming Language, Kernighan B.W and Dennis M. Ritchie, 2015, 2 <sup>nd</sup> Edition, Prentice Hall, ISBN (13): 9780131103627.				
3.	Turbo C: The Complete Reference, H. Schildt, 2000, 4 <sup>th</sup> Edition, Mcgraw Hill Education, ISBN-13: 9780070411838.				
4.	Algorithmic Problem Solving, Roland Backhouse, 2011, Wiley, ISBN: 978-0-470-68453-5				

#### PRACTICE PROGRAMS

#### Implement the following programs using cc/gcc compiler

- 1. Familiarization with programming environment: Concept of creating, naming and saving the program file in gedit/vi editor, Concept of compilation and execution, Concept of debugging in GDB environment.
- 2. Implementation and execution of simple programs to understand working of
  - Formatted input and output functions- printf() and scanf().
  - Escape sequences in C.
  - Using formula in a C program for specific computation: For example: computing area of circle, converting Celsius to Fahrenheit, area of a triangle, converting distance in centimeters to inches, etc.
  - Preprocessor directives (#include, #define).
- 3. Execution of erroneous C programs to understand debugging and correcting the errors like:
  - Syntax / compiler errors.
  - Run-time errors.
  - Linker errors.
  - Logical errors.
  - Semantical errors.
- 4. Implementation and execution of simple programs to understand working of operators like:
  - Unary.
  - Arithmetic.
  - Logical.
  - Relational.
  - Conditional.
  - Bitwise.
- 5. Develop a C program to compute the roots of the equation  $ax^2 + bx + c = 0$ .
- 6. Develop a C program that reads N integer numbers and arrange them in ascending or descending order using selection sort and bubble sort technique.
- 7. Develop a C program for Matrix multiplication.
- 8. Develop a C program to search an element using Binary search and linear search techniques.
- 9. 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.
- 10. 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'.
- 11. Develop a C program using pointers to function to find given two strings are equal or not.
- 12. Develop a C program using recursion, to determine GCD, LCM of two numbers and to perform binary to decimal conversion.

Go, change the world



	RUBRICS FOR THE CONTINUOUS INTERNAL EVALUATION (THEORY)	)
#	COMPONENTS	MARKS
1.	QUIZZES: Quizzes will be conducted in online/offline mode. TWO QUIZZES will be conducted & Each Quiz will be evaluated for 05 Marks. THE SUM OF TWO QUIZZES WILL BE THE FINAL QUIZ MARKS.	10
2.	<b>TESTS:</b> Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). <b>TWO TESTS</b> will be conducted. Each test will be evaluated for 25 Marks, adding up to 50 Marks. <b>FINAL TEST MARKS WILL BE REDUCED TO 20 MARKS.</b>	20
3.	<b>EXPERIENTIAL LEARNING:</b> Students will be evaluated for their creativity and practical implementation of the problem. <b>Phase I (10) &amp; Phase II (10) ADDING UPTO 20 MARKS</b> .	20
	MAXIMUM MARKS FOR THE CIE THEORY	50



,				Semester: IV			
	PR	OF		RY AND LINEAR		Ĵ	
				FESSIONAL CORI AS, CH, CV, EE, EI			
				(Theory)	, E I , WIL)		
Course	Code	:	MA241TA	()	CIE	:	100 Marks
Credits	s: L:T:P	:	2:1:0		SEE	:	100 Marks
Total H	Iours	:	30L+26T		SEE Duration	:	03 Hours
				U <b>nit-I</b>			06 Hrs
Randon cumulat probabi	tive distribut lity mass f	isc tio fun	n function, mean ction, joint prob	s, probability mass f and variance. Two ability density fun a Implementation usi	or more random ction, conditional	va	riables - Join
<b>`</b>				nit – II	0		06 Hrs
	oility Distrib						
				and Geometric. Cor		ns –	Exponential,
Uniform	n, Normal an	a١	A	ation using MATLA	В.		06 Hrs
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				utions - Simple rand	om sampling (with	ren	lacement and
				Sampling distribution			
				tribution of difference			
				ation using MATLA			F
			_	nit –IV			06 Hrs
Inferen	ntial Statistic	s:					
Princip	les of Statistic	cal	Inference, Test of h	ypothesis - Null and	alternative hypothe	sis,	Procedure for
	•	• •	•	rrors, level of signif			•
				tests, P – value, Spec	•	nce	for large and
small sa	amples (F, Cl	ni –		. Implementation usi	ng MATLAB.		
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using G		ılat ıpl	ex and Big M meth	ods. Implementation	using MATLAB.	amn	ning problem
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using G Course CO1:	Outcomes: Illustrate th inferential s	Af	ex and Big M meth ter completing the fundamental conce istics and optimiza	ods. Implementation course, the student pts of random variation.	using MATLAB.	sam	npling,
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Refere	ence Books
1	Probability & Statistics for Engineers & Scientists, Ronald E. Walpole & Raymond H. Myers, 9 <sup>th</sup> Edition, 2016, Pearson Education, ISBN-13: 978-0134115856.
2	Applied Statistics and Probability for Engineers, Douglas C. Montgomery and George C. Runger, 6 <sup>th</sup> Edition, 2014, John Wiley & Sons, ISBN:13 9781118539712, ISBN (BRV):9781118645062.
3	Introduction to Probability and Statistics for Engineers and Scientists, Sheldon Ross, 5 <sup>th</sup> Edition, 2014, Academic Press, ISBN: 13-978-0123948113.
4	Higher Engineering Mathematics, B.S. Grewal, 44 <sup>th</sup> Edition, 2015, Khanna Publishers, ISBN: 81-7409-195-5.

	<b>RUBRIC FOR THE CONTINUOUS INTERNAL EVALUATION (THEOR</b>	RY)
#	COMPONENTS	MARKS
1.	QUIZZES: Quizzes will be conducted in online/offline mode. TWO QUIZZES will be conducted & Each Quiz will be evaluated for 10 Marks. THE SUM OF TWO QUIZZES WILL BE THE FINAL QUIZ MARKS.	20
2.	<b>TESTS:</b> Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). THREE tests will be conducted (Two regular tests & One optional Improvement test). Each test will be evaluated for 50 Marks, adding upto 100 Marks. <b>FINAL TEST MARKS WILL BE REDUCED TO 40 MARKS.</b>	40
3.	<b>EXPERIENTIAL LEARNING:</b> Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning (05), Program specific requirements (05), Video based seminar/presentation/demonstration (10), MATLAB (20). ADDING UPTO 40 MARKS.	40
	MAXIMUM MARKS FOR THE CIE THEORY	100

RUBRIC FOR SEMESTER END EXAMINATION (THEORY)				
Q. NO.	CONTENTS	MARKS		
	PART A	-		
1	Objective type questions covering entire syllabus	20		
	<b>PART B</b> (Maximum of TWO Sub-divisions only)			
2	Unit 1: (Compulsory)	16		
3 & 4	Unit 2: Question 3 or 4	16		
5&6	Unit 3: Question 5 or 6	16		
7 & 8	7 & 8 Unit 4: Question 7 or 8			
9 & 10	Unit 5: Question 9 or 10	16		
	TOTAL	100		



			Semester: IV			
		ENVIR	ONMENT AND SUSTA	INABILITY		
			tegory: Basket Courses			
			(Common to all Progr			
			(Theory)			
Course Code	:	CV242TA		CIE	:	100 Marks
Credits: L:T:P	:	03:00:00		SEE	:	100 Marks
Total Hours	:	45L		SEE Duration	:	03 Hrs
			Unit-I			10 Hrs
ENVIRONMENT	ANI	) <b>BIODIVERSI</b> 1	Y			
Definition, scope a	nd im	portance of envir	onment - need for public	awareness. Eco-system	and H	Energy flow–
ecological successi	on. T	ypes of biodiversi	ity: genetic, species and e	cosystem diversity– valu	ies of	biodiversity,
threats to biodivers	sity: l	nabitat loss, poacl	hing of wildlife, man-wil	ldlife conflicts – endang	gered	and endemic
species of India – c	conser	rvation of biodive	rsity.			
ENVIRONMENT						
		eventive measures	of Water, Soil, Air and	Noise Pollution. Solid,	Haza	ardous and E-
Waste managemer						
	th an	d Safety Manager	ment system (OHASMS)	. Environmental protect	ion, E	Environmental
protection acts.						
			Unit – II			09 Hrs
RENEWABLE SO						
	nt and	d conservation, No	ew Energy Sources: Nee	d of new sources. Dif	ferent	types ofnew
energy sources.						
		•	and sequestration, Gre	en Engineering: Susta	inable	e urbanization-
Socioeconomical a	nd tee	chnological chang	20			
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	•	ogen energy, Oce	ean energy resources, Tid	dal energy conversion.	Conce	ept, origin and
Applications of -	•	ogen energy, Oce nal energy.	ean energy resources, Tio	dal energy conversion.	Conce	
power plants of geo	otherr	ogen energy, Oce nal energy.	ean energy resources, Tio	dal energy conversion.	Conce	ept, origin and <b>09 Hrs</b>
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power plants of geo SUSTAINABILIT Introduction to E	TY All	ogen energy, Oce nal energy. ND MANAGEM nmental Econom	ean energy resources, Tid Unit –III ENT ics, Environmental Auc	lit, Development, GDI	P, Su	09 Hrs stainability -
sustainable for the second sec	TY A nviro d cha	ogen energy, Oce nal energy. ND MANAGEM nmental Econom allenges-economic	ean energy resources, Tid Unit –III ENT ics, Environmental Auc c, social and aspects of	lit, Development, GDI	P, Su	09 Hrs stainability -
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Course	Course Outcomes: After completing the course, the students will be able to:				
CO1	Understand the basic elements of Environment and its Biodiversity.				
CO2	Explain the various types of pollution and requirement for sustainable strategy for present scenario.				
CO3	Evaluate the different concepts of sustainability and its significance for welfare of all life forms.				
CO4	Recognize the role of Corporate social responsibility in conserving the Environment.				

Refere	ence Books
1.	Environmental Science and Engineering, Benny Joseph, Tata McGraw-Hill, New Delhi, 2016. ISBN-13 -978-9387432352.
2.	Introduction to Environmental Engineering and Science, Gilbert M.Masters, Wendell P Ela, 3 <sup>rd</sup> Edition, Pearson Education, 2006. ISBN-13 - 978-0132339346.
3.	Environment Impact Assessment Guidelines, Notification of Government of India, 2006.
4.	A Handbook of Corporate Governance and Social Responsibility (Corporate Social Responsibility), David Crowther and Guler Aras, Gower Publishing Ltd, ISBN - 13 - 978-0566088179.

	<b>RUBRIC FOR THE CONTINUOUS INTERNAL EVALUATION (THEORY)</b>	
#	COMPONENTS	MARKS
1.	<b>QUIZZES:</b> Quizzes will be conducted in online/offline mode. TWO QUIZZES will be conducted & Each Quiz will be evaluated for 10 Marks. <b>THE SUM OF TWO QUIZZES WILL BE THE FINAL QUIZ MARKS.</b>	20
2.	<b>TESTS:</b> Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). TWO tests will be conducted. Each test will be evaluated for 50 Marks, adding upto 100 Marks. <b>FINAL TEST MARKS WILL BE REDUCED TO 40 MARKS.</b>	40
3.	<b>EXPERIENTIAL LEARNING:</b> Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning (10), Program specific requirements (10), Video based seminar/presentation/demonstration (20) <b>Phase 2 will be done in the exhibition mode (Demo/Prototype/any outcome). ADDING UPTO 40 MARKS</b> .	40
	MAXIMUM MARKS FOR THE CIE THEORY	100

	<b>RUBRIC FOR SEMESTER END EXAMINATION (THEORY)</b>					
Q. NO.	CONTENTS	MARKS				
	PART A					
1	Objective type questions covering entire syllabus	20				
	PART B (Maximum of TWO Sub-divisions only)					
2	Unit 1 : (Compulsory)	16				
3 & 4	Unit 2 : Question 3 or 4	16				
5&6	Unit 3 : Question 5 or 6	16				
7&8	Unit 4 : Question 7 or 8	16				
9 & 10	Unit 5: Question 9 or 10	16				
	TOTAL	100				



				Semester: IV			
				ALS SCIENCE FOR			
			Category:	Category: Basket Co (Common to all Prog	-		
				(Common to an 110) (Theory)	gi allis)		
Cours	e Code	:	ME242TB		CIE	:	100 Marks
Credit	ts: L:T:P	:	3:0:0		SEE	:	100 Marks
Total ]	Hours	:	40L		SEE Duration	:	3 Hours
				Unit-I			06 Hrs
The F	undamenta	ls o	f Materials				
					ar bonds: ionic bond, cova		
					nds in metals, insulators, a		
				ations. Types of mate	rials: polymers, metals ar	nd allo	bys, ceramics,
semico	onductors, co	omp	oosites.	Unit – II			10 Hrs
Mcto				UIIII – 11			10 Hrs
	<b>ial behavio</b>		ermal conductivity	thermoelectric effects	heat capacity, thermal ex	nancic	n coefficient
					chaviours and temperature		
					ectricity, super conductor.		
			<u> </u>	2 1	strain diagram, elastic d		1 1
					fracture toughness, fatigue		
				Unit –III			10 Hrs
Matan	viola and the						
water	Tais and the	eir A	Applications				
Semico	onductors, d	liele	ectrics, optoelectron		ls, ferrous alloys, nonferr		-
Semico concre	onductors, dete, ceramic	liele , ai	ectrics, optoelectron nd glasses. Polyme	rs: thermosets and the	hermoplastics, composite	s: fib	re-reinforced,
Semico concre	onductors, dete, ceramic	liele , ai	ectrics, optoelectron nd glasses. Polyme	rs: thermosets and the set of the		s: fib	re-reinforced, terials.
Semico concre aggreg	onductors, c ete, ceramic gated compos	liele , ai	ectrics, optoelectron nd glasses. Polyme	rs: thermosets and the	hermoplastics, composite	s: fib	re-reinforced,
Semico concre aggreg Heat T	onductors, dete, ceramic gated compose <b>Freatment</b>	liele , ai site	ectrics, optoelectron nd glasses. Polyme s, electronic packagi	rs: thermosets and t ng materials, biomater Unit –IV	hermoplastics, composite ials, processing of structur	s: fib ral ma	re-reinforced, terials. 07 Hrs
Semico concre aggreg Heat T Post pr	onductors, dete, ceramic gated compose <b>Freatment</b> rocessing he	liele , an site	ectrics, optoelectron nd glasses. Polyme s, electronic packagi treatment of electron	rs: thermosets and the ng materials, biomater Unit –IV nic devices: thermal or	hermoplastics, composite ials, processing of structur xidation, diffusion, rapid	s: fib ral ma	re-reinforced, terials. 07 Hrs al processing.
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RV College of Engineering<sup>®</sup> Mysore Road, RV Vidyaniketan Post, Bengaluru - 560059, Karnataka, India

Refe	erence Books
1.	Material Science and Engineering, William D Callister, 6 <sup>th</sup> Edition, 1997, John Wiley and Sons, ISBN: 9812-53-052-5.
2.	Introduction to Physical Metallurgy, Sydney H Avner, 1994, Mc. Graw Hill Book Company, ISBN: 0-07-Y85018-6.
3.	Material Science and Engineering, William F Smith, 4 <sup>th</sup> Edition, 2008, Mc. Graw Hill Book Company, ISBN: 0-07-066717-9.
4.	Nanomaterials: Synthesis, Properties and Applications, A.S. Edelstein and R.C. Cammarata, CRC Press 1996, ISBN:978-0849322749.

	<b>RUBRIC FOR THE CONTINUOUS INTERNAL EVALUATION (THEORY)</b>	
#	COMPONENTS	MARKS
1.	<b>QUIZZES:</b> Quizzes will be conducted in online/offline mode. TWO QUIZZES will beconducted & Each Quiz will be evaluated for 10 Marks. <b>THE SUM OF TWO QUIZZES WILL BE THE FINAL QUIZ MARKS.</b>	20
2.	<b>TESTS:</b> Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). TWO tests will be conducted. Each test will be evaluated for 50 Marks, adding upto 100 Marks. <b>FINAL TEST MARKS WILL BE REDUCED TO 40 MARKS.</b>	40
3.	<b>EXPERIENTIAL LEARNING:</b> Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning (10), Program specific requirements (10), Video based seminar/presentation/demonstration (20) <b>Phase 2 will be done in the exhibition mode (Demo/Prototype/any outcome). ADDING UPTO 40 MARKS</b> .	40
MAX	IMUM MARKS FOR THE CIE THEORY	100

	<b>RUBRIC FOR SEMESTER END EXAMINATION (THEORY)</b>				
Q. NO.	CONTENTS	MARKS			
	PART A				
1	Objective type questions covering entire syllabus	20			
	PART B (Maximum of TWO Sub-divisions only)				
2	Unit 1: (Compulsory)	16			
3 & 4	Unit 2: Question 3 or 4	16			
5&6	Unit 3: Question 5 or 6	16			
7&8	Unit 4: Question 7 or 8	16			
9 & 10	Unit 5: Question 9 or 10	16			
	TOTAL	100			



			Semester: IV			
		BIOS	SAFETY STANDARDS AN	<b>ID ETHICS</b>		
		С	ategory: Basket Courses - C	-		
			(Common to all Program	ns)		
~ ~ ~	1		(Theory)	~~~~		
Course Code	:	BT242TC		CIE	:	100 Marks
Credits: L:T:P	:	3:0:0		SEE	:	100 Marks
Total Hours	:	45L		SEE Duration	:	03 Hrs
			Unit-I			09 Hrs
Biohazards, Bio	safety	y levels and cal	binets: Introduction to Bioha	azards, Biological Sa	afety 1	evels, Biosafety
			o safety cabinets. Various pa			
(Materials used for	r fabr	ication, sensors,	filters, pumps, compressors)	-		-
			Unit – II			08 Hrs
<b>Biosafety Guideli</b>	nes:	Biosafety guide	lines of Government of India	a, GMOs & LMOs, I	Roles	of Institutional
•			Committee on Genetic Manij			
Committee) for	GMC	) applications	in food and agriculture.	Overview of Nation	al R	egulations and
relevant Internatio	nal A	greements inclu	ding Cartagena Protocol.			-
			Unit –III			10 Hrs
Food safety stand	lards	: FSSAI (Food	Safety and Standards Author	rity of India), Functi	ons, L	icense, types o
FOGATT:	nd co	mpliance rules	•			
FSSAI Licences an		impliance rules.				
Food Hygiene: G	lenera	al principles of	food microbiology and over		pathog	
Food Hygiene: G microorganisms in	the f	al principles of food chain (raw :	materials, water, air, equipme	ent, etc.)		gens, sources o
<b>Food Hygiene:</b> G microorganisms in Quality of foods,	eneration the formation of the formation of the second sec	al principles of food chain (raw a obial food spoil	materials, water, air, equipme age and Foodborne diseases	ent, etc.) s, Overview of bene	ficial	gens, sources o microorganism
<b>Food Hygiene:</b> G microorganisms in Quality of foods, and their role in fo	ienera the f Micr ood p	al principles of food chain (raw a obial food spoil rocessing and h	materials, water, air, equipme age and Foodborne diseases uman nutrition, Food Analys	ent, etc.) s, Overview of bene sis and Testing, Gene	ficial	gens, sources o microorganism
<b>Food Hygiene:</b> G microorganisms in Quality of foods, and their role in fo	ienera the f Micr ood p	al principles of food chain (raw a obial food spoil rocessing and h	materials, water, air, equipme age and Foodborne diseases uman nutrition, Food Analys alysis Critical Control Point	ent, etc.) s, Overview of bene sis and Testing, Gene	ficial	gens, sources o microorganism rinciples of food
<b>Food Hygiene:</b> G microorganisms in Quality of foods, and their role in fo safety managemen	eneration the f Micr bod p t syst	al principles of food chain (raw obial food spoil rocessing and h tems, Hazard Ar	materials, water, air, equipme age and Foodborne diseases uman nutrition, Food Analys alysis Critical Control Point <b>Unit –IV</b>	ent, etc.) s, Overview of bene sis and Testing, Gene	ficial	gens, sources o microorganism
Food Hygiene: G microorganisms in Quality of foods, and their role in for safety management Food Preservation	eneration the f Micr Dod p t system	al principles of food chain (raw so obial food spoil rocessing and h tems, Hazard Ar rocessing, and J	materials, water, air, equipme age and Foodborne diseases uman nutrition, Food Analys alysis Critical Control Point Unit –IV packaging	ent, etc.) s, Overview of bene sis and Testing, Gene (HACCP).	ficial eral pi	gens, sources o microorganism inciples of food 09 Hrs
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Cours	Course Outcomes: After completing the course, the students will be able to:					
CO1	Have a comprehensive knowledge of Biohazards and bio safety levels					
CO2	Understand the biosafety guidelines and their importance to the society					
CO3	Acquire knowledge with respect to the Food standards, Hygiene, food processing and packing					
<b>CO4</b>	Appreciate the food safety, Ethics, biosafety and bio ethics					



Ref	Reference Books						
1.	IPR, Biosafety and Bioethics, Deepa Goel, Shomini Parashar 1 <sup>st</sup> Edition, 2013, ISBN: 978-8131774700.						
2.	The Food Safety, Cynthia A Roberts, Oryx Press, 1st Edition, 2001, ISBN: 1–57356–305–6.						
3.	Food Safety Management Systems, Hal King, Springer Cham, 2020, ISBN: 978-3-030-44734-2.						
4.	Bioethics: The Basics, Routledge, Alastair V. Campbell, 2 <sup>nd</sup> edition, 2017, ISBN: 978-0415790314.						

RUBRIC FOR THE CONTINUOUS INTERNAL EVALUATION (THEORY)				
#	COMPONENTS	MARKS		
1.	<b>QUIZZES:</b> Quizzes will be conducted in online/offline mode. TWO QUIZZES will be conducted & Each Quiz will be evaluated for 10 Marks. <b>THE SUM OF TWO QUIZZES WILL BE THE FINAL QUIZ MARKS.</b>	20		
2.	<b>TESTS:</b> Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). TWO tests will be conducted. Each test will be evaluated for 50 Marks, adding upto 100 Marks. <b>FINAL TEST MARKS WILL BE REDUCED TO 40 MARKS</b> .	40		
3.	<b>EXPERIENTIAL LEARNING:</b> Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning (10), Program specific requirements (10), Video based seminar/presentation/demonstration (20) <b>ADDING UPTO 40 MARKS</b> .	40		
	MAXIMUM MARKS FOR THE CIE THEORY	10 0		

	<b>RUBRIC FOR SEMESTER END EXAMINATION (THEORY)</b>				
Q. NO.	CONTENTS	MARKS			
	PART A				
1	Objective type questions covering entire syllabus	20			
	PART B				
	(Maximum of TWO Sub-divisions only)				
2	Unit 1: (Compulsory)	16			
3 & 4	Unit 2: (Internal Choice)	16			
5&6	Unit 3: (Internal Choice)	16			
7 & 8	Unit 4: (Internal Choice)	16			
9 & 10	Unit 5: (Internal Choice)	16			
	TOTAL	100			



				Semester	: IV					
		MICR	ROCON	<b>FROLLER</b>	& PROGRAM	<b>IMING</b>				
		Cate	egory: PF	ROFESSION	AL CORE CO	URSE				
			(Con	nmon to EI, I	EC, ET, EE)					
				Theory and <b>I</b>	Practice)					
Course Co										
Credits: L		03:00:0			SEE	:		100+50		
Total Hou	rs	45L+30			SEE Dura	ation :	:	03 Hrs+		
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Introducti	on to Processi	ng units:								
		0	k diagram	n Processor la	ogic unit, Contro	ol unit Ir	nst	ruction f	ormat	Assembl
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					ixed point, Intr					
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0	<b>d Analog IO:</b> ex M4 MCUs.	Mamory o	roonizati	on Reset & C				mming:		
and Push b	buttons, Analo	g to digita	al conver	ters (ADC), S	lock Control, G Successive App DAC), Program	roximatio		ADC, P		
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and Push t interfacing Serial Port	buttons, Analog an analog sens t USART:	g to digita or, Digital	al conver l to Analo Ur	rters (ADC), s og Converter ( nit –IV	Successive App DAC), Program	roximatic ming.	on		rogram	ming and 9 Hrs
and Push t interfacing Serial Port Basics of s	buttons, Analog an analog sens t USART: erial communic	g to digita or, Digital	al conver l to Analo Ur	rters (ADC), s og Converter ( nit –IV s, asynchrono	Successive App DAC), Program	roximatic ming. ampling,	Ba	aud rate ;	rogram 09 generati	ming and 9 Hrs on,
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and Push t interfacing Serial Port Basics of s Programmi	buttons, Analog an analog sens t USART: erial communic ing USART for	g to digita or, Digital	al conver l to Analo Ur nchronou transmiss	rters (ADC), s og Converter ( nit –IV s, asynchrono	Successive App DAC), Program	roximatic ming. ampling,	Ba	aud rate ;	rogrami 09 generati for data	ming and 9 Hrs on,
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and Push b interfacing Serial Port Basics of se Programmi Interrupts Types of ir Programmi Programmi Course Ou	t USART: erial communic ing USART for and Timers: nterrupts, Nester ing interrupts, T ing modulators utcomes: After Analyse the a computers an Compile the	g to digita or, Digital cation (Syn character d vector i Timers, Co to generat <b>completi</b> rchitecture <u>d embeddo</u> informatio	al conver l to Analo Ur mchronou transmiss Un interrupt of ontrolling te PWM v ing the co e, instruct led system on of AE	ters (ADC), s og Converter ( nit –IV s, asynchrono sion, Serial Per nit –V controller (NV the operation wave for given ourse, the stua ion set and me ns.	Successive App DAC), Program us), Framing, S ipheral Interfac /IC) in Cortex-I , Programming n specifications.	ampling, e, Program M cores, with time le to: - on of pro		aud rate g ning SPI errupt vo Pulse w	rogrami 09 generati for data 09 ectors, I idth mo	ming and 9 Hrs on, 1 transfer 9 Hrs Priorities odulators

Apply the knowledge of microcontroller for programming peripherals using registers and APIs

**CO3** 



Referen	nce Books
1.	The Definitive Guide to the ARM Cortex-M3& M4 Processors, Joseph Yiu, 3 <sup>rd</sup> Edition, Newnes
	(Elsevier), 2014, ISBN:978-93-5107-175-4.
2.	STM32 Arm Programming for Embedded Systems, Shujen Chen, Eshragh Ghaemi, Muhammad Ali
	Mazidi, Microdigitaled, ISBN: 978-0997925944.
3.	Reference manuals: STM32F411, STMcubeMX, SPI
4.	White Paper: Cortex-M for Beginners - An overview of the Arm Cortex-M processor family and
	comparison.

#### Practical: Programming in ARM Assembly using Keil

- 1. Data Transfer Programs: Block Moves & Exchange (With & Without Overlap) with & without String Instructions.
- 2. Arithmetic Operations: Addition, Multiplication & Division on 32-Bit Data.
- 3. Search for a Key in an Array of Elements using Linear Search, Binary Search. Programming in Keil using embedded C in STMCubeMx.
- 4. Program digital IOs control LEDs, seven segment interface, push buttons.
- 5. Program digital IOs to control stepper and motor drivers for given specifications.
- 6. Program ADC and show analog to digital conversion. Display digital value on suitable interface.
- 7. Program ADC and show interfacing of analog sensor for given specifications.
- 8. Program USART and serial data transfer.
- 9. Program SPI and show the configuration and data transfer between SPI slave device and master.
- 10. Program to configure NVIC and writing interrupt service routines.

#### **Innovative Experiments**

- 1. Program SPI and show the configuration and data transfer between SPI slave device and master.
- 2. Program ADC and show interfacing of analog sensor for given specifications.
- 3. Data transfer in polling, interrupt and DMA based modes.
- 4. Real time Audio applications: Flanging effect.



RU	RUBRIC FOR THE CONTINUOUS INTERNAL EVALUATION (THEORY AND PRACTICE)					
#	COMPONENTS	MARKS				
1.	<b>QUIZZES:</b> Quizzes will be conducted in online/offline mode. <b>TWO QUIZZES</b> will be conducted & Each Quiz will be evaluated for 10 Marks. Each quiz is evaluated for 10 marks adding up to 20 MARKS.	20				
2.	<b>TESTS:</b> Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). <b>TWO tests will be conducted</b> . Each test will be evaluated for <b>50 Marks</b> , adding up to 100 Marks. <b>FINAL TEST MARKS WILL BE REDUCED TO 40 MARKS</b> .	40				
3.	<b>EXPERIENTIAL LEARNING:</b> Students will be evaluated for their creativity and practical implementation of the problem. Case study based teaching learning (10), Program specific requirements (10), Video based seminar/presentation/demonstration (10) Designing & Modeling (10) Phase 2 will be done in the exhibition mode (Demo/Prototype/any outcome). ADDING UPTO 40 MARKS.	40				
4.	<b>LAB:</b> Conduction of laboratory exercises, lab report, observation, and analysis (20 Marks), lab test (10 Marks) and Innovative Experiment/ Concept Design and Implementation (20 Marks) adding up to 50 Marks. THE FINAL MARKS WILL BE 50 MARKS.	50				
	MAXIMUM MARKS FOR THE CIE (THEORY AND PRACTICE)	150				

	<b>RUBRIC FOR SEMESTER END EXAMINATION (THEORY)</b>					
Q.NO.	CONTENTS	MARKS				
	PART A					
1	Objective type of questions covering entire syllabus	20				
	PART B (Maximum of THREE Sub-divisions only)					
2	Unit 1: (Compulsory)	16				
3 & 4	Unit 2: Question 3 or 4	16				
5&6	Unit 3: Question 5 or 6	16				
7 & 8	Unit 4: Question 7 or 8	16				
9 & 10	Unit 5: Question 9 or 10	16				
	TOTAL	100				

	<b>RUBRIC FOR SEMESTER END EXAMINATION (LAB)</b>					
Q.NO.	CONTENTS	MARKS				
1	Write Up	10				
2	Conduction of the Experiments	30				
3	Viva	10				
	TOTAL	50				



Course Code Credits: L:T:P Total Hours Introduction to Signal Definition of Signals, definition of Systems, analog to digital signals	Ту Pro	Category: I EC244AI 03:00:01 45L+30P md Systems: pes and Classif		ORE COURSE ce) EI) CIE SEE SEE Duration	::	100+50 M 100+50 M 03 Hrs+0	Aarks
Credits: L:T:P Total Hours Introduction to Signal Definition of Signals, definition of Systems,	: : Is a Ty Pro	EC244AI 03:00:01 45L+30P and Systems: pes and Classif	(Theory & Practi (Common to EC, ) Unit-I fication of Signals v	ce) EI) CIE SEE SEE Duration	:	100+50 N	Aarks 3 Hrs
Credits: L:T:P Total Hours Introduction to Signal Definition of Signals, definition of Systems,	: : Is a Ty Pro	03:00:01 45L+30P and Systems: ypes and Classit	(Common to EC, Unit-I fication of Signals v	EI) CIE SEE SEE Duration	:	100+50 N	Aarks 3 Hrs
Credits: L:T:P Total Hours Introduction to Signal Definition of Signals, definition of Systems,	: : Is a Ty Pro	03:00:01 45L+30P and Systems: ypes and Classit	Unit-I fication of Signals v	CIE SEE SEE Duration	:	100+50 N	Aarks 3 Hrs
Credits: L:T:P Total Hours Introduction to Signal Definition of Signals, definition of Systems,	: : Is a Ty Pro	03:00:01 45L+30P and Systems: ypes and Classit	fication of Signals v	SEE SEE Duration	:	100+50 N	Aarks 3 Hrs
Total Hours Introduction to Signal Definition of Signals, definition of Systems,	: Is a Ty Pro	45L+30P and Systems: ypes and Classif	fication of Signals v	<b>SEE Duration</b> vith examples, Basic	-		3 Hrs
<b>Introduction to Signal</b> Definition of Signals, definition of Systems,	ls a Ty Pro	nd Systems: pes and Classi	fication of Signals v	vith examples, Basic	:	03 Hrs+0	
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Definition of Signals, definition of Systems,	Ту Pro	pes and Classif					<b>U9 HIS</b>
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definition of Systems,	Pro				Or	perations o	n Signals
		perties of Syster	ins, system viewed a	a Interaconnection of (			
analog to digital signal	5.			is interconnection of v	Ope	rations. Co	
			Unit – II				09 Hrs
Time domain renreas	<b></b>	tions of Lincon		toma			071115
Time domain represe					. D	alations	l
Convolution Sum, cond				lections of LTT System	n, K	leiations	between
LTI Systems, Propertie	s o	I L I I systems, A	Applications.				
			Unit –III				09 Hrs
Applications of Fourie	or I	Penresentation					<b>07 111</b> 5
Review of Fourier tran				vith properties (no der	ivat	tion) com	nutation of
DTFT for basic periodi					Iva	uon), com	
D II I Ioi busic periodi	c u	na non perioaie	signuis, ripplications				
			Unit –IV				09 Hrs
The Discrete Fourier	tra	nsforms - Prop	erties and Application	ons:			
Concept of DFT, Prop					ies	Multiplica	tion of tw
DFTs, circular correlat							
long data sequence. Eff							intering of
iong data sequence. En	1010	ent computation		Sometimes up to a point		1	
			Unit –V				09 Hrs
Time and frequency d	om	nain features:					
Time domain features			ce correlation skewr	ness energy envelop	of	signal etc.	Frequenc
domain features like do							
		num nequency,	Pour vulue etc, Class	invation of signals Das	Ju	on reature	can action.
Course Outcomes: Af	ter	completing the	e course, the student	s will be able to: -			

004150	
CO1	Analyze the fundamental concepts of both continuous and discrete signals and
	systems, representation of both periodic & aperiodic signals in frequency domain.
CO2	Analysis the strong fundamentals in discrete time signal processing.
CO3	Analyze discrete system and validate the functionality of the same using simulation tool.
CO4	Design discrete systems to meet specific requirement for signal processing application.



Refer	ence Books
1	Signals and Systems, Simon Haykin and Barry Van Veen, John Wiley & Sons, 2 <sup>nd</sup> Edition,2008. (Unit
1.	1 and 2)
2.	Digital Signal Processing, Proakis G & Dimitris G. Manolakis, PHI, 3 <sup>rd</sup> Edition, 2007. (Unit 3, 4 and 5)
3.	Signals and Systems, V. Oppenheim, Alan Willsky and A. Hamid Nawab, Pearson Education, Asia/ PHI, 2 <sup>nd</sup> Edition, 2006
4.	Digital Signal Processing a Practical Approach, Emmanuel C. Ifeachar, Barrie E. Jervis, Pearson Education, 2 <sup>nd</sup> Edition, 2003.

#### **Practical's:**

- 1. Generation of the following discrete signals using MATLAB. (i) unit step (ii) unit impulse (iii) unit ramp (iv) Sinc (v) Gaussian.
- 2. Perform basic operations: time shifting, time scaling and time reversal for the above signals and plot.
- 3. Write a MATLAB program to FT of basic signals. Also plot its magnitude and phase spectrum.
- 4. Write a MATLAB program for calculating DFT and IDFT discrete time sequences using analytical calculation and inbuilt function.
- 5. Write a Python program for linear and circular convolution of two discrete time sequences. Plot all the sequences and verify the result by analytical calculation.
- 6. Write a Python program for circular correlation of two discrete time sequences. Plot all the sequences and verify the result by analytical calculation.
- 7. Write a python code to extract features in time domain for any signal.
- 8. Write a python code to extract features in frequency domain for any signal.
- 9. Develop a Simulink model to demonstrate Amplitude modulation and Demodulation.
- 10. Write a python Code to classify two signals using various features.

#### **Innovative Experiment**

1. Demonstration of any real time applications using microcontroller.



RU	RUBRIC FOR THE CONTINUOUS INTERNAL EVALUATION (THEORY AND PRACTICE)				
#	COMPONENTS	MARKS			
1.	<b>QUIZZES:</b> Quizzes will be conducted in online/offline mode. <b>TWO QUIZZES</b> will be conducted & Each Quiz will be evaluated for 10 Marks. Each quiz is evaluated for 10 marks adding up to 20 MARKS.	20			
2.	<b>TESTS:</b> Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). <b>TWO tests will be conducted</b> . Each test will be evaluated for <b>50 Marks</b> , adding up to 100 Marks. <b>FINAL TEST MARKS WILL BE REDUCED TO 40 MARKS</b> .	40			
3.	<b>EXPERIENTIAL LEARNING:</b> Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning (10), Program specific requirements (10), Video based seminar/presentation/demonstration (10) Designing & Modeling (10) Phase 2 will be done in the exhibition mode (Demo/Prototype/any outcome). ADDING UPTO 40 MARKS.	40			
4.	<b>LAB:</b> Conduction of laboratory exercises, lab report, observation, and analysis (20 Marks), lab test (10 Marks) and Innovative Experiment/ Concept Design and Implementation (20 Marks) adding up to 50 Marks. THE FINAL MARKS WILL BE 50 MARKS.	50			
	MAXIMUM MARKS FOR THE CIE (THEORY AND PRACTICE)	150			

	<b>RUBRIC FOR SEMESTER END EXAMINATION (THEORY)</b>					
Q.NO.	CONTENTS	MARKS				
	PART A					
1	Objective type of questions covering entire syllabus	20				
	PART B (Maximum of THREE Sub-divisions only)					
2	Unit 1: (Compulsory)	16				
3 & 4	Unit 2: Question 3 or 4	16				
5&6	Unit 3: Question 5 or 6	16				
7&8	Unit 4: Question 7 or 8	16				
9 & 10	Unit 5: Question 9 or 10	16				
	TOTAL	100				

RUBRIC FOR SEMESTER END EXAMINATION (LAB)					
Q.NO.	CONTENTS	MARKS			
1	Write Up	10			
2	Conduction of the Experiments	30			
3	Viva	10			
	TOTAL	50			



			Semester: I	V			
			SENSORS AND AC				
Category: PROFESSIONAL CORE COURSE							
(Theory)							
Course Code						5	
Credits: L:T:P	:	03:00:00		SEE	:	100 Marks	5
Total Hours	:	45L		SEE Duration	:	03 Hrs	
			Unit-I	·	•		09 Hrs
Introduction:							•
Definition of a se	enso	or, Generalized m	neasurement system, S	tatic and dynamic	chara	cteristics of	Instruments,
Classification of s	sens	sors, Characterist	ics of sensors.				
<b>Resistive sensors</b>	:Po	otentiometers: Ch	aracteristics, Loading	effect, and problem	s. Stra	in gauge: Tł	eory, Types,
applications and p	oroł	blems. Thermisto	r, RTD: Theory, applic	ations and problem	ns.		
			Unit – II				09 Hrs
Thermocouple: N	Mea	asurement of ther	mocouple output, com	pensating circuits, l	lead co	mpensation	, advantages,
and disadvantages	s of	f thermocouple.		. –		-	-
Inductive sensor	s: F	Basic principle, T	ypes of Inductive trans	ducers: LVDT			
			, Characteristics, Pract		f LVD'	Г.	
Capacitive senso	rs:	Capacitive sense	ors using change in are	a of plates (Cylind	lrical),	distance be	tween plates
(Parallel plate) an	d c	hange of dielectri	ic constants, Frequency	response, Applica	tions c	f Capacitiv	e sensors and
problems.		-				_	
			Unit –III				09 Hrs
Piezo-electric ser	nso	rs: Principle of o	peration, expression for	or output voltage, p	iezo-e	lectric mate	rials,
			quency response and pr				
Photo sensors: P	1	a resistor Photod	liode, Phototransistor,	DI CET CI.		ed device.	
	not	0 10313101, 1 110100		Photo FET, Charge	e coup.		
Chemical sensor			lissolved oxygen senso			ential sense	r, Zirconium
Chemical sensor	<b>s:</b> p	H value sensor, d				ential sense	r, Zirconium
probe Sensors, Cl Tactile sensors: (	s: p hen Cor	bH value sensor, d n FET sensors. nstruction and ope	lissolved oxygen senso eration, types.	r, oxidation-reduct	ion po		
probe Sensors, Cl Tactile sensors: (	s: p hen Cor	bH value sensor, d n FET sensors. nstruction and ope	lissolved oxygen senso	r, oxidation-reduct	ion po		
probe Sensors, Cl Tactile sensors: ( Special Transdu	s: p hen Cor cer	oH value sensor, d n FET sensors. nstruction and ope s: Direction sens	lissolved oxygen senso eration, types. sors, Thin film sensors <b>Unit –IV</b>	r, oxidation-reduct and smart sensors:	ion por	ples and ap	olications. 09 Hrs
probe Sensors, Cl Tactile sensors: ( Special Transdu	s: p hen Cor cer	oH value sensor, d n FET sensors. nstruction and ope s: Direction sens	lissolved oxygen senso eration, types. sors, Thin film sensors	r, oxidation-reduct and smart sensors:	ion por	ples and ap	olications. 09 Hrs
probe Sensors, Cl Tactile sensors: ( Special Transdu Fabrication Tech	s: p hen Cor cer	oH value sensor, d in FET sensors. instruction and operation senses is: Direction sense ques for Thin Fi	lissolved oxygen senso eration, types. sors, Thin film sensors <b>Unit –IV</b>	r, oxidation-reduct and smart sensors: ithography; Types	ion por Princi	ples and ap	plications. 09 Hrs pplication of
probe Sensors, Cl Tactile sensors: ( Special Transdu Fabrication Tech	s: p hen Cor cer	oH value sensor, d in FET sensors. instruction and operation senses is: Direction sense ques for Thin Fi	lissolved oxygen senso eration, types. sors, Thin film sensors Unit –IV ilm Sensors: Photo L	r, oxidation-reduct and smart sensors: ithography; Types	ion por Princi	ples and ap	plications. 09 Hrs pplication of
probe Sensors, Cl Tactile sensors: ( Special Transdu Fabrication Tech photoresists on su Electroplating.	s: p hen Cor cer hni ubs	oH value sensor, d in FET sensors. instruction and operative s: Direction sense ques for Thin Fit trate. LIGA pro	lissolved oxygen senso eration, types. sors, Thin film sensors Unit –IV ilm Sensors: Photo L	r, oxidation-reduct and smart sensors: ithography; Types tion, Material for	Princi s of ph Substr	ples and ap otoresists, a ate and Pho	plications. 09 Hrs pplication of toresists and
probe Sensors, Cl Tactile sensors: ( Special Transdue Fabrication Tech photoresists on su Electroplating. Humidity Sensor	s: p herr Cor cer hnie ubs	oH value sensor, d in FET sensors. Instruction and operation sense is: Direction sense ques for Thin Fit trate. LIGA pro and Moisture Se	lissolved oxygen senso eration, types. sors, Thin film sensors Unit –IV ilm Sensors: Photo L ocess; General Descrip	r, oxidation-reduct and smart sensors: ithography; Types tion, Material for midity, Electrical (	Princi s of ph Substr	ples and ap otoresists, a ate and Pho	plications. 09 Hrs pplication of toresists and
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Course	Course Outcomes: After completing the course, the students will be able to:-					
CO1	Comprehend the basic principles of different sensors and actuators.					
CO2	Apply the knowledge of sensors and actuators to comprehend digital instrumentation systems.					
CO3	Analyse and evaluate the performance characteristics of different sensors for various applications.					
CO4	Create a system using appropriate sensors for a particular application.					

Go, change the world



Referen	ce Books
1.	Handbook of Modern Sensors: Physics, Designs, and Applications, Jacob Fraden, Springer, 2016 Edition, ISBN: 3319307673
2.	Electrical and Electronic Measurements and Instrumentation, A.K. Sawhney, Dhanpat Rai & Co. (P) Limited, 8 <sup>th</sup> Edition, January 2015, ISBN: 8177001000.
3.	Sensors and Actuators: Control systems Instrumentation, Clarence W.de Silva, CRC Press, 2015 Edition, ISBN: 978-1-4200-4483-6.
4.	Sensors and Actuators: Francisco Alegria, World Scientific Publishing, 2022 Edition, ISBN: 978-981-124-250-2.

	<b>RUBRIC FOR THE CONTINUOUS INTERNAL EVALUATION (THEORY)</b>	
#	COMPONENTS	MARKS
1.	QUIZZES: Quizzes will be conducted in online/offline mode. TWO QUIZZES will beconducted & Each Quiz will be evaluated for 10 Marks. THE SUM OF TWO QUIZZES WILL BE THE FINAL QUIZ MARKS.	20
2.	<b>TESTS:</b> Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). TWO tests will be conducted. Each test will be evaluated for 50 Marks, adding upto 100 Marks. <b>FINAL TEST MARKS WILL BE REDUCED TO 40 MARKS.</b>	40
3.	<b>EXPERIENTIAL LEARNING:</b> Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning (10), Program specific requirements (10), Video based seminar/presentation/demonstration (20). Phase 2 will be done in the exhibition mode (Demo/Prototype/any outcome). ADDING UPTO 40 MARKS.	40
	MAXIMUM MARKS FOR THE CIE THEORY	100

	<b>RUBRIC FOR SEMESTER END EXAMINATION (THEORY)</b>					
Q. NO.	O. CONTENTS					
	PART A					
1	Objective type questions covering entire syllabus	20				
	<b>PART B</b> (Maximum of TWO Sub-divisions only)					
2	Unit 1 : (Compulsory)	16				
3 & 4	Unit 2 : Question 3 or 4	16				
5&6	Unit 3 : Question 5 or 6	16				
7 & 8 Unit 4 : Question 7 or 8						
9 & 10	Unit 5: Question 9 or 10	16				
	TOTAL	100				



		Semester: IV			
		DESIGN THINKIN			
	Categ	gory: PROFESSIONAL	CORE COURSE		
		(Practice)			
Course Code	:	EI247DL	CIE	:	50 Marks
Credits: L:T:P	:	0:00:02	SEE	:	50 Marks
Total Hours	:	26P	SEE Duration	:	02 Hrs
					26 Hrs

#### Guidelines for Design Thinking Lab (DTL):

- 1. DTL is to be carried out by a team of two-three students.
- 2. Each student in a team must contribute equally in the tasks mentioned below.
- 3. Each group must select a theme that will provide solutions to the challenges of societal concern. Normally three to four themes would be identified by the department.
- 4. Each group should follow the stages of Empathy, Design, Ideate, prototype and Test for completion of DTL.
- 5. After every stage of DTL, the committee constituted by the department along with the coordinators would evaluate for CIE. The committee shall consist of respective coordinator & two senior faculty members as examiners. The evaluation will be done for each student separately.
- 6. The team should prepare a Digital Poster and a report should be submitted after incorporation of any modifications suggested by the evaluation committee.

#### The Design Thinking lab tasks would involve:

- 1. Carry out the detailed questionnaire to arrive at the problem of the selected theme. The empathy report shall be prepared based on the response of the stake holders.
- 2. For the problem identified, the team needs to give solution through thinking out of the box innovatively to complete the ideation stage of DTL
- 3. Once the idea of the solution is ready, detailed design must be formulated in the Design stage considering the practical feasibility.
- 4. If the Design of the problem is approved, the team should implement the design and come out with prototype of the system.
- 5. Conduct thorough testing of all the modules in the prototype developed and carry out integrated testing.
- 6. Demonstrate the functioning of the prototype along with presentations of the same.
- 7. Prepare a Digital poster indicating all the stages of DTL separately. A Detailed project report also should be submitted covering the difficulties and challenges faced in each stage of DTL.
- 8. Methods of testing and validation should be clearly defined both in the Digital poster as well as the report.
- 9. The students are required to submit the Poster and the report in the prescribed format provided by the department.



Course	Course Outcomes: After completing the course, the students will be able to:-					
CO1	Interpret the process of Design Thinking to solve real world problems from the end user viewpoint.					
CO2	Apply design thinking tools to make decisions and attain a feasible solution.					
CO3	Identify and solve a Capstone project with sustainable goals using Design Thinking.					
CO4	Develop a prototype and optimize it further through demonstrations.					

<b>RUBRICS FOR THE CONTINUOUS INTERNAL EVALUATION</b>					
#	COMPONENTS	MARKS			
1.	Empathy, Ideate evaluation	10			
2.	Design evaluation	20			
3.	Prototype evaluation, Digital Poster presentation and report submission	20			
<b>IAXIN</b>	UM MARKS FOR THE CIE	50			

	RUBRIC FOR SEMESTER END EXAMINATION(LAB)					
Q.NO.	IO. CONTENTS					
1	Write Up	10				
2	Demonstration of the project	30				
3	Viva	10				
	TOTAL	50				



			S	emester: IV				
		UN	IVERSAL	HUMAN VALU	JES			
(Theory)								
Course Code       :       HS248AT       CIE       :       50 Marks								
Credits: L:T:P	:	2:0:0			<b>SEE</b> : 50 Ma			
Total Hours	:	28L			SEE Duration	:	02 Hrs	
Unit-I							10 Hrs	
Course Introduction	)n -	Need, Basic G	uidelines,	Content and Pro	cess for Value Educat	ion:		
					iversal Human Values		elf-Exploration	
					piness and Prosperity-			
					nding Happiness and Pro			
Practice sessions to	o di	scuss natural a	acceptance	in human being	as the innate accepta	nce	for living with	
responsibility.								
Understanding Ha								
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		cuss the role of	hers have p	played in making	material goods availabl	e to 1	me. Identifying	
from one's own life	•							
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			Unit -				10 Hrs	
			Family and	l Society- Hari	mony in Human Hu		Relationship:	
Understanding value	es in	human-human	F <b>amily and</b> relationshi	l Society- Harr p; meaning of Jus	stice and program for its	fulfi	Relationship: lment to ensure	
Understanding value mutual happiness; T Trust.	es in Trus	human-human t and Respect a	Family and a relationshing the found	l Society- Harr p; meaning of Jus ational values of	stice and program for its relationship, Understan	fulfi ding	<b>Relationship:</b> lment to ensure the meaning of	
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Understanding value mutual happiness; T Trust. Understanding the fearlessness (trust) a	es in Trus hari and o	human-human t and Respect a mony in the so co-existence as	Family and a relationshi as the found ociety (soci comprehen	<b>I Society- Harr</b> p; meaning of Jus ational values of ety being an ex- sive Human Goa	stice and program for its relationship, Understan tension of family): Res ls, Visualizing a univers	fulfi ding oluti	<b>Relationship:</b> lment to ensure the meaning of on, Prosperity,	
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Cours	Course Outcomes: After completion of the course the students will be able to					
CO1	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	Understand human relationships and human nature in mind so that they will have better critical ability.					
CO3	Become sensitive to their commitment towards what they have understood (human values, human					
	relationship and human society).					
CO4	Apply what they have learnt to their own self in different day-to-day settings in real life.					



Refe	erence Books
1	Human Values and Professional Ethics, R. R. Gaur, R Sangal, G P Bagaria, 1 <sup>st</sup> Edition, 2010, Excel Books, New Delhi, ISBN: 9788174467812.
2	Human Values, A.N. Tripathi, 3 <sup>rd</sup> Edition, 2019, New Age Intl. Publishers, New Delhi, ISBN:9788122425895.
3	India Wins Freedom, Maulana Abdul Kalam Azad, 1 <sup>st</sup> Edition, 1988, Orient Blackswan, ISBN:97881250051481.
4	The Story of My Experiments with Truth, Mohandas Karamchand Gandhi, 1 <sup>st</sup> Edition, 2011, Create Space Publishing platform, ISBN: 9781463694876.
5	Small is Beautiful, E. F Schumacher, 1 <sup>st</sup> Edition, 2011, (PBD)VINTAGE, ISBN: 9780099225614.

<b>RUBRICS FOR THE CONTINUOUS INTERNAL EVALUATION (THEOP</b>			
#	COMPONENTS	MARKS	
1.	<b>QUIZZES:</b> Quizzes will be conducted in online/offline mode. <b>TWO QUIZZES</b> will be conducted & Each Quiz will be evaluated for 5 Marks. <b>THE SUM OF TWO QUIZZES WILL BE THE FINAL QUIZ MARKS.</b>		
2.	<b>TESTS:</b> Students will be evaluated in test, descriptive questions with different complexitylevels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). <b>TWO TESTS</b> will be conducted. Each test will be evaluated for 25 Marks, adding up to 50 Marks. <b>FINAL TEST MARKS WILL BE REDUCED TO 20 MARKS.</b>	20	
3.	<b>EXPERIENTIAL LEARNING:</b> Students will be evaluated for their creativity and practical implementation of the problem. <b>Phase I (10) &amp; Phase II (10) ADDING UPTO 20 MARKS</b> .	20	
	MAXIMUM MARKS FOR THE CIE THEORY	50	

	<b>RUBRICS FOR SEMESTER END EXAMINATION (THEORY)</b>				
Q.NO.	Q.NO. CONTENTS				
	PART A				
1	Objective type questions covering entire syllabus	10			
	PART B				
	(Maximum of THREE Sub-divisions only)				
2	Unit 1: (Compulsory)	08			
3 & 4	Unit 2: Question 3 or 4	08			
5&6	Unit 3: Question 5 or 6	08			
7 & 8	Unit 4: Question 7 or 8	08			
9 & 10	Unit 5: Question 9 or 10	08			
	TOTAL	50			



			Semeste	er: IV				
Bridge Course: MATHEMATICS								
(Mandatory Audit Course)								
			(Common to Al	LL Branches)				
Course Code	:	MAT149AT		CIE	:	50 Marks		
Credits: L: T: P	:	2:0:0		SEE	:	NO SEE (AUDIT	COURSE)	
<b>Total Hours</b>	:	30L						
			Unit-I				10 Hrs	
Multivariable Cal	culu	s:						
Partial Differentia	ation	: Introduction,	simple problems	s. Total derivati	ve,	composite function	s. Jacobians –	
simple problems.								
Vector Differentia	ation	: Introduction,	velocity and ac	celeration, grad	ien	t, divergence - sol	enoidal vector	
function, curl – irro	tatic	nal vector functi	ion and Laplacia	n, simple proble	ms.			
			Unit – II				10 Hrs	
<b>Differential Equat</b>	ions	:						
Higher order linear	r dif	ferential equation	ons with constar	nt coefficients, s	olu	tion of homogeneo	us equations -	
Complementary fu	nctio	ons. Non-homog	eneous equation	ns – Inverse dif	fere	ential operator metl	hod of finding	
particular integral b	asec	l on input function	on (force functio	n).				
Unit –III 10 Hrs								
Numerical Method	ls:							
						operty, Newton-Ra		
						d 4 <sup>th</sup> order Runge-H		
Numerical integrati	on _	Simpson's 1/3rd	$1^{\circ}$ 3/8 <sup>th</sup> and Wedd	$11a^{\prime}a^{\prime}m^{\prime}a^{\prime}a^{\prime}$	not	hads without proof)		

Course Outcomes: After completing the course, the students will be able to		
CO1:	Illustrate the fundamental concepts of partial differentiation, vector differentiation, higher order linear	
	differential equations and numerical methods.	
<b>CO2:</b>	Derive the solution by applying the acquired knowledge of differential calculus, differential equations,	
	velocity, and acceleration vectors to the problems of engineering applications.	
CO3:	Evaluate the solution of the problems using appropriate techniques of differential calculus, vector	
	differentiation, differential equations, and numerical methods.	
<b>CO4:</b>	Compile the overall knowledge of differential calculus, vector differentiation, differential equations	
	and numerical methods gained to engage in life – long learning.	

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

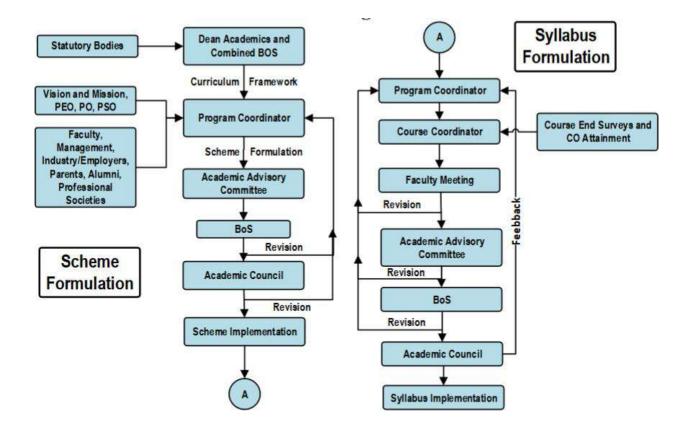




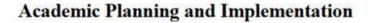
	RUBRIC FOR THE CONTINUOUS INTERNAL EVALUATION (THEORY)		
#	COMPONENTS	MARKS	
1.	<b>QUIZZES:</b> Quizzes will be conducted in online/offline mode. TWO QUIZZES will be conducted & Each Quiz will be evaluated for 10 Marks. <b>THE SUM OF TWO QUIZZES WILL BE THE FINAL QUIZ MARKS.</b>	20	
2.	<b>TESTS:</b> Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). TWO TESTS will be conducted. Each test will be evaluated for 30 Marks, adding upto 60 Marks. <b>FINAL TEST MARKS WILL BE AVERAGE OF TWO TESTS.</b>	30	
MAXIMUM MARKS FOR THE CIE THEORY			

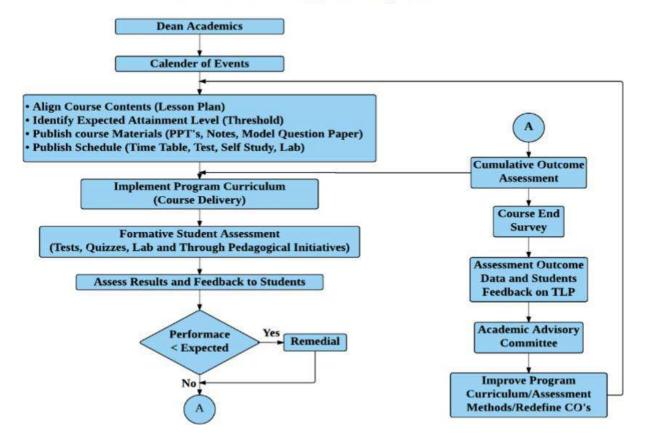


### **Curriculum Design Process**



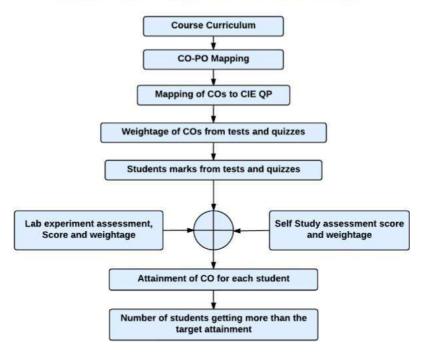




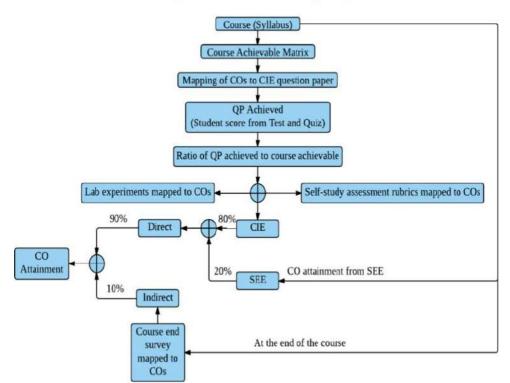




#### **Process For Course Outcome Attainment**



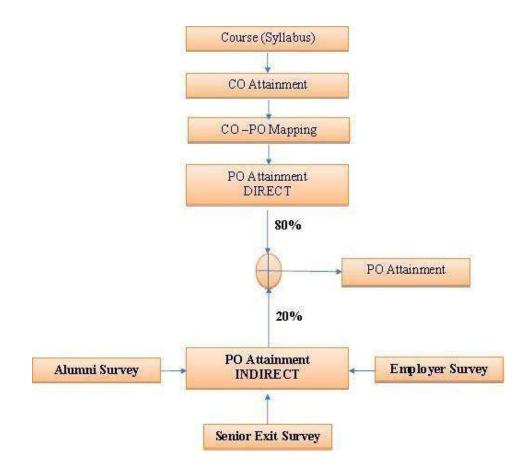
#### Final CO Attainment Process



Electronics & Instrumentation Engineering



### Program Outcomes (POs) Attainment Process





## Knowledge and Attitude Profile (WK)

- **WK 1:** A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.
- WK 2: Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline.
- **WK 3:** A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.
- WK 4: Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.
- **WK 5:** Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.
- WK 6: Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.
- **WK 7:** Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development.
- WK 8: Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.
- **WK 9:** Ethics, inclusive behaviour and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes.



# **New Program Outcomes(PO)**

- PO1: Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.
- PO2: Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)
- PO3: Design/Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)
- PO4: Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).
- PO5: Engineering Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)
- PO6: The Engineer and The World: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).
- PO7: Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)
- PO8: Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.
- PO9: Communication: Communicate effectively and inclusively within the community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences
- PO10: Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.
- PO11: Life-Long Learning: Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

## **INNOVATIVE TEAMS OF RVCE**

Ashwa Mobility Foundation (AMF): Designs and fabricates Formula-themed race cars and mobility solutions to address urban transportation issues.

Astra Robotics Team: Focuses on designing and building application-specific robots.

Coding Club: Helps students gain coding skills and succeed in competitions like GSoC and ACM-ICPC.

Entrepreneurship Development Cell (E-Cell): Promotes entrepreneurship through workshops, speaker sessions, and mentoring for startups.

Frequency Club Team: Works on software and hardware, emphasizing AI and Machine Learning.

Team Garuda: Develops a supermileage urban concept electric car and E-mobility products.

Team Jatayu: Builds low-cost UAVs with autonomous capabilities for various tasks.

Solar Car Team: Aims to create a solar electric vehicle for sustainable transportation.

Team Antariksh: Focuses on space technology and the development of operational rockets.

Team Chimera: Builds a Formula Electric Car through R&D in E-Mobility.

Helios Racing Team: Designs and tests All-Terrain Vehicles, participating in SAE's BAJA competitions.

Team Hydra: Develops autonomous underwater vehicles for tasks like water purification.

Team Krushi: Creates low-cost farming equipment to assist farmers in cultivation and harvesting.

Team Vyoma: Designs and tests radio-controlled aircraft and UAVs.

Team Dhruva: Engages in astronomy-related activities and collaborates on projects with organizationslike **ICTS and IIA.** 

#### **Cultural Activity Teams**

- AALAP (Music club)
- DEBSOC (Debating society)
- CARV (Dramatics club)
- FOOTPRINTS (Dance club) 4.
- QUIZCORP (Quizzing society)
- ROTARACT (Social welfare club) RAAG (Youth club)
- 8.
- EVOKE (Fashion team)
- f/6.3 (Photography club)
- 10. CARV ACCESS (Film-making





NSS of RVCE

NCC of RVCE

## VISION

Leadership in Quality Technical Education, Interdisciplinary Research & Innovation, with a Focus on Sustainable and Inclusive Technology

## MISSION

- To deliver outcome based Quality education, emphasizing on experientiallearning with the state of the art infrastructure.
- To create a conducive environment for interdisciplinary research and innovation.
- To develop professionals through holistic education focusing on individual growth, discipline, integrity, ethics and social sensitivity.
- To nurture industry-institution collaboration leading to competency enhancement and entrepreneurship.
- To focus on technologies that are sustainable and inclusive, benefiting all sections of the society.

## **QUALITY POLICY**

Achieving Excellence in Technical Education, Research and Consulting through an Outcome Based Curriculum focusing on Continuous Improvement and Innovation by Benchmarking against the global Best Practices.

## **CORE VALUES**

## Professionalism, Commitment, Integrity, Team Work, Innovation



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