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RV Educational Institutions \* RV College of Engineering \*



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



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

# BACHELOR OF ENGINEERING (B.E) IN INFORMATION SCIENCE AND ENGINEERING

(ACADEMIC YEAR 2022-2023)

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New Delhi



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**DEPARTMENT VISION** 

To be the hub for innovation in Information Science & Engineering through Teaching, Research, Development and Consultancy; thus make the department a well-known resource centre in advanced, sustainable and inclusive technology.

# **DEPARTMENT MISSION**

**ISE1:** To enable students to become responsible professionals, strong in fundamentals of Information Science and engineering through experiential learning.

**ISE2:** To bring research and entrepreneurship into classrooms by continuous design of innovative solutions through research publications and dynamic development oriented curriculum.

**ISE3:** To facilitate continuous interaction with the outside world through student internship, faculty consultancy, workshops, faculty development programmes, industry collaboration and association with the professional societies.

**ISE4:** To create a new generation of entrepreneurial problem solvers for a sustainable future through green technology with an emphasis on ethical practices, inclusive societal concerns and environment.

**ISE5:** To promote teamwork through inter-disciplinary projects, co-curricular and social activities.

# **PROGRAM EDUCATIONAL OBJECTIVES (PEOs)**

**PEO1:** To provide adaptive and agile skills in Information Science and Engineering needed for professional excellence / higher studies /Employment, in rapidly changing scenarios.

**PEO2:** To provide students a strong foundation in basic sciences and its applications to technology.

**PEO3:** To train students in core areas of Information science and Engineering, enabling them to analyse, design and create products and solutions for the real-world problems, in the context of changing technical, financial, managerial and legal issues.

**PEO4:** To inculcate leadership, professional ethics, effective communication, team spirit, multidisciplinary approach in students and an ability to relate Information Engineering issues to social and environmental context.

**PEO5:** To motivate students to develop passion for lifelong learning, innovation, career growth and professional achievement.

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# **PROGRAM SPECIFIC OUTCOMES (PSOs)**

PSO	Description
PSO1	Recognize and appreciate the principles of theoretical foundations, data organization, data communication, security and data analytical methods in the evolving technology
PSO2	Learn the applicability of various system software for the development of quality products in solving real-world problems with a focus on performance optimization
PSO3	Demonstrate the ability of team work, professional ethics, communication and documentation skills in designing and implementation of software products using the SDLC principles

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## ABBREVIATIONS

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

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# Bachelor of Engineering in INFORMATION SCIENCE AND ENGINEERING

	III SEMESTER													
Sl. No.	Course Code	Course Title	Credit Alloca			ation	BoS	Category	CIE Duration	Max Mar	ks CIE	SEE Duration	Max Marks SEE	
			L	Т	Р	Total			(H)	Theory	Lab	(H)	Theory	Lab
1	21MA31A	Linear algebra, Integral transforms and Number theory	3	1	0	4	MA	Theory	1.5	100	****	3	100	***
2	21BT32A	Environmental Technology	2	0	0	2	BT	Theory	1	50	****	2	50	****
3	211S33	Data Structure and Applications (Common to CS & IS)	3	0	1	4	IS	Theory+Lab	1.5	100	50	3	100	50
4	211834	Digital Design and Computer Organization	3	1	0	4	IS	Theory	1.5	100	****	3	100	****
5	21CS35	Operating Systems (Common to CS, IS & AI)	2	0	1	3	CS	Theory+Lab	1.5	100	50	3	100	50
6	21CS36	Discrete Mathematical Structures (Common to CS, IS & AI)	3	0	0	3	CS	Theory	1.5	100	****	2	100	****
7	21DCS37*	Bridge Course: C Programming	2(A)	0	0	AUDIT	CS	Theory	1	50	****	-	***	****
8	21HS38A / 21HS38V	Kannada Course: AADALITHA KANNADA / VYAVAHARIKA KANNADA	1	0	0	1	HSS	Theory	1	50	****	2	50	****
9	21HSAE39A/ B/ C/D/E**	Ability Enhancement course	0	0	1	1	HSS	Lab	1	****	50	2	****	50
10	21ISI310	Summer Internship- I	0	0	1	1	IS	Internship	1	****	50	1	****	50
23														

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



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	*ENGI	<b>NEERING MATHEM</b>	IATICS – III								
	COURSE TITL	E	COURSE CODE	BRANCHES							
Linear	algebra, Integral transforms, ar	nd Number theory	21MA31A	CS and IS							
Linear	algebra, Integral transforms, ar	nd Fourier series	21MA31B	AS, EC, EE, EI, ET							
Integral Technic	l transforms, Optimization and ques	Numerical	21MA31C	BT, CH, CV, IM, ME							
Mathen	natics for AI & ML		21MA31D	AI & ML							
	** MANDATORY COURSES										
Sl.No	COURSE TITLE	COURSE CODE	BRANCHES								
1	Environmental Technology	21BT32A	AI, BT, CV, CS, EC, EE, EI, ET, & IS Branches								
2	Biology for Engineers	21BT32B		BT							
3	Engineering Materials	21ME32		AS, CH & ME							
***	*** BRIDGE COURSE: AUDIT COURSE FOR LATERAL ENTRY DIPLOMA STUDENTS (ONLY CIE AND NO SEE)										
Sl.No	COURSE TITLE	COURSE CODE		BRANCHES							
1	Bridge Course: Mathematics	21DMA37	AS, BT, CH	, CV, EC, EE, EI, IM, ME & TE							
2	Bridge Course: C Programming	21DCS37		CS, IS & AI							



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# Bachelor of Engineering in INFORMATION SCIENCE AND ENGINEERING

	<b>IV SEMESTER</b>													
Sl. No.	Course Code	Course Title	Ст	redit	dit Allocation		BoS	Category	CIE Duration	Max Marks CIE		SEE Duration	Max Marks SEE	
			L	Т	Р	Total			(H)	Theory	Lab	(H)	Theory	Lab
1	21MA41	Statistics and Probability for Data Science	2	1	0	3	MA	Theory	1.5	100	****	3	100	****
2	21BT42	Bioinspired Engineering	2	0	0	2	BT	Theory	1	50	****	2	50	****
3	21CS43	Design and Analysis of Algorithms (Common to CS, IS & AI)	3	0	1	4	CS	Theory+Lab	1.5	100	50	3	100	50
4	21IS44	Theory of Computation	3	0	0	3	IS	Theory	1.5	100	***	3	100	***
5	21CS45	Computer Networks (Common to CS, IS & AI)	3	0	0	3	CS	Theory	1.5	100	****	3	100	****
6	21IS4AX	Professional Elective – Group A	2	0	0	2	IS	MOOC	1	50	****	2	50	****
7	21IS46	Design Thinking Lab	0	0	2	2	IS	Lab	1	****	50	2	****	50
8	21DMA47	Bridge Course: Mathematics ***	2 (A)	1	0	AUDIT	MA	Theory	1.5	50	****	***	***	****
9	21HSU48	Universal Human Values and Professional Ethics	2	0	0	2	HSS	Theory	1	50	****	2	50	****
10	21IS49	Programming in JAVA	1	0	1	2	IS	Theory+Lab	1	50	50	2	50	50
	•			•	•	22		•	•			•		

\* Summer Internship-II will be done after the IV sem for 04 Weeks



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



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	# GROUP A: PROFESSIONAL CORE ELECTIVES (MOOC COURSES)								
Sl. No.	COURSE CODE	Duration							
1	21IS4A1	Object Oriented Analysis and Design	8 Weeks						
2	21IS4A2	Multicore computer architecture-Storage and Interconnects	8 Weeks						
3	21IS4A3	Data Science using Python	8 Weeks						
4	21IS4A4	Embedded System Design with ARM	8 Weeks						
5	21IS4A5	Distributed Systems	8 Weeks						

	## ABILITY ENHANCEMENT COURSES										
SI. No.	Course Code	Course Title	Branches								
1.	21HSAE39A/46A	National Service Scheme (NSS)	Common to all								
2.	21HSAE39B	National Cadet Corps (NCC)	Branches. Minimum one								
3.	21HSAE39C	Physical Education	vertical is mandatory.								
4.	21HSAE39D1/2/3	Music/Dance/Theatre									
5.	21HSAE39E1/2	Art work/ Photography & Film making									

				Semester: II	[			
	LINEAR AI	LG	EBRA, INTEGF	RAL TRANSFO	DRMS AND NU	MB	BEI	R THEORY
	(Theory)							
C	Cala	Γ.	(( 21MA 21A	Common to CS	, IS)	<u> </u>	1	00 Maada
Course		:	21MA31A			:	1	OU Marks
Credits	S: L:1:P	:	3:1:0		SEE D 4	:	1	UU Marks
I otal H	lours	:	45L+151		SEE Duration	:	3	5.00 Hours
			TI					00 11
T •			Unit – I					09 Hrs
Linear	Algebra – I:	•	1 1	1 . 1 1	1	•	ſ	· · · · · · · · · · · · · · · · · · ·
Vectors	spaces, subspaces, in	ine	ar dependence and	d independence,	basis and dimens	sion	1, I(	our fundamental subspaces.
Kank al	na nullity theorem (	W1	nout proof). Line	ear transformation	ons - matrix repre	eser	nta	tion, kernel and image of a
innear u	ansiormation, dilat	IOI	, reflection, proje	ction and rotatic	on matrices.			
Lincor	Algohya II.		0111 - 11					03 1118
Linear Innor Di	Algebra - II:	ma	tricos orthogonal	and orthonorm	lhagog Grom So	hm	ide	t process OP factorization
Figen	values and Figen	ma	etors diagonali	ration of a m	al Dases, Oralli-Sc		nuu	rices) and singular value
decom	values and Eigen	vc	ciors, diagonanz		attix (symmetrie	11	Iau	fices) and singular value
uccomp	0311011.		Unit – III	ſ				09 Hrs
Lanlac	e and Inverse Lan	ace	- Transform:	-				
Existen	ce and uniqueness	of	Laplace transform	n (LT), transfor	m of elementary	fur	nct	ions, Properties - linearity,
scaling	and $s - domain shift$	t.d	lifferentiation in t	the s $-$ domain.	livision by t. diffe	erer	ntia	ation and integration in the
time do	main. Inverse Lapl	ace	transforms - pro	perties, evaluat	ion using differen	nt n	net	thods, convolution theorem
(withou	t proof) and problem	ms.	1	1	8			,
	<b>-1</b>		Unit – IV	7				09 Hrs
Fourier	r Transform:							
Fourier	integral theorem, c	om	plex Fourier and	inverse Fourier	transform, Fouri	er s	sine	e transform, Fourier cosine
transfor	m, properties - lir	ieai	rity, scaling, tim	e-shift and mo	dulation. Convol	luti	on	theorem (without proof),
problen	ns.							
			Unit – V					09 Hrs
Numbe	er Theory:							
Divisib	ility, the greatest co	omr	non divisor, prop	perties of prime	numbers, the fun	ıdar	me	ental theorem of arithmetic,
modula	r arithmetic, remain	nde	r arithmetic, mul	tiplicative inver	ses and cancellin	ıg, İ	Eu	ller's theorem, RSA Public
key enc	ryption.							
Course	Outcomes: After	con	npleting the cour	rse, the student	s will be able to			
CO1:	Illustrate the funda	ame	ental concepts of	linear algebra, I	Laplace and inver	se I	Lap	place transforms, Fourier
~ ~ ~	transforms and nu	mb	er theory.					
CO2:	Apply the acquire	d ki	nowledge of linea	ar algebra, Lapla	ace and inverse $L_{\alpha}$	apla	ace	e transforms, Fourier
<b>GO</b>	transforms and nu	mb	er theory to solve	the problems o	f engineering app	olica	atic	ons.
CO3:	Analyze the soluti	on	of the problems u	using appropriat	e techniques of lin	nea	r a	llgebra, integral transforms
	and number theory	$\frac{y}{11}$ to	the real world pr	roblems arising	in many practical	s1t	$\frac{uat}{1}$	tions.
CO4:	Interpret the overa	ull k	nowledge of line	ar algebra, Lapl	ace and inverse L	Lapl	lac	e transforms, Fourier
	transforms, and nu	ımt	ber theory gained	to engage in life	e-long learning.			

Refer	Reference Books							
1	Linear Algebra and its Applications, Gilbert Strang, 4th Edition, 2014, Cengage Learning India							
1	Edition, ISBN: 9788131501726, 8131501728.							
2	Discrete and Combinatorial Mathematics, Ralph P Grimaldi, 5 <sup>th</sup> Edition, 2006, Pearson							
	Education, ISBN-13: 978-81-7758-424-0.							
2	Higher Engineering Mathematics, B.S. Grewal, 44th Edition, 2015, Khanna Publishers,							
3	ISBN: 81-7409-195-5.							
4	Linear Algebra and its Applications, David C Lay, 4th Edition, 2012, Pearson Education India,							
	ISBN-13: 970321385178, ISBN-10: 0321385171.							

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

High-3: Medium-2: Low-1

ENVIRONMENTAL TECHNOLOGY (Theory) (Common to all branches)         Course Code : 21BT32A/21BT42A       CIE : 50 Marks         Credits: L:T:P : 2:0:0       SEE : 50 Marks         Total Hours : 26 L       SEE Duration : 90 min         Course Learning Objectives: The students will be able to         1       Explain the various components of environment and the significance of the sustainability of healthy environment.       Develop critical thinking for shaping strategies (scientific, social, economic and legal) for environmental protection and conservation of biodiversity, social equity and sustainable development         4       Develop the models that help mitigate or prevent the negative impact of proposed activity on the environment					
(Theory) (Common to all branches)         Course Code       : 21BT32A/21BT42A       CIE       : 50 Marks         Credits: L:T:P       : 2:0:0       SEE       : 50 Marks         Total Hours       : 26 L       SEE Duration       : 90 min         Course Learning Objectives: The students will be able to         1       Explain the various components of environment and the significance of the sustainability of healthy environment.       Identify the implications of different types of the wastes produced by natural and anthropogenic activity.         2       Identify the implications of different types of the wastes produced by natural and anthropogenic activity.         3       Develop critical thinking for shaping strategies (scientific, social, economic and legal) for environmental protection and conservation of biodiversity, social equity and sustainable development         4       Design the models that help mitigate or prevent the negative impact of proposed activity on the environment					
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Credits: L:T:P       :       2:0:0       SEE       :       50 Marks         Total Hours       :       26 L       SEE Duration       :       90 min         Course Learning Objectives: The students will be able to       :       90 min         1       Explain the various components of environment and the significance of the sustainability of healthy environment.       :       90 min         2       Identify the implications of different types of the wastes produced by natural and anthropogenic activity.       :       :       :         3       Develop critical thinking for shaping strategies (scientific, social, economic and legal) for environmental protection and conservation of biodiversity, social equity and sustainable development       :       :       :       :       :       :       :       :       :       :       :       :       :       :       :       :       :       :       :       :       :       :       :       :       :       :       :       :       :       :       :       :       :       :       :       :       :       :       :       :       :       :       :       :       :       :       :       :       :       :       :       :       :       :       :       :       <					
Total Hours       :       26 L       SEE Duration       :       90 min         Course Learning Objectives: The students will be able to         1       Explain the various components of environment and the significance of the sustainability of healthy environment.         2       Identify the implications of different types of the wastes produced by natural and anthropogenic activity.         3       Develop critical thinking for shaping strategies (scientific, social, economic and legal) for environmental protection and conservation of biodiversity, social equity and sustainable development         4       Design the models that help mitigate or prevent the negative impact of proposed activity on the environment					
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<ul> <li>environment.</li> <li>2 Identify the implications of different types of the wastes produced by natural and anthropogenic activity.</li> <li>3 Develop critical thinking for shaping strategies (scientific, social, economic and legal) for environmental protection and conservation of biodiversity, social equity and sustainable development</li> <li>4 Design the models that help mitigate or prevent the negative impact of proposed activity on the environment</li> </ul>					
<ul> <li>2 Identify the implications of different types of the wastes produced by natural and anthropogenic activity.</li> <li>3 Develop critical thinking for shaping strategies (scientific, social, economic and legal) for environmental protection and conservation of biodiversity, social equity and sustainable development</li> <li>4 Design the models that help mitigate or prevent the negative impact of proposed activity on the environment</li> </ul>					
<ul> <li>Bevelop critical thinking for shaping strategies (scientific, social, economic and legal) for environmental protection and conservation of biodiversity, social equity and sustainable development</li> <li>Design the models that help mitigate or prevent the negative impact of proposed activity on the environment</li> </ul>					
<ul> <li>protection and conservation of biodiversity, social equity and sustainable development</li> <li>4 Design the models that help mitigate or prevent the negative impact of proposed activity on the environment</li> </ul>					
<ul> <li>sustainable development</li> <li>4 Design the models that help mitigate or prevent the negative impact of proposed activity on the environment</li> </ul>					
4 Design the models that help mitigate or prevent the negative impact of proposed activity on the environment					
in line with Sustainable Developmental Goals.					
Unit I 08 hrs					
Introduction: Climate action – Paris convention, Sustainable Developmental Goals in relation					
to environment, Components of environment, Ecosystem. Environmental education,					
Environmental acts & regulations, role of non-governmental organizations (NGOs), EMS: ISO					
14000. Environmental Impact Assessment, Environmental auditing					
1 1000, 2n include inipace i lisessinent. En include automg.					
Unit II 09 hrs					
<b>Pollution and its remedies:</b> Air pollution – point and non-point sources of air pollution and					
their controlling measures (particulate and gaseous contaminants). Noise pollution, Land					
pollution (sources, impacts and remedial measures),					
Water management: Advanced water treatment techniques, water conservation methods.					
Waste management: Solid waste, e-waste & biomedical waste – sources, characteristics &					
disposal methods. Concepts of Reduce, Reuse and Recycling of the wastes					
Waste to Energy. Different types of Energy Conventional sources & Non-conventional					
sources of energy: Solar Hydro Electric Wind Nuclear Biomass & Biogas Fossil Fuels and					
Undrogon					
Environmental design: Green buildings, green materials, Leadership in Energy and					
Environmental Design (LEED), Hydroponics, Organic Farming, Biofuels, IC engine to E					
mobility transition and its impacts, Carbon Credits, Carbon Foot Prints, Opportunities for					
Green Technology Markets, Carbon Sequestration.					
Resource recovery system: Processing techniques, Materials recovery systems, Biological					
conversion (composting and anaerobic digestion). Thermal conversion products (Combustion,					
Incineration, Gasification, Pyrolysis, use of Refuse Derived Fuels). Case studies.					

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

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

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

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

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

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

Semester: III							
Data Structure and Applications							
(Common to CS & IS)							
(Theory and Lab)							
Course Code	:	21IS33		CIE	:	150 Marks	
Credits: L:T:P	:	3:0:1		SEE	:	150 Marks	
<b>Total Hours</b>	:	36L+30P		<b>SEE Duration</b>	:	<b>3Hours + 3Hours</b>	
			Unit-I			7 Hrs	
Introduction:							
Introduction to Da	ata	structures, Type	es of Data Structures	, Linear & non-lin	ear	Data Structures	
Stacks:	_	_					
Stack definitions	& c(	oncepts, Repres	enting stacks in C, C	perations on stacks	s, A	pplications of Stacks:	
Infix to Postfix, In	nfix	to Prefix, Post	fix expression evalu	ation			
Recursion:				1			
Introduction to Re	ecui	rsion, Factorial	function, Binary sea	rch, Towers of Ha	noı	problem, Role of the	
stack during exec	utic	on.	1			7 11	
0			U <b>nit – 11</b>			/ Hrs	
Queues:			····· • • • • • • • • • • • • • • • • •	1		· · · · · · · · · · · · · · · · · · ·	
Representation of	qu	eue, operations,	, circular queues. Ap	plication of Queue		lessage queue using	
circular queue.		<b>U</b> a a <b>4</b> a <b>m</b> a <b>m</b> a 11					
Dynamic Memor	y a	<b>mocation:</b> mail	oc(), calloc(),free(),	realloc()			
Linked Lists:			inter d Line (CLL) V			T. in a set is a stated in a	
Definition and ter	uuu Ma	freenede and	haadar nada	arious operations of	151	L: Insertion, deletion	
and display, genic	Jue,		T <b>nit _III</b>			7 Hrs	
Circular Singly I	UIIII – III / HPS						
implementation	IIIKV	cu List (CSLL)		operations, Appli	cath	on. Queue	
Doubly Linked L	ist (	DLL) Circular	Doubly Linked List	(CDLL) Applicat	ions	· Polynomial	
multiplication Ac	multiplication Addition of long positive integers						
Troce.							
Recursive Definition Terminology Binary Trees (BT) Binary Search Trees (BST) Expression							
Trees (ET)							
Unit –IV 7 Hrs							
Various Operations on BT, BST, ET: Insertion, Deletion, Display and Traversals.							
Applications: Tree Sort, Infix, Postfix and Prefix							
Heap:							
Definition, Construction, Applications of Heap: Heap Sort, Priority Queue.							
Unit –V 8 Hrs							
Threaded Binary Tree: Types and application.							
Balanced tree: AV	Balanced tree: AVL trees, B+ tree, Splay and Tries.						
Graph:							
Preliminaries; Matrix and Adjacency List representation of Graphs.							
Hashing:							
Open Hashing, Closed Hashing, Collision and Collision Resolution Strategies.							

	Course Outcomes: After completing the course, the students will be able to			
CO1:	Apply the knowledge of computing to define the various data structures and its operations.			
CO2:	Analyse a problem and identify the suitable data structure to develop solution			
CO3:	Investigate &Design solution to a given problem using modern tools and appropriate data			
	structures.			
CO4:	Implement solutions for real-time applications			
CO5:	Demonstrate Good Coding Practices engaging in lifelong learning			

Refe	erence Books
1	Data Structures using C and C++, YedidyahLangsam Moshe J. Augenstein and Aaron M. Tenenbaum, 2 <sup>nd</sup> Edition, 2009, PHI/Pearson.
2	Data Structures and Algorithm Analysis in C++, Mark Allen Weiss, 4th Revised Edition, 2013, Addison-Wesley, ISBN-13: 9780132847377
3	Data Structures Using C, ReemaThareja, 1st Edition, 2011, Oxford Higher Education
4	Fundamentals of Data Structures, Ellis Horowitz, SartajSahni, Illustrated Edition, Computer Science Press.

#### Laboratory Component

### PART A

Note: The following programs can be executed on C/C++/Python/Java or any equivalent

tool/language

#### **Practice Programs:**

Implementation and execution of following programs to understand basic concept and working of various data structures.

- 1. To solve tower of Hanoi problem.
- 2. To Implement a Stack using an Array
- 3. To Implement a Queue using an Array
- 4. To implement Stack using multiple Queues
- 5. To implement Queue using multiple Stacks
- 6. To Search for an Element in a Linked List
- 7. To reverse a Linked List
- 8. To Detect the Cycle in a Linked List
- 9. To Print Height and Depth of given Binary Tree
- 10. To Implement Binary Search Tree and tree traversals

#### Lab Programs: (At-least two application from each of the following data structure)

#### 1. Application of Stack

- a) Implementation of Infix to Postfix conversion
- b) Implementation of Infix to Postfix conversion
- c) Implementation of evaluation of postfix expression
- d) Implementation of evaluation of prefix evaluation

#### 2. Application of Queue

- a) Implement Circular Buffer or Ring Buffer
- b) Implement Priority Queue to Add and Delete Elements
- c) Implementation of multiple stacks and queues
- d) Implementation of maze problem

#### 3. Application of List

- a) Implementation of sparse matrix multiplication.
- b) Implementation of polynomials operations (addition, subtraction) using Linked List.
- c) Implementation of Linked Lists menu driven program (stack and queue)
- d) Implementation of Double ended queue using Linked Lists.

#### 4. Application of Heap, Tries and Hash Table

- a) Implementation of Double hashing technique
- b) Implementation of priority queue using Binary Heap
- c) Implementation of Heap sort
- d) Implementation of dictionary using Tries

#### 5. Application of Trees

- a) Implementation of conversion of Prefix to Postfix / Infix to Postfix /Postfix to Prefix using Expression Tree.
- b) Implementation of various operations on Binary Tree like creating a tree, displaying a tree, copying tree, mirroring a tree, counting the number of nodes in the tree, counting only leaf nodes in the tree.
- c) Implementation of various operations on Binary Search Tree like Inserting a node, Deleting a node, Displaying a tree, Tree Sort
- d) Implementation of B+ tree

ASSESSMENT AND EVALUATION PATTERN				
	CIE	SEE		
WEIGHTAGE	50%	50%		
QUIZZES				
Quiz-I	Each quiz is evaluated for 10			
Quiz-II	marks adding up to <b>20</b> MARKS.	****		
THEORY COURSE	•			
(Bloom's Taxonomy Levels: Remembering, Underst	anding, Applying, Analyzing,			
Evaluating, and Creating)				
Test I	Each test will be conducted			
	for 50 Marks adding up to			
	100 marks. Final test marks	****		
Test – II	will be reduced to <b>40</b>			
	MARKS			
EXPERIENTIAL LEARNING (Maxi	****			
Case Study-based Teaching-Learning	10			
Program Specific Requirement for EL Assessment	20	****		
Video based seminar (4-5 minutes per student)	10			
MAXIMUM MARKS FOR THE THEORY	100 MARKS	100 MARKS		
PRACTICALS	50	50		
TOTAL MARKS FOR THE COURSE	150	150		

Semester: III						
Digital Design and Computer Organization						
(Theory)						
Course Code	:	21IS34		CIE	:	100 Marks
Credits: L:T:P	:	3:1:0		SEE	:	100 Marks
Total Hours	:	39 L+15T		SEE Duration	:	3Hrs

Unit-I	7 Hrs					
Synchronous Sequential Logic : Introduction, Sequential Circuits, Storage Elements : Latches, Flip-						
flops, Analysis of clocked Sequential Circuits, State Reduction and Design Proceed	lure.					
Unit – II	8 Hrs					
Registers and Counters : Registers, Shift Registers, Ripple Counters, Synchrono	ous Counters, Other					
Counters						
Memory and Programmable Logic : Introduction, Random Access Memory, M	emory Decoding,					
Read Only Memory.						
Unit –III	8 Hrs					
Basic Concepts: Organization and Architecture, Structure and function.						
A Top-Level View of Computer Function and Interconnection: Computer Con	nponents,					
Computer Function, Interconnection Structures, Bus Interconnection, PCI Expres	S.					
Cache Memory: Computer Memory System Overview, Cache Memory Principle	es, Elements of					
Cache Design Pentium 4 Cache Organization.						
Internal and External Memory: Semiconductor Main Memory, Magnetic Disk,	RAID, Optical					
Memory.						
Unit –IV	8 Hrs					
Input/Output:						
External Devices, I/O Modules, Programmed I/O, Interrupt-Driven I/O, Direct Memory Access, I/O						
Channels and Processors, External Interconnection Standards.						
Computer Arithmetic:						
The Arithmetic and Logic Unit (ALU), Integer Representation, Integer Arithmetic	c, Floating-Point					
Representation, Floating-Point Arithmetic.						
Unit –V	8 Hrs					
Instruction Sets Characteristics and Functions: Machine Instruction Character	istics, Types of					
Operands, Intel x86 and ARM Data Types, Types of Operations						
Operands, Intel x86 and ARM Data Types, Types of Operations <b>Processor Structure and Function:</b> Processor Organization, Register Organization	on, The Instruction					
Operands, Intel x86 and ARM Data Types, Types of Operations <b>Processor Structure and Function:</b> Processor Organization, Register Organization Cycle, Instruction Pipelining.	on, The Instruction					
<ul> <li>Operands, Intel x86 and ARM Data Types, Types of Operations</li> <li>Processor Structure and Function: Processor Organization, Register Organization</li> <li>Cycle, Instruction Pipelining.</li> <li>Parallel Processing : Multiple Processor Organizations, Symmetric Multiprocess</li> </ul>	on, The Instruction ors, Cache					

Cours	e Outcomes: After completing the course, the students will be able to
CO1:	Create a state transition diagram from a description of a sequential logic function and then convert the diagram into an implementation of a finite-state machine with the appropriate combinational and sequential components.
CO2:	Articulate the design issues involved in computer architecture at theoretical and application levels.
CO3:	Evaluate the close relation between instruction set architecture design, and algorithm design
<b>CO4:</b>	Demonstrate key skills of constructing cost-effective computer systems.

Reference Books				
1	Digital Design with an Introduction to the Verilog HDL, M. Morris Mano, Michael D. Ciletti,			
1	5th edition, 2013, Pearson, ISBN-13: 978-0-13-277420-8			
2	Computer Organization and Architecture Designing for Performance, William Stallings, 10th			
2	Edition, 2018, Pearson, ISBN 978-0134101613			
3	Digital Design and Computer Architecture, David Money Harris and Sarah L Harris, 2nd			
	Edition, 2013, Elsevier, ISBN: 978-0-12-394424-5			
4	Computer Organization and Design, David A.Patterson and John L Hennessy, 5th edition,			
	Morgan Kaufmann , 2016, ISBN : 978-0124077263			

ASSESSMENT AND EVALUATION PATTERN			
	CIE	SEE	
WEIGHTAGE	50%	50%	
QUIZZES			
Quiz-I	Each quiz is evaluated for 10		
Quiz-II	marks adding up to <b>20</b> MARKS.		
THEORY COURSE			
(Bloom's Taxonomy Levels: Remembering, Understanding	ng, Applying, Analyzing,		
Evaluating, and Creating)			
Test – I	Each test will be conducted for		
	50 Marks adding up to 100		
Test – II	marks. Final test marks will be		
	reduced to 40 MARKS		
EXPERIENTIAL LEARNING (Maximum of 40	Marks)	****	
Case Study-based Teaching-Learning	10		
Program Specific Requirement for EL Assessment	****		
Video based seminar (4-5 minutes per student)	10		
MAXIMUM MARKS FOR THE THEORY	100	100	
TOTAL MARKS FOR THE COURSE	100	100	

Semester: III							
Operating Systems							
			(Common to CS,18 (Theory and La)	&AI) b)			
Course Code	Course Code         :         21CS35         CIE         :         100 + 50 Marks						arks
Credits: L:T:P	redits: L:T:P : 2:0:1 SEE : 100 + 50 Marks			arks			
Total Hours	:	30L+30P		SEE Duration	:	3 + 3 Hours	5
			∐nit-I				06 Hrs
Introduction- Persi	nec	tives					00 111 5
Business domain: V	/irt	ualisation and Clou	d Computing				
Application: Traditi	ion	al computing, Mobi	ile computing, Distrib	outed systems			
Introduction				•			
What Operating Sys	tem	n do, Operating Sys	tem structure, Operati	ing system Operation	1S.		
System Structures							
Operating system set	rvi	ces, System Calls, 7	Types of System calls				
Process Manageme	ent	1 1 1 0					
Process concept, Process scheduling, Operations on processes							
Unit – II 06 Hrs							
Multithreaded programming							
CDU asheduling on	e pr	ogramming, Multit	nreading models, 1 hr	ead libraries - plinrea	as		
Basic concepts sche	a r dul	ling criteria schedu	ling algorithms-FCFS	S SIF RR priority	Rea	l-time CPU so	cheduling
Basic concepts, sene	Unit_III						
Process Synchronization							
Background The Cr	itic	al section problem.	Peterson's Solution				
Process Synchroniz	zati	on					
Synchronization har	dw	are, Mutex locks, S	emaphores, Classic pi	roblems of synchron	izat	on	
Unit –IV 06 Hrs							
Main Memory Management							
Background, Swapping, Contiguous memory allocation, Segmentation, Paging, Structure of page table.							
Virtual memory							
Background, Demand Paging, Copy-on-write, Page replacement, Allocation of frames, Thrashing							
Eile Swatama			Unit –v				U0 Hrs
File Systems							
File-System calls File-System I avout Implementing Files							
r ne-5ystem cans, r ne-5ystem Layout, implementing r nes							
Course Outcomes: After completing the course, the students will be able to:-							

CO 1	Apply the operating systems concepts to solve problems in computing domain.
CO 2	Analyze data structures and algorithms used to implement OS concepts.
CO 3	Design solutions using modern tools to solve applicable problems in operating systems domain
CO 4	Implement process, memory, scheduling, synchronization and other operating system techniques.
CO 5	Demonstrate skills like investigation, effective communication, working in team/Individual and
	following ethical practices by implementing operating system concepts and applications.

Ref	Reference Books					
1.	Operating System Concepts, Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, 9 <sup>th</sup> Edition, Incorporated, 2018, John Wiley & Sons, ISBN 978-1-265-5427-0					
2.	Modern operating systems, Tanenbaum, Andrew, 4 <sup>th</sup> Edition, Pearson Education, Inc 2009. ISBN 013359162X, 978-0133591620					
3.	UNIX System Programming Using C++, Terrence Chan, 2011, Prentice Hall India, ISBN: 9788120314689 978-8120314689.					
4.	Operating systems - A concept based Approach, D.M Dhamdhere, 3rd Edition, 2017, Tata McGraw-Hill, ISBN: 1259005585, 978-1259005589					
5.	"xv6: a simple, Unix-like teaching operating system", https://pdos.csail.mit.edu/6.828/2014/xv6/book-rev8.pdf					

#### **EXPERIENTIAL LEARNING**

1. Students need to implement Operating system with kernel concepts with the help of references like:

- Weenix- project for people interested in writing parts of a Unix kernel.
- GitHub cfenollosa/os-tutorial: How to create an OS from scratch
- 2. Open Ended Problems are given to students to solve using various latest OS technology.

#### Laboratory Component PART A

1. Implementation of basic UNIX commands using file APIs- Write a program to implement commands ls( -l option), cp, rm and mv using UNIX file APIs.

2. Apply the concepts of Process control system calls to build applications to demonstrate use of fork, execve, wait, getpid, exitsystem calls

3. Apply the pthread library to build Applications to demonstrate use of pthread library functions to create and manage threads.

4. Apply the concepts of Process/Thread synchronization to build Applications to demonstrate process/thread synchronizationusing semaphores and mutex. Implement Dining philosophers problem, reader-writer and producer-consumer.

5. Apply the concepts of Process/Thread synchronization for file access to build applications to demonstrate process/threadsynchronization using file locks.

6. Apply Memory management concepts towrite a program to simulate Buddy memory allocation algorithm.

7. Apply the concepts of Static and Shared libraries to write a program to create and use static and shared libraries. Demonstrate the advantage of shared libraries over static libraries in terms of memory usage.

#### PART B Open Ended Experiments

The students are expected to implement a mini project using operating system concepts and APIs/system calls learned in the theory. The primary emphasis of the experiment is to understand and gain knowledge of operating system concepts so as to apply these concepts in implementing solutions to real world problems. Students are required to form a team, with constraint of maximum 3 persons in a team. Students have to select the problem/application of their choice and get confirmed with faculty handling the course.

Some sample topics could be

- Implement a complex open-ended project with case studies on various OS like Embedded OS, Mobile OS etc.
- Implement kernel concepts in OS

ASSESSMENT AND EVALUATION PATTERN				
	CIE	SEE		
WEIGHTAGE	50%	50%		
QUIZZES	-			
Quiz-I	Each quiz is evaluated for 10			
Quiz-II	marks adding up to 20 MARKS.			
<b>THEORY COURSE</b> (Bloom's Taxonomy Levels: Remembering, Understandi Evaluating, and Creating)	ng, Applying, Analyzing,			
Test – I	Each test will be conducted for 50			
Test – II	Final test marks will be reduced to 40 MARKS			
EXPERIENTIAL LEARNING	40	****		
Case Study-based Teaching-Learning	10			
Program Specific Requirement for EL Assessment	20	****		
Video based seminar (4-5 minutes per student)	10			
MAXIMUM MARKS FOR THE THEORY	100 MARKS	100 MARKS		
PRACTICALS	50	50		
TOTAL MARKS FOR THE COURSE	150	150		

Semester: III							
Discrete Mathematical Structures							
(Theory )							
			(Common to CS, IS	& AI)			
Course Code	Course Code   :   21CS36   CIE   :   100 Marks						
Credits: L:T:P	:	3:0:0		SEE	:	100 Marks	
<b>Total Hours</b>	:	45L		<b>SEE Duration</b>	:	3Hours	
			Init I			10 Hrs	
Introduction- Pers	nec	tives	01111-1			10 111 5	
Business Domains	8	Annlications: An	lication of discrete ma	thematics incoding t	heor	ry job scheduling	
routing in networki	αr nσ i	network security e	etc	thematics medding t	neo	ry, job seneduling,	
Fundamental Prin	cinl	les of Counting					
The Dule of Sum on	d D.	vaduat Darmutatia	ng Combinations The	Dinamial Theorem	~~~~	hingtions with repetition	
Recursive Definition	u FI	Recurrence Rel	ations	billoilliai Theorem,	2011	iomations with repetition	
Recursive definition	опз, 5 Б	inst order lineer re	autons	vulation problems on	d ar	remular Second order	
linear homogeneous	1, Г1 с тес	urrence relations	with constant coefficie	nte	a ex	tamples, Second order	
inical nonlogeneous	5 100		Unit II	1115		00 Uma	
Fundamontals of I	Unit – II 08 Hrs						
Rasic Connectives	and	ic Truth Tables, Tai	utologies, Logical Equi	valence. The laws of	floc	ric Logical Implications	
Rules of inference.	One	en Statement, Qua	ntifiers. Definition and	the use of Quantifier	rs. T	Definitions and the proofs	
of theorems.	ope	in Statement, Qua			, <b>L</b>	erinitions and the proofs	
Unit –III 9 Hrs							
Relations							
Properties of relatio	ns,	Composition of R	elations, Partial Orders	, Hasse Diagrams, E	quiv	valence Relations and	
Partitions.							
Functions							
Functions-plain, On	e-to	o-one, onto functio	ons, Stirling numbers of	f the second kind, Fu	inct	ion composition and	
Inverse function, Growth of function.							
Unit –iv 9 Hrs							
Language and Finite State Machine							
Set Theory of strings, Finite State machine, introduction to Finite Automata, Basic concepts of Automata theory,							
Fourivalence of NFA & amp: DFA							
Unit –V 9 Hrs							
Groups theory						, 110	
Definition, Examples and Elementary properties. Abelian groups, Homomorphism isomorphism, cyclic groups							
cosets and Lagrange's theorem.							
Coding Theory:							
Elementary coding theory, the hamming metric, the parity-Check and generator Matrices							

Cours	Course Outcomes: After completing the course, the students will be able to:-				
CO1	Apply the concepts of discrete mathematical structures for effective computation and relating problems				
	in the computer science domain.				
CO2	Analyze the concepts of discrete mathematics to various fields of computer science.				
CO3	Design solutions for complex problems using different concepts of discrete mathematical structure as a				
	logical predictable system.				
<b>CO4</b>	Explore/Develop new innovative ideas to solve some open problems in theoretical computer science.				
CO5	Effectively communicate, work in groups in order to accomplish a task and engage in continuing				
	professional development.				

Ref	erence Books
1	Ralph P. Grimaldi and B V Ramana, Discrete and Combinatorial Mathematics- An Applied Introduction,
1.	Pearson Education, Asia, 5th Edition – 2017, ISBN 978-0321385024
C	J.P. Tremblay and R. Manohar, Discrete Mathematical Structures with Applications to Computer Science,
۷.	Tata – McGraw Hill, 1st Edition 2017, ISBN 13:978-0074631133
2	Kenneth H. Rosen, Discrete Mathematics and its Applications, Tata – McGraw Hill, 6th Edition, 7 edition
э.	2017, ISBN-(13): 978-0070681880

ASSESSMENT AND EVALUATION PATTERN			
	CIE	SEE	
WEIGHTAGE	50%	50%	
QUIZZES			
Quiz-I	Each quiz is evaluated for 10		
Quiz-II	marks adding up to 20 MARKS.		
<b>THEORY COURSE</b> (Bloom's Taxonomy Levels: Remembering, Understanding, Ap Creating)	pplying, Analyzing, Evaluating, and		
Test – I	Each test will be conducted for 50 Marks adding up to 100 marks Final		
Test – II	st – II Marks adding up to 100 marks. Final test marks will be reduced to 40 MARKS		
EXPERIENTIAL LEARNING	40	****	
Case Study-based Teaching-Learning	10		
Program Specific Requirement for EL Assessment	20	****	
Video based seminar (4-5 minutes per student)	10		
MAXIMUM MARKS FOR THE THEORY	100 MARKS	100 MARKS	
TOTAL MARKS FOR THE COURSE	100	100	

Semester: III								
Bridge Course: C Programming								
	(Theory)							
	(Common to all Branches)							
Course Code	:	21DCS37	CIE	:	50 Marks			
Credits: L:T:P	Credits: L:T:P : 2:0:0 SEE :							
<b>Total Hours</b>	:	30L	SEE Duration	:	2 Hours			

Unit-I	08 Hrs			
Unit-1	00 111 5			
Rusinass Domains: Drogramming				
Dusiness Domanis, Flogramming.	tin a Stratance			
Applications: Design games, GUI, DBIVIS, Embedded Systems, Compilers and Opera	ung Systems.			
Introduction to Computer Concepts: Introduction to Computer Hardware, Software	e and its Types.			
Introduction to C programming: Programming paradigms, Basic structure of C pro	gram, Process of			
compiling and running a C program, Features of C language, Character set, C tokens,	Keywords and			
Identifiers, Constants, Variables, Data types, Pre-processor directives. Handling Input	ut and Output			
operations and operators: Formatted input/output functions, Unformatted input/outp	put functions with			
programming examples using all functions.				
Unit – II	10 Hrs			
<b>Operators:</b> Introduction to operator set, Arithmetic operators, Relational operators, Logical Operators,				
Assignment operators, Increment and Decrement operators, Conditional operators, E	Bit-wise operators,			
Special operators. Expressions: Arithmetic expressions, evaluation of expression	ns, Precedence of			
arithmetic operators, Type conversion in expressions, Operator precedence and associ	iativity.			
Decision Making and Branching: Decision making with 'if' statement, Simple	'if' statement, the			
'ifelse' statement, nesting of 'ifelse' statements, The 'else if' ladder, The 'switc	ch' statement, The			
'?:' operator, The 'goto' statement.				
Unit –III	12 Hrs			
Programming Constructs: Decision making and looping: The 'for', 'while', 'do-	while' statements			
with examples, Jumps in loops. Arrays: Introduction to Arrays, Types of arrays, Declaration arrays,				
Initializing dimensional arrays (One Dimensional and Multidimensional Array) with examples.				
String Operations: Introduction, Declaration and Initializing String Variables using arrays, String				
operations and functions with examples. Functions: Need for Functions, Types of functions (User				
Defined and Built –In), working with functions, Definition, declaration and its scope. Pointers:				
Introduction, Benefits of using pointers, Declaration and Initialization of pointers, Obtaining a value of				

a variable.

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

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

## PRACTICE PROGRAMS

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

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

ASSESSMENT AND EVALUATION PATTERN			
	CIE	SEE	
WEIGHTAGE 100%			
QUIZZES			
Quiz-I	z-I Each quiz is evaluated for 10		
Quiz-II	marks adding up to 10 MARKS.		
<b>THEORY COURSE</b> (Bloom's Taxonomy Levels: Remembering, Understand Evaluating, and Creating)	ding, Applying, Analyzing,		
Test – I Each test will be conducted for 50 Marks adding unto 100 marks			
Test – II	Final test marks will be reduced to 30 MARKS		
EXPERIENTIAL LEARNING	10		
TOTAL MARKS FOR THE COURSE	50		

బ	ಳಕೆ ಕನ್ನಡ - baLa	ike Kannada (K	Kannada for Usage)				
ಕನ್ನಡ ಕಲಿಕೆಗಾಗಿ <u>ನಿಗದಿ</u> ಪಡಿಸಿದ ಪಠ್ಯಪುಸ್ತಕ - (Prescribed Textbook to Learn Kannada)							
ವಿಷಯ ಸಂಕೇತ (Cour Code)	rse 21KBK39/49	ి నిర అం Ev	ರಂತರ ಆಂತರಿಕ ಮೌಲ್ಯಮಾಪನದ ಂಕಗಳು (Continuous Internal valuation Marks)	50			
ಒಂದು ವಾರಕ್ಕೆ ಬೋಧನ (Teaching Hours / W (L:T:P: S)	ಗಾ ಅವಧಿ Teek 0:2:0:1	0:2:0:1 ಸೆಮಿಸ್ಟರ್ ಅಂತ್ಯದ ಪರೀಕ್ಷೆಯ ಅಂಕಗಳು (Semester End Examination Marks)					
ಒಟ್ಟು ಬೋಧನಾ ಅವರ Total Hours of Ped	ಧಿ 25 ಗಂಟೆಗಳು lagogy	201	ಒಟ್ಟು ಅಂಕಗಳು (Total Marks) 100				
ಕ್ರೆಡಿಚ್ಸ್ (Credits)	01	ಪ	ರೀಕ್ಷೆಯ ಅವಧಿ (Exam Hours)	01 ಗಂಚೆ			
ಬಳಕೆ ಕನ್ನಡ ಪಠ್ಯದ ಕಲಿ • To hea • To • To • To	ಕೆಯ ಉದ್ದೇಶಗಳು (Course o Create the awareness r althy life. o enable learners to Listo o speak, read and write l o train the learners for co	Learning Objectives): egarding the necessity of en and understand the K Kannada language as per prrect and polite conserv	e of learning local language for c annada language properly. r requirement. vation.	omfortable and			
ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ	ವ್ಯವಸ್ಥೆ (Teaching-Learnii	ng Process - General Inst	ructions) :				
These are sample Str 1. ಬಳಕೆ ಕನ್ನಡವನ 2. ಪ್ರಮುಖ ಅಂಶಗ	These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes. 1. ಬಳಕೆ ಕನ್ನಡವನ್ನು ತರಗತಿಯಲ್ಲಿ ಶಿಕ್ಷಕರು ಬೋಧಿಸಲು ವಿಟಿಯು ಸೂಚಿಸಿರುವ ಪಠ್ಯಪುಸ್ತಕವನ್ನು ಉಪಯೊಗಿಸಬೇಕು.						
 ಅವಕಾಶ ಮಾಡಿ	ತಿಕೊಡುವುದು.	0 4 -					
3. ಪ್ರತಿ ವಿದ್ಯಾರ್ಥಿ ನ ಸಂಬಂದಪಟಂತ	ಪುಸ್ತಕವನ್ನು ತರಗತಿಯಲ್ಲಿ ಬಳಕ ತೆ ಪೂರಕ ಚಟುವಟಿಕೆಗಳಿಗೆ ತೊ	ುವಂತೆ ನೋಡಿಕೊಳ್ಳುವುದು ವ ಡಗಿಸತಕ್ತದು.	ಹಿತ್ತು ಪ್ರತಿ ಪಾಠ ಮತ್ತು ಪ್ರವಚನಗಳ ಮು	ಾಲ ಅಂಶಗಳಿಗೆ			
1ರಿಜೀಚ್ ತಂತಜ್ಞಾನದ ಮುಖಾಂತರ ಇತೀಚೆಗೆ ಡಿಜೀಬಿಕರಣ ರೊಂಡಿರುವ ಬಾಸೆ ಕಬಿಕೆಯ ವಿಧಾನಗಳನ್ನು ಸಿಸಿಚಿ ನುಸು ರ ಕ							
ಮಾದ,ಮದ ನ							
್ಶ ಕೇಳಲು ಮತ್ತು	್ರ ಲಧ್ಯಯನದಲಿ ತೊಡಗಲು ಅಸ್	್ಶೆ <sup>2</sup> ರ ಮಕೂಲವಾಗುತದೆ.	શું જ શ	2			
2. ಭಾಷಾಕಲಿಕೆಂ ಕಾರ್ಯಚಟುಕ	ಿ ್ಯ ಮೆ ಪ್ರಯೋಗಾಲಯದೆ ಮುಖಾಂ ನಟಿಕೆಗಳನ್ನು ಮತ್ತು ಕ್ರಿಯಾ ಯೆ/	ೆ ತರ ಬಹುಬೇಗ ಕನ್ನಡ ಭಾಷೆಯ neಜನೆಗಳನ್ನು ರೂಪಿಸುವುದು.	ುನ್ನು ಕಲಿಯಲು ಅನುಕೂಲವಾಗುವಂತೆ				
Module-1							
<ol> <li>Introduction, Necessity of learning a local language. Methods to learn the Kannada language.</li> <li>Easy learning of a Kannada Language: A few tips. Hints for correct and polite conservation, Listening and Speaking Activities</li> <li>Key to Transcription.</li> <li>aj, ಯಕ್ತಿಕ, ಸ್ವಾಮೈಸೂಚಕ/ಸಂಬಂಧಿತ ಸಾರ್ವನಾಮಗಳು ಮತ್ತು ಪ್ರಶ್ನಾರ್ಥಕ ಪದಗಳು - Personal Pronouns, Possessive Forms. Interrogative words</li> </ol>							
ಬೋಧನೆ ಮತ್ತು	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋ	ರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗ	ಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ	ಮತ್ತು ದೃಶ್ಯ			
ಕಲಿಕಾ ವಿಧಾನ ಮಾಧ್ಯಮದ ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಖಾಂತರ ಚರ್ಚಿಸುವುದು.							

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

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

Skill Set): At the end of the Course, The Students will be able

- 1. To understand the necessity of learning of local language for comfortable life.
  - To Listen and understand the Kannada language properly.
- **3.** To speak, read and write Kannada language as per requirement.
- 4. To communicate (converse) in Kannada language in their daily life with kannada speakers.
- 5. To speak in polite conservation.

## Assessment Details (both CIE and SEE)

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

## **Continuous Internal Evaluation:**

2.

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

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

Two assignments each of **10 Marks : 1.** First assignment at the end of 4<sup>th</sup> week of the semester

7. Second assignment at the end of 9<sup>th</sup> week of the semester

Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for **20 Marks** (duration 01 hours)

8. At the end of the 13<sup>th</sup> week of the semester

The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be scaled down to 50 marks

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

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

SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject.

- 2. The question paper will have 50 questions. Each question is set for 01 mark.
- 3. SEE Pattern will be in MCQ Model for 50 marks. Duration of the exam is 01 Hour.

# **Textbook** :

ಬಳಕೆ ಕನ್ನಡ

ಲೇಖಕರು : ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ

ಪ್ರಸಾರಾಂಗ, ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಬೆಳಗಾವಿ.

# BE - III/IV Semester - Common to all

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ						
ವಿಷಯ ಸಂಕೇತ (Course Code)	21KSK39/49	ನಿರಂತರ ಆಂತರಿಕ ಮೌಲ್ಯಮಾಪನದ	- 0			
		ಅಂಕಗಳು	50			
ಒಂದು ವಾರಕ್ಕೆ ಬೋಧನಾ ಅವಧಿ		ಸೆಮಿಸ್ಟರ್ ಅಂತ್ಯದ ಪರೀಕ್ಷೆಯ	50			
(Teaching Hours / Week (L:T:P: S)	0:2:0:1	ಅಂಕಗಳು	50			
ಒಟ್ಟು ಬೋಧನಾ ಅವಧಿ	25 ಗಂಟೆಗಳು	2,63) ಅಂಕಗಳು	100			
Total Hours of Pedagogy			100			
ಕ್ರೆಡಿಟ್ಸ್ (Credits)	01	ಪರೀಕ್ಷೆಯ ಅವಧಿ	01 ಗಂಟೆ			
ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಪಠ್ಯದ ಕಲಿಕೆಯ ಆ	ಉದ್ದೇಶಗಳು:					
1. ವೃತ್ತಿಪರ ಪದವಿ ವಿದ್ಯಾರ್ಥಿಗ ಮಾಡಿಕೊಡುವುದು	ಳಾಗಿರುವುದರಿಂದ ಕನ್ನಡ ಭಾಷೆ, ಸ	ಾಹಿತ್ಯ ಮತ್ತು ಕನ್ನಡದ ಸಂಸ್ಕೃತಿಯ	ು ಪರಿಚಯ			
ಂ ಕನನ ಪ್ರಾಸಿತನ ಸರಾನ ಇ	ನವನ ಅವು ೩ ಸಂಸಂ ನುತು ಅನ		ದಿನನ್ನು ೩			
2. ರನ್ನಡ ನಾಹತ್ಯದ ಪ್ರಧಾನ ಧ	പ്പ പ്രാപ്പാംഗ് നിന്നു നിന്നും നനും നിന്നും നിന്ന		ക്ഷായം			
ಎದ್ಯಾರ್ಥಗಳಲ್ಲಿ ಸಾಹತ್ಯ ಮತ್ತು	ಸಂಸ್ಕೃತಿಯ ಬಗ್ಗೆ ಅಂದು ಹಾಗೂ ಆಸಕ್ತ	ಯನ್ನು ಮೂಡನುವುದು.				
3. ತಾಂತ್ರಕ ವ್ಯಕ್ತಿಗಳ ಪರಚಯವನ	ನ್ನು ಹಾಗೂ ಅವರುಗಳ ಸಾಧಸಿದ ಎಷಯ	ಗಳನ್ನು ಪರಚಯಸುವುದು.				
4. ಕನ್ನಡ ಶಬ್ದಸಂಪತ್ತಿನ ಪರಿಚಯ	ಮತ್ತು ಕನ್ನಡ ಭಾಷೆಯ ಬಳಕೆ ಹಾಗೂ ಕನ	ನ್ನಡದಲ್ಲಿ ಪತ್ರ ವ್ಯವಹಾರವನ್ನು ತಿಳಿಸಿಕೆ	ಾಡುವುದು.			
ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವ್ಯವಸ್ಥೆ (Teaching	-Learning Process - General Inst	ructions) :				
These are sample Strategies, which 1. ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡವನ್ನು ಬೋಟ	n teacher can use to accelerate the ನಿಸಲು ತರಗತಿಯಲ್ಲಿ ಶಿಕ್ಷಕರು ಪ್ರಸ್ತುತ	attainment of the course outcome ಪುಸ್ತಕ ಆಧಾರಿಸಿ ಬ್ಲಾಕ್ ಬೋರ್ಡ್	es. ವಿಧಾನವನ್ನು			
ಅನುಸರಿಸುವುದು. ಪ್ರಮುಖ ಅಂಬ	ಅನುಸರಿಸುವುದು. ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಚ್ ಗಳನ್ನು ತಯಾರಿಸಲು ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಪ್ರೇರೇಪಿಸುವುದು ಮತು ತರಗತಿಯಲಿ					
) ಅವುಗಳನ್ನು ಚರ್ಚಿಸಲು ಅವಕಾಶ ಪ	ಅವುಗಳನ್ನು ಚರ್ಚಿಸಲು ಅವಕಾಶ ಮಾಡಿಕೊಡುವುದು.					
2. ಇತ್ತೀಚಿನ ತಂತ್ರಜ್ಞಾನದ ಅನುಕೋ	~ 2.     ಇತ್ರೀಚಿನ ತಂತ್ರಜ್ಞಾನದ  ಅನುಕೂಲಗಳನ್ನು  ಬಳಸಿಕೊಳ್ಳುವುದು -  ಅಂದರೆ ಕವಿ-ಕಾವ್ಯ ಪರಿಚಯದಲಿ ಕವಿಗಳ ಚಿತ್ರಣ ಮತು ಲೇಖನಗಳು					
ಮತ್ತು ಕಥೆ ಕಾವ್ಯಗಳ ಮೂಲ ಅಂಬ	್ ್ ್ ್ ್ ್ ್ ್ ್ ್ ್ ್ ್ ್ ್ ್ ್ ್ ್					
ವಿಮರ್ಶಾತ್ಮಕ ವಿಷಯಗಳನ್ನು ಟಿಪಿ	ಟಿ, ಡಿಜಿಟಲ್ ಮಾಧ್ಯಮಗಳ ಮುಖಾಂತರ ವಿ	ಶ್ಲೇಷಿಸುವುದು.				
3. ನವೀನ ಮಾದರಿಯ ಸಾಹಿತ್ಯ ಬೋ	3. ನವೀನ ಮಾದರಿಯ ಸಾಹಿತ್ಯ ಬೋಧನೆಗೆ ಸಂಬಂಧಪಟ್ಟ ವಿಧಾನಗಳನ್ನು ಶಿಕ್ಷಕರು ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಅನುಕೂಲವಾಗುವ ರೀತಿಯಲಿ					
ಅಳವಡಿಸಿಕೊಳ್ಳಬಹುದು.						
ಘಟಕ -1 ಲೇಖನಗಳು						
1. ಕರ್ನಾಟಕ ಸಂಸ್ಕೃತಿ - ಹಂಪ ನ	1. ಕರ್ನಾಟಕ ಸಂಸ್ಕೃತಿ - ಹಂಪ ನಾಗರಾಜಯ್ಯ					
2. ಕರ್ನಾಟಕದ ಏಕೀಕರಣ : ಒಂದು ಅಪೂರ್ವ ಚರಿತ್ರೆ - ಜಿ. ವೆಂಕಟಸುಬ್ಬಯ್ಯ						
3. ಆಡಳಿತ ಭಾಷೆಯಾಗಿ ಕನ್ನಡ - ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ ಮತ್ತು ಪ್ರೋ. ವಿ. ಕೇಶವಮೂರ್ತಿ						
ಬೋಧನೆ ಮತ್ತು ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬ	ಾಧನೆ ಮತ್ತು ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಚ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ					
ಕಲಿಕಾ ವಿಧಾನ ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವ	, ವಿಧಾನ ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಖಾಂತರ ಚರ್ಚಿಸುವುದು.					

ಘಟಕ -2 ಆಧುನಿಕ ಪೂರ್ವದ ಕಾವ್ಯ ಭಾಗ

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

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

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

## ಘಟಕ -3 ಆಧುನಿಕ ಕಾವ್ಯಭಾಗ

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

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

ಘಟಕ -4 ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯ

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

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

ಕಲಿಕಾ ವಿಧಾನ 🛛 ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಖಾಂತರ ಚರ್ಚಿಸುವುದು.

## ಘಟಕ -5 ಕಥೆ ಮತ್ತು ಪ್ರವಾಸ ಕಥನ

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

ಬೋದನೆ ಮತು	ಪುಸಕ ಆದಾರಿತ ಬಾಕ್	ಬೋರ್ಡ್ ವಿಧಾನ.	ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಚ್ (	ಗಳನು ಬಳಸುವುದು.	ಪಿಪಿಟಿ ಮತು ದ್ರಶ.

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

## ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಕಲಿಕೆಯಿಂದ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಆಗುವ ಪರಿಣಾಮಗಳು (course Outcomes):

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

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

(methods of CIE - MCQ, Quizzes, Open book test, Seminar or micro project)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The student has to obtain a minimum of 40% marks individually both in CIE and 35% marks in SEE to pass. Theory Semester End Exam (SEE) is conducted for 50 marks (01 hour duration). Based on this grading will be awarded.

## **Continuous Internal Evaluation:**

Three Tests each of 20 Marks (duration 01 hour)

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

Two assignments each of **10 Marks : 1.** First assignment at the end of 4<sup>th</sup> week of the semester

2. Second assignment at the end of 9<sup>th</sup> week of the semester

Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for **20 Marks** (duration 01 hours)

3. At the end of the 13<sup>th</sup> week of the semester

The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be scaled down to 50 marks

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

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

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

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

ಪಠ್ಯಪುಸ್ತಕ :

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ

ಡಾ. ಹಿ.ಚೆ.ಬೋರಲಿಂಗಯ್ಯ ಮತ್ತು ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ,

ಪ್ರಸಾರಾಂಗ, ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಬೆಳಗಾವಿ.

	Semester: III					
	National Service Scheme					
		(Prac	tical)			
	(Common to all Branches)					
Course Code	:	21HSAE39A/21HSAE46A		CIE	:	50 Marks
Credits: L:T:P	:	0:0:1		SEE	:	50 Marks
<b>Total Hours</b>	:	13P		<b>SEE Duration</b>	:	2 Hours

#### **Prerequisites:**

1. Students should have service-oriented mindset and social concern.

2. Students should have dedication to work at any remote place, any time with available resources and proper time management for the other works.

3. Students should be ready to sacrifice some of the timely will and wishes to achieve service-oriented targets on time.

Content13 HrsStudents must take up any one activity on below mentioned topics and has to prepare contents for awareness and<br/>technical contents for implementation of the projects and has to present strategies for implementation of the same.<br/>Compulsorily must attend one camp.

CIE will be evaluated based on their presentation, approach, and implementation strategies. (Any one of the below mentioned activity)

1. Helping local schools to achieve good result and enhance their enrolment in Higher/technical/vocational education.

2. Preparing an actionable business proposal for enhancing the village/ farmer income and approach for implementation.

3. Developing Sustainable Water management system for rural/ urban areas and implementation approaches.

4. Setting of the information imparting club for women leading to contribution in social and economic issues.

5. Spreading public awareness/ government schemes under rural outreach program. (Minimum 5 programs)

6. Contribution to any national level initiative of Government of India. For eg. Digital India, Skill India, Swachh

Bharat, Atmanirbhar Bharath, Make in India, Mudra scheme, Skill development programs etc..

7. Social connect and responsibilities

8. Plantation and adoption of plants. Know your plants

9. Organic farming, Indian Agriculture (Past, Present and Future) Connectivity for marketing

10. Waste management - Public, Private and Govt organization, 5 R's

11. Water conservation techniques - Role of different stakeholders - Implementation

12. Govt. School Rejuvenation and assistance to achieve good infrastructure.

13. Organize National integration and social harmony events/ workshops / seminars. (Minimum 2 programs)

#### AND ONE NSS-CAMP

<b>Course Outcome</b>	s: A	fter going through this course the student will be able to:
CO1	:	Understand the importance of his/her responsibilities towards society.
CO2	:	Analyze the environmental and societal problems/ issues and will be able to design solutions for the same.
CO3	:	Evaluate the existing system and to propose practical solutions for the same for sustainable development.
CO4	:	Implement government or self-driven projects effectively in the field.

**SEE** for 50 marks is executed by means of an examination. The Question paper for the course contains two parts, Part - A and Part - B. Part - A consists of objective type questions for 10 marks covering the complete syllabus. Part - B is for 40 marks. It consists of simple grammar and essay type questions.

	Semester: III					
	National Cadet Corps					
		(Pr	actical)	_		
	(Common to all Branches)					
Course Code	:	21HSAE39B/ 21HSAE46B		CIE	:	50 Marks
Credits: L:T:P	:	0:0:1		SEE	:	50 Marks
Total Hours	:	15P		SEE Duration	:	2 Hours

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

Course Outcomes: After going through this course the student 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.

# **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
| Semester: III       |                                         |                                |                     |           |                                      |         |                    |
|---------------------|-----------------------------------------|--------------------------------|---------------------|-----------|--------------------------------------|---------|--------------------|
|                     | DUVSICAL EDUCATION (SDODTS & ATHLETICS) |                                |                     |           |                                      |         |                    |
|                     |                                         | (Pra                           | (SI OK              | ISCAI     | ILETICS)                             |         |                    |
| Course Code         | :                                       | 21HSAE39C/21HSAE46C            | ,                   | CIE       | :                                    | :       | 50 Marks           |
| Credits: L: T: P    | :                                       | 0:0:1                          |                     | SEE       | :                                    | :       | 50 Marks           |
| Total Hours         | :                                       | 30 P                           |                     | SEE Du    | ration :                             | :       | 2.30 Hours         |
|                     |                                         | Introduction of Physic         | al Educa            | ation and | Sports                               |         |                    |
| General & Specific  | war                                     | m up exercises                 |                     |           |                                      |         |                    |
| Conditioning exerci | ises                                    |                                |                     |           |                                      |         |                    |
| Any 2 Major Game    | s                                       |                                |                     |           |                                      |         |                    |
| Intramural Competi  | tion                                    | s                              |                     |           |                                      |         |                    |
|                     |                                         | Choose any one ac              | cording             | to serial | no                                   |         |                    |
| 1 171 171           | Gi                                      | Giving Kho, Single chain, Pole |                     | ( Vahadd; | Hand touch, Chain hold, Ankle        |         |                    |
| 1. KIIO-KIIO        | div                                     | e, Pole turning, 3-6 Up        | o. Kai              | Jaudi     | hold, Thigh hold, Getting bonus      |         |                    |
| 2 Throwball         | Se                                      | rvice, Receive, Spin pass,     | 7 Vollovball        |           | Attack, Block, Service, Upper hand   |         |                    |
|                     | Sir                                     | nple pass, Jump throw          | 7. VOI              | leyball   | pass, Lower hand pass                |         |                    |
| 3 Nethall           | Step with ball, Shooting,               |                                | 8 Har               | ndhall    | Step with ball, Shooting, Passing,   |         |                    |
| J. Iterball         | Pa                                      | ssing, Blocking                | Blocking, Dribbling |           |                                      | ibbling |                    |
| 4 Softhall          | Ca                                      | tching, Pitching, Slugging,    | 9 E00               | thall     | Dribbling, Chest Drop, Ball Control, |         |                    |
| 4. Soltball         | Ba                                      | se Running, Stealing           | 7.100               | tball     | Thigh Drop, Shooting                 |         |                    |
| 5. Ball             | Se                                      | rvice, Fore hand receive, Back | 10. Ta              | ble       | Service, For                         | re      | hand receive, Back |
| badminton           | hai                                     | nd receive, Spin smash, Rally  | Tenni               | <b>S</b>  | hand receiv                          | /e,     | , Smash, Rally     |

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

### **Topics for Viva:**

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

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

ASSESSMENT ANI PATTI CIE-50 M	D EVALUATION ERN IARKS		
Activity book- 10 marks			
QUIZZES			
Quiz-I	Each quiz is evaluated for 10 marks		
Quiz-II adding up to 20 MARKS.			
Test – I	Demonstration of skills is evaluated for		
Test – II	10 marks adding up to 20 MARKS.		
ASSESSMENT ANI PATTI SEE-50 M	D EVALUATION ERN IARKS		
Practicals	30 marks		
Viva voce	20 marks		
Total	50 marks		

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

Rubric for SEE (2022 Scheme)				
Sl.No	Content	Marks		
1	Performing Skills (Any Two)	30		
2	Viva	20		
	Total :	50		

	Semester: III					
	Music					
(Common to all Branches)						
Course Code	:	21HSAE39D1/1HSAE46D1		CIE	:	50 Marks
Credits: L:T:P	:	0:0:1		SEE	:	50 Marks
<b>Total Hours</b>	:	13P		<b>SEE Duration</b>	:	2 Hours

1. Students should know basics of music.

2. Students should have dedication to learn and improve on their musical skills.

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

	Content
1. Introduction to different genres of music	

2. Evolution of genres in India: Inspiration from the world

3. Ragas, time and their moods in Indian Classical Music

4. Identification of ragas and application into contemporary songs

5. Adding your touch to a composition

6. Maths and Music: A demonstration

7. Harmonies in music

8. Chords: Basics and application into any song

9. Music Production-I

10. Music Production-II

Students have to form groups of 2-4 and present a musical performance/ a musical task which shall be given by the experts. The experts shall judge the groups and award marks for the same.

CIE will be evaluated based on their presentation, approach and implementation strategies. Students need to submit their certificates of any event they participated or bagged prizes in. This shall also be considered for CIE evaluation.

Course Outcomes: After going through this course the student 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.		

### **Reference Books:**

1. Music Cognition: The Basics by Henkjan Honing

2. Basic Rudiments Answer Book - Ultimate Music Theory: Basic Music Theory Answer Book by Glory St 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

13 Hrs

	Semester: III					
	Dance					
	(Practical)					
(Common to all Branches)						
Course Code	:	21HSAE39D2/21HSAE46D2		CIE	:	50 Marks
Credits: L:T:P	:	0:0:1		SEE	:	50 Marks
<b>Total Hours</b>	:	13P		<b>SEE Duration</b>	:	2 Hours

1. Students should have the will and interest to learn dancing.

2. Students should have a positive mindset.

3. Students should be willing to interact and cooperate in group activities.

Content	13 Hrs
1. Introduction to Dance	

2. Preparing the body for dancing by learning different ways to warm up.

3. Basics of different dance forms i.e. classical, eastern, and western.

4. Assessing the interest of students and dividing them into different styles based on interaction.

5. Advancing more into the styles of interest.

6. Understanding of music i.e. beats, rhythm, and other components.

7. Expert sessions in the respective dance forms.

8. Activities such as cypher, showcase to gauge learning.

9. Components of performance through demonstration.

10. Introduction to choreographies and routines.

11. Learning to choreograph.

12. Choreograph and perform either solo or in groups.

#### **Course Outcomes:**

### After going through this course the student will be able to:

CO1	:	Understand the fundamentals of dancing.
CO2	:	Adapt to impromptu dancing.
CO3	:	Ability to pick choreography and understand musicality.
CO4	:	To be able to do choreographies and perform in front of a live audience.

#### **Reference Books:**

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

Semester: III										
Lights Camera Drama										
	(Practical)									
	(Common to all Branches)									
<b>Course Code</b>	Course Code : 21HSAE39D3/21HSAE46D3 CIE : 50 Marks									
Credits: L:T:P	Credits: L:T:P         :         0:0:1         SEE         :         50 Marks									
<b>Total Hours</b>	'otal Hours     : 13P     SEE Duration     : 2 Hours									

1. Students should have creative oriented mindset and social concern.

2. Students should have dedication to work with their classmates for long hours until a collective goal is reached.

3. Students should be ready to sacrifice some of the timely will and wishes to achieve targets on time.

Content	13 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 social anxiety, 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 the dramatic aspect of it, this unit discusses some tips to help the young actors improve their dialogue delivery skills:

7. Elementary, My dear Watson.

8. Responsibilities of an actor tools of an actor character analysis Observations aspects, Stage presence,

concentration, conviction, confidence, energy and directionality.

9. Show time

10. Pick a genre: COMEDY, THRILLER, HORROR, and TRAGEDY: Showcase a performance. Stylized acting with reference to historical and mythological plays. Mime: conventional, occupational and pantomime Mono acting: different types of characters

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

### **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

Semester: III									
Art									
	(Practical)								
		(Common to al	I Brai	ncnes)					
Course Code	Course Code : 21HSAE39E1/21HSAE46E1 CIE : 50 Marks								
Credits: L:T:P         :         0:0:1         SEE         :         50 Marks									
<b>Total Hours</b>	Fotal Hours     :     13P     SEE Duration     :     2 Hours								

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

Content	13 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 to create 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

0. Equilarization with the many art forms and techniques of expression four

9. Familiarization with the many art forms and techniques of expression found throughout India.

### AND

### ONE EDUCATIONAL VISIT TO AN ART MUSEUM / INSTITUTE / GALLERY

Students must turn in assignments for each of the above said topics on a weekly basis and have to compulsorily take part in the museum visit. CIE will be evaluated based on a still life piece, a composition using any one of the media of composition and a presentation on Indian art styles and creation of a piece pertaining to the presented art style.

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

# **Reference Books:**

1. Catching the Big Fish: Meditation, Consciousness, and Creativity by David Lynch

2.Art & Fear: Observations on the Perils (and Rewards) of Artmaking by David Bayles & Ted Orland

Semester: III									
Photography									
	(Practical)								
(Common to all Branches)									
Course Code	Course Code : 21HSAE39E2/21HSAE46E2 CIE : 50 Marks								
Credits: L:T:P         :         0:0:1         SEE         :         50 Marks									
<b>Total Hours</b>	:	13P		<b>SEE Duration</b>	:	2 Hours			

1. Students should know basics of photography and cinematography.

- 2. Students should have dedication to learn and improve on their photography and film making skills.
- 3. Students should have participated in photography events.
- 4. Students should have a DSLR camera.

Content	

13 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 Outcomes: After going through this course the student 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

Semester III								
Course Title: SUMMER INTERNSHIP-I (Practice)								
Course Code	:	21ISI310	CIE Marks	:	50 Marks			
Credits: L:T:P	:	0:0:2	SEE Marks	:	50 Marks			
Total Hours	:	3 Weeks	SEE Duration	:	1 Hours			

### Guidelines 3 Weeks

- 1. A minimum of 1 credit of internship after I year may be counted towards B.E. degree program.
- 2. During II semester to III semester transition, Three weeks of internship is mandatory.
- **3.** Internship report and certificate need to be submitted at the end of the internship to the concerned department for the evaluation.
- 4. Internship evaluation will be done during III semester for 1 credit in two phases.
- 5. Students can opt the internship with the below options:
  - A. Within the respective department at RVCE (Inhouse) Departments may offer internship opportunities to the students through the available tools so that the students come out with the solutions to the relevant societal problems that could be completed within THREE WEEKS.

### B. At RVCE Center of Excellence/Competence

RVCE hosts around 16 CENTER OP EIXCELLENCE in various domains and around 05 CENTER OP COMPETENCE. The details of these could be obtained by visiting the website https://rvce.edu.in/rvce-center-excellence. Each center would be providing the students relevant training/internship that could be completed in three weeks.

# C. At Intern Shala

Intern Shala is India's no.1 internship and training platform with 40000+ paid internships in Engineering. Students can opt any internship for the duration of three weeks by enrolling on to the platform through https: //internshala.com At Engineering Colleges nearby their hometown Students who are residing out of Bangalore, should take permission from the nearing Engineering College of their hometown to do the internship. The nearby college should agree to give the certificate and the letter/email stating the name of the student along with the title of the internship held with the duration of the internship in their official letter head.

# E. At Industry or Research Organizations

Students can opt for interning at the industry or research organizations like BEL, DRDO, ISRO, BHEL, etc.. through personal contacts. However, the institute/industry should provide the letter of acceptance through hard copy/email with clear mention of the title of the work assigned along with the duration and the name of the student.

### **Procedures for the Internship:**

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

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

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

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

			Semester: IV			
	S	<b>FATISTICS AND</b>	PROBABILITY	FOR DATA SCI	ENC	CE
			(Theory)			
		(Co)	mmon to ALL Pro	ograms)		1
Course Code	:	21MA41		CIE	:	100 Marks
Credits: L:T:P	:	2:1:0		SEE	:	100 Marks
Total Hours	:	30L+15T		SEE Duration	:	<b>3.00 Hours</b>
			J <b>nit-l</b>			06 Hrs
Statistics:						
Central moments,	me	an, variance, coeff	icients of skewnes	s and kurtosis in ter	rms	of moments.
Correlation analys	sis,	rank correlation, li	near and multivari	ate regression analy	ysis	– problems.
		Ui	nit – 11			06 Hrs
Random Variabl	es:					
Random variables	-dis	screte and continuo	ous, probability ma	ss function, probab	oility	y density function,
cumulative densit	y fu	nction, mean and	variance. Two or mo	re random variables - J	loint	probability mass functio
joint probability density function, conditional distribution and independence, Covariance and Correlation.						
D	·1	<u> </u>	III –III			00 1118
Probability Distr Discrete distributi	1DU	Dinomial Doisso	n Continuous dist	ributions Expond	ntial	Normal and Waibul
Discrete distributi	0115	- Dinomiai, Foisso	nit IV	Toutions – Exponen	Illai	<b>06 Hrs</b>
Sampling and Eq	4:	otion				00 111 5
Sampling and Es	um	allon:	om compling (wit	the replacement on	4 11	without ronloamant
Sompling distribution		pie, Simple Tando	known) Somnling	distributions of	u w	villout replacement
distribution Same	1110	a distributions of y	known), Sampning	( uisuibutions of	111Ca	ill (5 ulikilowil). t
Maximum Likalik	nin	g distributions of v	$\sigma$ unknow	(n): Chi - squared C	nstr	
Maximum Likelinood Esumation (MLE).						
		U	nit –v			06 Hrs
Inferential Statis	tics	•				
Principles of Stati	Principles of Statistical Inference, Test of hypothesis - Null and alternative hypothesis, Procedure for					
statistical testing, Type I and Type II errors, level of significance, Tests involving the normal						
statistical testing,	Ţ	ype I and Type I		significance, Tes	ts 1	
distribution, one -	Ty ta -	ype I and Type I iled and two – tail	led tests, P – value	significance, Tes e, Special tests of s	ts i signi	ificance for large an

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

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

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

			Semester:IV			
	BIOINSPIRED ENGINEERING					
			(Theory)			
	(Common to AI, BT, CS & IS)					
Course Code	:	21BT42		CIE	:	50 Marks
Credits: L:T:P	:	2:0:0		SEE	:	50 Marks
Total Hours	:	28L		<b>SEE Duration</b>	:	2.00 Hours

### Unit-I

09 Hrs

**09 Hrs** 

 Introduction to Bio-inspired Engineering

 Stem cells; types and applications. Synthetic Biology. Synthetic/ artificial life. Biological Clock,

 Biological and synthetic materials, Biopolymers; Bio-steel, Bio-composites, multi-functional

 biological materials. Inimitable Properties of biomaterials. Antireflection and photo-thermal,

 Microfluidics in biology.

 Unit – II

 10 Hrs

# Lesson from Nature-Bioinspired Materials and mechanism

Firefly-Bioluminescence, Cockleburs –Velcro, Lotus leaf - Self-cleaning materials, Gecko - Gecko tape, Whale fins - Turbine blades, Box Fish / Bone - Bionic car, Shark skin - Friction reducing swim suits, Kingfisher beak - Bullet train, Coral - Calera cement, Forest floor / Ecosystem functioning - Flooring tiles, Morpho butterfly- Photonics and Iridescence, Namib beetle- Water collecting, Termite/ ant hill-passive cooling, Birds/Insects- flights/ aerodynamics, Mosquito inspired micro needle..

#### Unit –III Biomedical Inspiration-Concept and applications

Organ system- Circulatory- artificial blood, artificial heart, pacemaker. Respiratory- artificial lungs. Excretory- Artificial kidney. Artificial Support and replacement of human organs: Artificial Skin, artificial liver and pancreas. Total joint replacements- artificial limbs. Visual prosthesis -bionic eye.

Course Outcomes: After completing the course, the students will be able to				
CO1:	Elucidate the concepts and phenomenon of natural processes			
CO2:	Apply the basic principles for design and development of bioinspired structures			
CO3:	Analyse and append the concept of bio-mimetics for diverse applications			
CO4:	Designing technical solutions by utilization of bio-inspiration modules.			

Referenc	e Books
1.	Yoseph Bar-Cohen. Biomimetics: Biologically Inspired Technologies D. Floreano and C.
	Mattiussi, Bio-Inspired Artificial Intelligence, CRC Press, 2018. ISBN: 1420037714,
	9781420037715.
2.	Guang Yang, Lin Xiao, and Lallepak Lamboni. Bioinspired Materials Science
	and Engineering. John Wiley, 2018. ISBN: 978-1-119-390336.
3.	M.A. Meyers and P.Y. Chen. Biological Materials, Bioinspired Materials, and Biomaterials
	Cambridge University Press, 2014 ISBN 978-1-107-01045.
4.	Tao Deng. Bioinspired Engineering of Thermal Materials. Wiley-VCH Press, 2018. ISBN:
	978-3-527-33834-4.

ASSESSMENT AND EVALUATION PATTERN				
	CIE	SEE		
WEIGHTAGE	50%	50%		
QUIZES				
Quiz-I	Each quiz is evaluated for 10 marks			
Quiz-II	two quizzes will be reduced to 10 MARKS.	****		
<b>THEORY COURSE</b> (Bloom's Taxonomy Levels: Remembering, Und Evaluating, and Creating)	lerstanding, Applying, Analyzing,	****		
Test – I	Each test will be conducted for 25			
Test – II	Marks adding upto 50 marks. Final test marks will be reduced to <b>30</b> MARKS	****		
EXPERIENTIAL LEARNING (I	Maximum of 40 Marks)	****		
Photosynthesis and Photovoltaic cells, Bionic/Artificial leaf. 3D-Bioprinting. Biosensors: e-tongue and e-nose. Echolocation. Insect foot adaptations for adhesion. Thermal insulation and storage materials. Bees and Honeycomb Structure. Artificial Intelligence- Travelling Salesman Problem (TSP), Artificial Neural Networking and bio-robotics.	05	****		
Video based seminar (4-5 minutes per student)	05			
MAXIMUM MARKS FOR THE THEORY	50 MARKS	50 MARKS		
TOTAL MARKS FOR THE COURSE	50	50		

			Semester: IV			
		DESIG	N AND ANALYSIS OF	ALGORITHMS		
			(Theory and Prac	tice) & AI)		
Course Code	Course Code : 21CS43 CIE : 100+50 Marks					
Credits: L:T:P	:	3:0:1		SEE	:	100+50 Marks
<b>Total Hours</b>	:	45L+30P		SEE Duration	:	3Hours + 3Hours
Γ						• ==
			Unit-I			8 Hrs
Introduction- Pers	pec	tives	uniona IT Mountantani			
Logistics	Bar and	suppl	Chain	ng, e-Commerce, O Management	niine	Telecommunication
Applications: Cor	nmi	inication & Ne	tworking Search engi	nes Machine learn	ino	Database management
Software tools deve	elop	ment. Data organ	nization. GPS navigation	systems	iiig,	Database management,
	F					
Introduction: Not	ion	of Algorithm,	Fundamentals of Algor	rithmic Problem So	olvin	g, Fundamentals of the
Analysis of Algorit	hm	ic Efficiency: A	nalysis Framework, Asy	mptotic Notations a	and I	Basic Efficiency Classes,
Mathematical Analy	ysis	of Non-recursiv	e and Recursive Algorit	hms.		
Brute Force: Selec	tior	Nort and Bubbl	e Sort.			
			T			10 11
Divide and Conqu	~	Managa gant Oui	Unit – II	I and Integens Stud		IU IIIS
Divide and Conquer: Merge sort, Quicksort, Multiplication of Long Integers, Strassen's Matrix Multiplication.						
Application of DFS	and	RFS	, Depui Fiist Search, Die	taun Fiist Search, I	opo	logical soluting,
-			Unit –III			10 Hrs
Transform and Co	nq	uer:Presorting, I	Heapsort, Problem reduc	tion.		
Space and Time Tr	ade	eoffs: Sorting by	Counting, Naive String I	Matching, Input Enh	ance	ment in String Matching:
Horspool's and Boy	/er-	Moore algorithm	l.			
						10 II.uc
Dynamia Dynama		age Computing a	Unit -IV	Varaball's and Flave	1' ~ ^	IU Hrs
Dynamic Program		ig: Computing a	Binomial Coefficient, v	varshall s and Floye	1 S A	ligorithms, Knapsack
Greedy Technique	• P1	rim's Algorithm	Diikstra's Algorithm H	luffman Trees and c	odes	
Greedy reeningue	• 1 1	ini szügörünn,	Dijkšua s Aigoriani, i	furminal frees and c	oues	
			Unit –V			7 Hrs
Backtracking: N-(	Que	en's Problem, Su	m of Subset Problem.			
Branch-and-Boun	d: 1	Travelling Salesp	erson Problem, Assignn	nent Problem		
Decision Trees: Decision Trees for Sorting						
NP and NP-Complete Problems: Basic Concepts, Non- Deterministic Algorithms, P, NP, NP Complete, and NP-						
Hard classes	Hard classes					

Course O	utcomes: After completing the course, the students will be able to:-
CO1	Apply knowledge of computing and mathematics to algorithm analysis and design
CO2	Analyze a problem and identify the computing requirements appropriate for a solution
CO3	Apply algorithmic principles and computer science theory to the modeling for evaluation of computer-
	based solutions in a way that demonstrates comprehension of thetrade-offs involved in design choices.
CO4	Investigate and use optimal design techniques, development principles, skills and tools in the
	construction of software solutions of varying complexity.
CO5	Demonstrate critical, innovative thinking, and display competence in solving engineering problems.
CO6	Exhibit effective communication and engage in continuing professional development through
	experiential learning.

Refe	rence Books
1.	Introduction to the Design and Analysis of Algorithms, Anany Levitin, University, 3rd Edition, 2012, Pearson, ISBN 13: 978-0-13-231681-1.
2.	Introduction to Algorithms, Cormen T.H., Leiserson C.E., Rivest R.L., Stein C., 3rd Edition, 2010, PHI, ISBN:9780262033848.
3.	Computer Algorithms, Horowitz E., Sahani S., Rajasekharan S., 2nd Edition, 2006, Galgotia Publications, ISBN:9780716783169.

#### EXPERIENTIAL LEARNING

The students in a team of two, must solve, implement and analyze for time and space efficiency, any one engineering problem from the identified business domain and application. The team has to submit a detailed report on the work done.

### Laboratory Component

### PART A

Note: The following programs should be implemented in C++ language

#### **Practice Programs:**

- i. Implementation and execution of simple programs to understand running time analysis of non-recursive algorithms
  - Finding maximum element in a given array.
  - Linear search,
  - Bubble sort,
  - Determine whether all the elements in a given array are distinct.
  - Given 2 NXN matrices, perform matrix multiplication using bruteforce approach.
- ii. Implementation and execution of simple programs to understand running time analysis of recursive algorithms
  - Find the Factorial of a given number.
  - Print Fibonacci series
  - Given a positive decimal integer n, find the number of binary digits in n's binary representation.
  - To solve tower of Hanoi problem.
  - Recursive linear search.

Lab Programs:(At-least one application from each of the following group)

- 1. Apply divide and conquer strategy to solve sorting problem
  - Merge sort
  - Quicksort
- 2. Apply decrease and conquer strategy to solve graph problem
  - Breadth first search
  - Topological sorting using depth first search
- 3. Apply transform and conquer strategy
  - Heapsort

6.

- Checking element uniqueness after presorting
- 4. Apply input enhancement strategy to solve string-matching problem
  - Horspool's algorithm
  - Boyer Moore's algorithm
- 5. Apply dynamic programming strategy to solve optimization problem
  - Warshall Floyd's Algorithms,
  - Knapsack problem solution using memory function.
  - Apply greedy strategy to solve graphproblem
    - Dijkstra's algorithm
    - Prim's algorithm
- 7. Apply backtracking strategy to solve combinatorial problem
  - N- Queen's problem
  - Subset sum problem
- 8. Apply branch and bound strategy to solve combinatorial problem
  - Travelling salesperson problem
  - Assignment problem

#### PART B

Students have to solve a given problem using different design technique. The analysis with the comparison of the implemented algorithm has to be demonstrated. The problem types will be one among the following: (Any other problem can be included) : Sorting, Searching, String matching, Graph problem, Combinatorial / Optimization problem.

ASSESSMENT AND EVALUATION PATTERN					
	CIE	SEE			
WEIGHTAGE	50%	50%			
QUIZZES					
Quiz-I	Each aviated for 10 months adding up to 20 MADLS				
Quiz-II	Each quiz is evaluated for 10 marks adding up to 20 MARKS.				
THEORY COURSE (Bloom's Taxonomy Levels: Rem Creating)	embering, Understanding, Applying, Analyzing, Evaluating, and				
Test – I	Each test will be conducted for 50 Marks adding upto 100 marks.				
Test – II	Final test marks will be reduced to 40 MARKS				
EXPERIENTIAL LEARNING	40	****			
Case Study-based Teaching- Learning	10				
Program Specific Requirement for the EL Assessment	20	****			
Video based seminar (4-5 minutes per student)	10				
MAXIMUM MARKS FOR THE THEORY	100 MARKS	100 MARKS			
PRACTICALS	50	50			
TOTAL MARKS FOR THE COURSE	150	150			

Semester: IV								
Theory of Computation (Theory)								
			(110013)					
Course Code	:	21IS44		CIE	:	100 Marks		
Credits: L:T:P	:	3:0:0		SEE	:	100 Marks		
Total Hours	:	39L		SEE Duration	:	3Hours		

Unit-I				
Regular Languages and Regular Expressions: Regular Expressions and Finite Automata,	08 Hrs			
Minimization of Finite Automata, Applications of Regular Expressions, Algebraic laws of Regular				
Expressions, Pumping Lemma for Regular Languages, Closure properties of Regular Languages,				
Decision properties of Regular languages.				
Unit – II				
Regular Grammars: Regular Grammars, Equivalence of Regular Grammars and Finite Automata.	07 Hrs			
Context-free grammars: Context-free grammars (CFG), Parse trees, Applications, Ambiguity in				
grammars & languages, Simplification of CFG, Normal forms of CFGs.				
Unit –III				
Push Down Automata (PDA): Definition, the languages of a PDA, Equivalence of PDA's & CFG's,	08 Hrs			
Deterministic PDA.				
Context Free Languages: The Pumping Lemma for Context Free Languages (CFL), Closure properties				
of CFLs, Decision properties of CFLs.				
Unit –IV				
<b>Turing Machines:</b> Turing Machines (TM): Definitions and Examples, TM as a Language Accepter,	08 Hrs			
Computing Partial Functions with Turing Machine.				
Models of Turing Machines: Variations of Turing Machines, Combining Turing Machines, Non				
Deterministic TM, Universal TM,				
Unit –V				
Unit V	00 Uma			
Hierarchy of Formal Languages and Automata: Recursively Enumerable Languages (REL) and Desurvive Languages Dreporties of DEL and Desurvive Languages Unrestricted Commerce Context				
Sensitive Languages (CSL) and Linear Bounded Automata (LBA). Chomsky Hierarchy Not all				
languages are Recursively Enumerable. The halting problem of TM Post's Correspondence Problem				
(DCD)				

Refere	nce Books
1	Introduction to Languages & Theory of Computation, John C Martin, Tata McGraw-Hill, 4 <sup>th</sup> Edition, 2011 ISBN: 978-0-07-319146-1.
2	Introduction to Automata Theory, Languages & Computation, J.P.Hopcroft, Rajeev Motwani, J.D.Ullman, Pearson Education., 3 <sup>rd</sup> Edition, 2008,ISBN:81-3172-047-0.
3	An Introduction To Formal Languages & Automata, Peter Linz, Narosa Publishing House, 6 <sup>th</sup> Edition, 2007, ISBN: 07-6371-422-4.

Course	Course Outcomes: After completing the course, the students will be able to				
CO1:	<b>CO1:</b> Describe the fundamental concepts of automata theory and formal languages.				
CO2:	2: Apply automata theory skills to describe computational problems effectively				
CO3:	3: Analyze the limitations and equivalence of different computing models				
<b>CO4:</b>	Design finite automata and computing model to solve problems in the field of computer science.				

ASSESSMENT AND EVALUATION PATTERN						
CIE						
WEIGHTAGE	50%	50%				
QUIZZES						
Quiz-I						
Quiz-II	Each quiz is evaluated for 10 marks adding up to 20 MARKS.					
THEORY COURSE (Bloom's Taxonomy Levels: Rem Creating)	embering, Understanding, Applying, Analyzing, Evaluating, and					
Test – I	Each test will be conducted for 50 Marks adding upto 100 marks.					
Test – II	Final test marks will be reduced to 40 MARKS					
EXPERIENTIAL LEARNING	40	****				
Case Study-based Teaching- Learning	10					
Program Specific Requirement for the EL Assessment	Program Specific Requirement 20					
Video based seminar (4-5 minutes per student)	10					
MAXIMUM MARKS FOR THE THEORY100 MARKS						
TOTAL MARKS FOR THE 100						

	Semester: IV					
		CC	<b>MPUTER NETW</b>	VORKS		
			(Theory)			
	-	(0	Common to CS, IS	& AI)	-	I
Course Code	:	21CS45		CIE	:	100 Marks
Credits: L:T:P	:	3:0:0		SEE	:	100 Marks
<b>Total Hours</b>	:	45L		SEE Duration	:	3Hours
		T	Init I			10 Hrs
Introduction Dou			)       -			10 1115
Rusinoss Domain	spe	Notworks				
Applications: Re	1 <b>5.</b> 1	rce Sharing Client	Server programmi	ng eCommerce on	44	igital communications
Introduction: Ne	sou	orks Network type	s Network Model	s: TCP / IP protoc	u u ol	suite Addressing The
OSI Model Trans	mis	sion Modes: Parall	el Transmission an	d Serial Transmissi	on	Link Laver: Data Link
Control (DI C): I	$\mathcal{M}$	Sion Modes. 1 and Services Data I	ink Laver Protoco	ls High Level Da	ta 1	ink Control (HDI C)
Point-to-Point Pr	otoc	ol (PPP). Framin	Transition phase	es Media Access		ntrol (MAC). Random
Access: CSMA/C	D	CSMA/CA	s, manshion phase			intor (ivir ice). Randoni
	<i>D</i> ,	UI	nit – II			9 Hrs
Network laver de	esia	n issues: Store and	l Forward nacket S	witching Services	Pro	ovided to the Transport
Laver Implement	atic	n of Connectionle	ess Service. Imple	mentation of Con	nect	tion Oriented Service.
Comparison of V	'irtu	al Circuit and Da	tagram Subnets: <b>R</b>	outing algorithm	s: 5	Shortest Path Routing.
Flooding, Distanc	e V	ector Routing, Lin	k state Routing. Hi	erarchical Routing	Bro	badcast Routing, and
Multicast Routing	<b>5.</b>	6)	8,	0		8,
	-	Ur	nit —III			8 Hrs
<b>Congestion Cont</b>	trol	Algorithms: Gen	eral Principles of	Congestion Contro	ol, (	Congestion Prevention
Policies, Congesti	on	Control in Virtual-	Circuit Subnets, Co	ongestion Control in	n D	atagram Subnets, Load
Shedding, Jitter C	ont	rol; Quality Of Ser	vice: Requirements	s, Techniques for A	chi	eving Good Quality of
Service Integrated	l Se	rvices Differentiat	ed Services	_		
	Unit –IV 9 Hrs					
Internetworking: How networks differ, How networks can be connected Connectionless						
Internetworking, Tunneling Internetwork Routing, Fragmentation						
The Network Layer in the Internet: The IP Protocol, IP Addresses, Internet Control Protocols, OSPF-						
Interior Gateway Routing Protocol, BGP- Exterior Gateway Routing Protocol, IPv6.						
Unit –V 9 Hrs						
The Internet Transport Protocols: Introduction to UDP, Introduction to TCP. The TCP Service Model.						
The TCP Protocol: TCP protocol, TCP Segment Header, TCP Connection Establishment, TCP						
Connection Release. TCP Transmission Policy, TCP Congestion Control, TCP Timer Management.						
Application Laver: World Wide web and HTTP, Telnet.						

Course	Outcomes: After completing the course, the students will be able to:-			
CO 1	Apply the algorithms/techniques of routing and congestion control to solve problems related to			
	Computer Networks.			
CO 2	Analyze the services provided by various layers of TCP/IP model to build effective solutions.			
CO 3	<b>O3</b> Design sustainable networking solutions with societal and environmental concerns by engag			
	in lifelong learning for emerging technology.			
<b>CO 4</b>	Exhibit network configuration, protocol usage and performance evaluation in networks.			
CO 5	Demonstrate the solutions using various algorithms/protocols available to address networking			
	issues using modern tools by exhibiting team work and effective communication.			

Re	eference Books
1.	Data Communications and Networking, Behrouz A Forouzan, 5th Edition, 2013, Tata McGraw-Hill, ISBN – 9781259064753.
2.	Computer Networks, Andrew S Tanenbaum, 5th Edition, 2014, Pearson Education; ISBN–978-81-7758-165-2.
3.	Computer Networking, A Top-Down Approach, James Kurose and Keith Ross, 6 <sup>th</sup> Edition, 2013, ISBN-13: 978-0-13-285620-1.
4.	Data and Computer Communications, William Stallings, 8th Edition, 2009, Pearson Education, ISBN-13: 978-0131392052.

# **EXPERIENTIAL LEARNING**

Problem statement and modern networking tools usage(Path Characterization & Bandwidth Estimation, Analysing Real-time information about the global routing system, Measure latency and packet loss reason in wired and wireless network, Online data Privacy, Host/Network Intrusion detection, Detection of potential DDoS attacks, Network analysis to monitor Ethernet and WLAN traffic in real time, IP Spoofing, TCP Off path attacks, Privacy Preserving network log data, wireless security)

ASSESSMENT AND	EVALUATION PATTERN	
	CIE	SEE
WEIGHTAGE	50%	50%
QUIZZES		
Quiz-I	Each quiz is evaluated for 10	
Quiz-II	marks adding up to <b>20 MARKS</b> .	
<b>THEORY COURSE</b> (Bloom's Taxonomy Levels: Remembering, Un Evaluating, and Creating)	derstanding, Applying, Analyzing,	
Test – I	Each test will be conducted for 50 Marks adding upto 100 marks	
Test – II	Final test marks will be reduced to 40 MARKS	
EXPERIENTIAL LEARNING	40	
Problem statement and modern networking tools usage.	10	
Design and implementation of solution.	20	
Demonstration and report.	10	
MAXIMUM MARKS FOR THE THEORY	100 MARKS	100 MARKS
TOTAL MARKS FOR THE COURSE	100	100

Semester: IV								
Object Oriented Analysis and Design (Online MOOC Course)								
Course Code	:	21IS4A1	CIE I	Marks	:	50 + 50		
Credits: L:T:P	:	2:0:0	SEE	Marks	:	50 + 50		
Total Hours	:	28L	SEE	Duration	:	2 Hrs		
Unit – I							S	

Software Complexity: Understanding the challenges OOAD can address
Object Model: Defining the primitives of the OO paradigm
Classes and Objects: Bringing in the broader perspectives

Unit – II
-----------

Classes and Objects: Bringing in the broader perspectives Classes and Objects: Identification approaches using OOAD

### Unit – III

10Hrs

9Hrs

Unified Modeling Language

OOAD Case Studies: Applying OOAD in different contexts

Course Outcomes: After completing the course, the students will be able to						
CO 1:	1: Understand the working of formal object-oriented analysis and design processes					
CO 2:	<b>CO 2:</b> Analyse the risks inherent to large-scale software development					
CO 3:	Develop the skills to determine which processes and OOAD techniques should be					
	applied to a given project					
CO 4:	Apply the OOAD practices from a software project management perspective					

# **Reference Books:**

1.	Object-Oriented Analysis and Design with Applications, Third Edition by Grady Booch,						
	Robert A. Maksimchuk, Michael W. Engle, Bobbi J. Young, Jim Conallen, and Kelli						
	Houston, 2007.						
2.	Learning UML 2.0 by Russ Miles & Kim Hamilton (O'Reilly), 2006						
3.	Design Patterns: Elements of Reusable Object-Oriented Software with Applying UML and						
	Patterns: An Introduction to Object-Oriented Analysis and Design and the Unified Process						
	by Erich Gamma, Richard Helm, Ralph Johnson, and John Vlissides, 2003						

Semester: IV					
Multi-Core Computer Architecture – Storage and Interconnects (Online MOOC Course)					
Course Code	:	21IS4A2	CIE Marks	:	50 + 50
Credits: L:T:P	:	2:0:0	SEE Marks	:	50 + 50
Total Hours	:	28L	SEE Duration	:	2 Hrs

Unit – I	10 Hrs
Fundamentals of instruction pipeline for superscalar processor design	
Memory hierarchy design, cache memory - fundamentals and basic optimisations	
Cache memory – advanced optimisations, performance improvement technoiues	
Unit – II	9Hrs
Gem5 simulator – build and run, address translations using TLB and page table	
DRAM – organisation, access techniques, scheduling algorithms and signal systems.	
Introduction – Tiled Chip Multicore Processors (TCMP), Network on Chips (NoC)	
Unit – III	9 Hrs
NoC router architecture design routing algorithms and flow control techniques	

NoC router – architecture, design, routing algorithms and flow control techniques. Advanced topics in NoC and storage – compression, prefetching, QoS

Course	Course Outcomes: After completing the course, the students will be able to				
CO1:	Identify the limitations of ILP and the need for multicore architectures				
CO2:	Define fundamental concepts of parallel programming and its design issues				
CO3:	Solve the issues related to multiprocessing and suggest solutions				
CO4:	Demonstrate the role of OpenMP and programming concept				

Refe	erence Books:							
1.	Computer Architecture - A Quantitative Approach-5e John L. Hennessy, David A. Patterson							
	Morgan Kaufman.							
2. Memory System - Cache, DRAM and Disk Bruce Jacob, Spencer W. Ng, David T								
	Morgan Kaufman.							
3.	Principles and Practices of Interconnection Networks William J. Dally, Brian P. Towles							
	Elsevier.							

Semester: IV							
Data Science using Python (Online MOOC Course)							
Course Code	:	21IS4A3		CIE Marks	:	50 + 50	
Credits: L:T:P	:	2:0:0		SEE Marks	:	50 + 50	
Total Hours	:	28L		SEE Duration	:	2 Hrs	
			Unit – I				10 Hrs

# **BASICS OF PYTHON SPYDER (TOOL)**

Introduction Spyder, Setting working Directory, Creating and saving a script file, File execution, clearing console, removing variables from environment, clearing environment, Commenting script files, Variable creation, Arithmetic and logical operators, Data types and associated operations

Unit – II					
Sequence data types and associated operations-Strings, Lists, Arrays, Tuples, Dictionary, Sets, Range NumPy-ndArray					
Unit – III 9 Hrs					
Pandas dataframe and dataframe related operations on Toyota Corolla dataset-					
Reading files, Exploratory data analysis, Data preparation and preprocessing					
• Data visualization on Toyoto Corolla dataset using matplotlib and seaborn libraries					

Scatter plot, Line plot, Bar plot, Histogram, Box plot, Pair plot

• Control structures using Toyota Corolla dataset if-else family, for loop, for loop with if break, while loop, Functions

### **CASE STUDY**

Regression-Predicting price of pre-owned cars

Classification-Classifying personal income

Course Outcomes: After completing the course, the students will be able to						
C01:	<b>CO1:</b> Understand and use python data science libraries as a tool for data analytics					
CO2:	Create Python codes for data analytics					
CO3:	Develop visualization codes using python					
CO4:	Demonstrate essential skills in decision science using Python					

Semester: IV					
Embedded System Design With ARM (Online MOOC Course)					
Course Code	:	21IS4A4	CIE Marks	:	50 + 50
Credits: L:T:P	:	2:0:0	SEE Marks	:	50 + 50
Total Hours	:	28L	SEE Duration	:	2 Hrs

Unit – I	10 Hrs
Introduction to embedded systems and microcontrollers	
Instruction set architecture of ARM microcontroller, and assembly language programm D/A and A/D converter, sensors, actuators and their interfacing	ning

Unit – II

9Hrs

Microcontroller development boards and embedded programming platforms Hands-on and demonstration I: Temperature sensing unit, Light sensing unit, Sound sensing unit Hands-on and demonstration II: Feedback control system, relay control unit, driving electrical appliances like motors, bulb, pump, etc.

Unit – III	9 Hrs
Hands-on and demonstration III: Object tracking using GPS and GSM	
Hands-on and demonstration IV: Introduction to Internet of Things, smart home conce	epts, motion
sensing using accelerometer, control of appliances over SMS	

Course	Course Outcomes: After completing the course, the students will be able to				
CO1:	Understand the main features of the ARM Cortex based Embedded System development environment				
CO2:	Designing, developing, coding, testing and debugging system software.				
CO3:	Analysing and enhancing efficiency, stability and scalability of system resources.				
CO4:	Designing and implementing software of embedded devices and systems.				

Re	ference Books:
1.	F. Vahid and T. Givargis, "Embedded System Design: A Unified Hardware/Software Introduction", Wiley India Pvt. Ltd., 2002.
2.	A.N. Sloss, D. Symes and C. Wright, "ARM System Developer's Guide: Design and Optimizing System Software", Morgan Kaufman Publishers, 2004.
3.	W. Wolf, "Computers as Components: Principles of Embedded Computing System Design", Morgan Kaufman Publishers, 2008.

Semester: IV						
Distributed Systems (Online MOOC Course)						
Course Code	:	21IS4A5	CIE N	Aarks	:	50 + 50
Credits: L:T:P	:	2:0:0	SEE N	Marks	:	50 + 50
<b>Total Hours</b>	:	28L	SEE I	Duration	:	2 Hrs

Unit – I	10 Hrs	
Introduction to DS, Message Passing, Leader Election, Distributed Models, Causality a Time	and Logical	
Logical Time, Global State & Snapshot and Distributed Mutual Exclusion-Non-Token Quorum based approaches	and	
Unit – II	9Hrs	
Distributed Mutual Exclusion-Token based approaches, Consensus & Agreement, Checkpointing & Rollback Recovery		
Termination Detection, Message Ordering & Group Communication, Fault Tolerance and Self- Stabilization		
Unit – III	9 Hrs	
Distributed Randomized Algorithms, DHT and P2P Computing		
Case Studies: GFS, HDFS, Map Reduce and Spark		

Case Studies: Sensor Networks, Authentication & Security in DS

Course	Course Outcomes: After completing the course, the students will be able to				
CO1:	Understand the design principles in distributed systems and the architectures for				
0011	distributed systems.				
<b>CO2:</b>	Apply various distributed algorithms related to clock synchronization, concurrency				
	control, deadlock detection, load balancing, voting etc.				
CO3:	Analyze fault tolerance and recovery in distributed systems and algorithms for the same.				
<b>CO4:</b>	Implement different distributed algorithms over current distributed platforms				

Ret	ference Books:
1.	M. Van Steen, A.S. Tanenbaum, Distributed Systems, Third Edition, CreateSpace
	Independent Publishing Platform, 2017
2.	Ajay D. Kshemkalyani and Mukesh Singhal, Distributed Computing: Principles,
	Algorithms and Systems, Cambridge University Press, 2011.
3.	Garg VK. Elements of distributed computing. John Wiley & Sons, 2002

	Semester: IV					
			Design Thinking Lab			
Course Code	•	21IS46	CIE	•		50 Marks
Credits: L:T:P	:	0:0:2	SEE	:		50 Marks
Hours	:	26P	SEE	<b>Duration</b> :		02 Hours

# **Guidelines for Design Thinking Lab:**

- 1. The Design Thinking Lab (DTL) is to be carried out by a team of two-three students.
- 2. Each student in a team must contribute equally in the tasks mentioned below.
- 3. Each group has to select a theme that will provide solutions to the challenges of societal concern. Normally three to four themes would be identified by the by the department
- 4. Each group should follow the stages of Empathy, Design, Ideate, prototype and Test for completion of DTL.
- 5. After every stage of DTL, the committee constituted by the department along with 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 has to 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.

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

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

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

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

# Scheme of Evaluation for SEE Marks:

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

			Semester: IV	7		
Bridge Course: MATHEMATICS						
		(	Common to all br	anches)		
Course Code	:	21DMA47		CIE	:	50 Marks
Credits: L:T:P	:	2:0:0		SEE	:	50 Marks
Audit	Co	ourse		<b>SEE Duration</b>	:	2.00 Hours
		I	U <b>nit-I</b>			05 Hrs
Differential Calcu	ılus	5:				
Partial derivatives	$-I_{1}$	ntroduction, simpl	le problems. Total d	erivative, composi	te f	unctions. Jacobians –
simple problems.						
		U	nit – II			05 Hrs
Vector Differenti	atio	on:				
Introduction, simp	le p	problems in terms	of velocity and acco	eleration. Concepts	of	gradient, divergence –
solenoidal vector f	unc	ction, curl – irrotat	tional vector function	on and Laplacian, s	imp	le problems.
Unit –III 06 Hrs						
Differential Equa	tio	ns:				
Higher order linear differential equations with constant coefficients, solution of homogeneous equations -						
Complementary fu	inct	tions. Non homog	eneous equations –	nverse differential	op	erator method of finding
particular integral based on input function (force function).						
		U	nit –I V			US Hrs
Numerical Metho	ds:	1. 1	. 1			
Solution of algebraic and transcendental equations – Intermediate value property, Newton-Raphson						
method. Solution	1 1C	irst order ordinary	y differential equati	ons - laylor series	s an	d 4 <sup>th</sup> order Runge-Kutta
methods. Numerical integration – Simpson's $1/3^{10}$ , $3/8^{11}$ and Weddle's rules. (All methods without proof).						
		U	nii – v			US Hrs
Multiple Integral	S:	• . 1 1	C 1 C		• •	• . 1 . 1• .•
Evaluation of double integrals, change of order of integration. Evaluation of triple integrals. Applications						
– Area, volume an	u II	iass – simple prob	noms.			

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

Refer	ence Books
1	B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44 <sup>th</sup> Edition, 2015, 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	N.P. Bali & Manish Goyal, A Textbook of Engineering Mathematics, Lakshmi Publications, 7 <sup>th</sup> Edition, 2010, ISBN: 978-81-31808320.
4	Advanced Engineering Mathematics, E. Kreyszig, 10 <sup>th</sup> Edition (Reprint), 2016. John Wiley & Sons, ISBN: 978-0470458365.

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

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

# Semester End Evaluation (SEE); Theory (50 Marks)

**SEE** for 50 marks is executed by means of an examination. The Question paper for the course consists of five main questions, one from each unit for 10 marks adding up to 50 marks. Each main question may have sub questions. The question from Units I, IV and V have no internal choice. Units II and III have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom's taxonomy level.

			Semester: IV		
Universal Human Values and Professional Ethics (Theory & Practical)					
<b>Course Code</b>	:	21HSU48	CIE	:	50 Marks
Credits: L:T:P	:	2:0:0	SEE	:	50 Marks
<b>Total Hours</b>	:	28L+0T+14P	SEE D	uration :	2.00 Hours

Unit-I	05 Hrs			
Course Introduction - Need, Basic Guidelines, Content and Process for Value Education: Purpose				
and motivation for the course, recapitulation from Universal Human Values-I, Self-Exploration-what is				
it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the	e process for self-			
exploration, Continuous Happiness and Prosperity- A look at basic Human A	Aspirations, Right			
understanding, Relationship and Physical Facility- the basic requirements for fulfilmer	nt of aspirations of			
every human being with their correct priority, Understanding Happiness and Prosp	erity correctly- A			
critical appraisal of the current scenario, Method to fulfil the above human aspiration	ons: understanding			
and living in harmony at various levels.				
Include practice sessions to discuss natural acceptance in human being as the innate ac	ceptance for living			
with responsibility (living in relationship, harmony and co-existence) rather than as arb	itrariness in choice			
based on liking-disliking.				
Unit – II	06 Hrs			
Understanding Harmony in the Human Being - Harmony in Myself!: Understanding human being as				
a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body'				
- happiness and physical facility, Understanding the Body as an instrument of 'I' (I b	eing the doer, seer			
and enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding				
the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of				
Prosperity in detail, Programs to ensure Sanyam and Health.				
Include practice sessions to discuss the role others have played in making material goods available to me.				
Identifying from one's own life. Differentiate between prosperity and accumulation. D	iscuss program for			
ensuring health vs dealing with disease	0 ( H			
Unit –III	06 Hrs			

**Understanding Harmony in the Family and Society- Harmony in Human Human Relationship:** Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship, Understanding the meaning of Trust; Difference between intention and competence, Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals, Visualizing a universal harmonious order in society- Undivided Society, Universal Orderfrom family to world family.

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives

Unit –IV	05 Hrs
Understanding Harmony in the Nature and Existence - Whole existence as Coex	istence:
Understanding the harmony in the Nature, Interconnectedness and mutual fulfilment a	among the four

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

Unit -V06 HrsImplications of the above Holistic Understanding of Harmony on Professional Ethics, Natural<br/>acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education,<br/>Humanistic Constitution and Humanistic Universal Order, Competence in professional ethics: a. Ability<br/>to utilize the professional competence for augmenting universal human order b. Ability to identify the<br/>scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify<br/>and develop appropriate technologies and management patterns for above production systems, Case<br/>studies of typical holistic technologies, management models and production systems, Strategy for<br/>transition from the present state to Universal Human Order: a. At the level of individual: as socially and<br/>ecologically responsible engineers, technologists and managers b. At the level of society: as mutually<br/>enriching institutions and organizations, Sum up.

Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.

### **Course Outcomes:**

CO1: By the end of the course, students are expected to become more aware of themselves, and their surroundings (family, society, nature); they would become more responsible in life, and in handling problems with sustainable solutions,

CO2: While keeping human relationships and human nature in mind. They would have better critical ability.

CO3: They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society).

CO4: It is hoped that they would be able to apply what they have learnt to their own self in different dayto-day settings in real life, at least a beginning would be made in this direction

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

# ASSESSMENT AND EVALUATION PATTERN

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

Semester: IV							
PROGRAMMING IN JAVA (Theory and Practice)							
Cours	se Code	:	21IS49		CIE Marks	:	50 + 50
Credi	its: L:T:P	:	1:0:1		SEE Marks	:	50 + 50
Total	Hours	:	15L+30P		SEE Duration	:	3 Hrs
Cours	se Learning	g Ob	jectives: The stu	idents will be able	to		
1.	1. Understand fundamentals of elements of Object Model, Classes and Objects						
2. Explore the features of Object-oriented Programming in Java including defining classes, invoking methods, using class libraries, etc.							
<b>3.</b> Develop the ability to program in Java to solve specified problems.							
4. Use the object-oriented principles and design classes using appropriate tools of collaborating programming (versioning systems, code review).							

Unit – I	7 Hrs	
The Object Model		
Foundations of the Object Model: Elements of the Object Model - Abstraction, Enc	apsulation,	
Modularity, Hierarchy; Classes and Objects: The Nature of an Object, Relationsl	nips among	
Objects, The Nature of a Class, Relationships among Classes, The Interplay of Classes	and Objects	
Java Programming Fundamentals: Class Fundamentals, Declaring Objects, Introducing	g Methods,	
Constructors, this keyword, Overloading Methods and Constructors, Static fields an	d Methods,	
Nested and Inner classes	,	
Inheritance: Inheritance Basics, Using Super, Creating a Multi-Level Hierarchy, Method		
Overriding, Dynamic Method Dispatch, Using Abstract Classes, Using final with	Inheritance,	
Object Class.		
Packages and Interfaces: Introduction to Packages, Access Protection, Importing Packages,		
Interfaces, Default Interface Methods.		
Unit – II	8 Hrs	
Exception Handling : Exception-Handling Fundamentals – Exception Classes , Exception	otion Types,	
Uncaught Exceptions, Using try and catch, Multiple catch clauses, Nested try Statements, throw		
throws, finally, Java's Built-in Exceptions, Creating your own Exception Subclasses.		
Multithereaded Decommunication The Joya Thread Model The Main Thread Creating a Thread		

Multithreaded Programming : The Java Thread Model , The Main Thread , Creating a Thread, Creating Multiple Threads, Using isAlive() and join() , Thread Priorities , Synchronization, Interthread Communication, Suspending, Resuming and Stopping Threads, Obtaining a Thread's State.

### Laboratory Component

**Familiarization with IDE** - compilation, debugging and execution considering simple Java programs.

**Implement programs on Fundamentals of Java Programming**: Data Types, Variables and Arrays, Operators, Control Statements:

1. Write a Java program to convert time in seconds to hours, minutes and seconds, and display the output in format HH:MM:SS

2. Write a Java program which reads an integer n and find the number of combinations of a,b,c and d  $(0 \le a,b,c,d \le 9)$  where (a + b + c + d) will be equal to n. 3. Write a Java program to form a staircase shape of n coins where every k-th row must have exactly k coins.

Example 1: n = 3

The coins can form the following rows:

\$

\$\$

We will return 2 rows.

Example 2:

n = 4

The coins can form the following rows:

\$

\$\$

\$

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4. Write a Java program to rearrange all the elements of an given array of integers so that all the odd numbers come before all the even numbers.

5. Write a Java program that accepts three integers from the user and return true if two or more of them (integers ) have the same rightmost digit. The integers are non-negative.

6. Given is a 2-dimensional integer array [0..m-1, 0..n-1], each row and column of which is in ascending order (see example), write a Java program to find the row, column position of a specified number (row, column position) in a given 2-dimensional array.

# Classes and objects.

Design an Address class with member variables Street num, city, state and country and appropriate constructor. Design a Student class with constructor (Student (String USN, String Name, Address addr)), College class with constructor (College (String Name, Address addr)) and Employee class with constructor (Employee (String EmpID, String Name, Address addr)). Write a Java program to create 'n' Student objects, College Objects and Employee objects and print the student, college and employee addresses respectively and demonstrate passing of object as a parameter to the constructor.

# Inheritance and Polymorphism.

Design a base class Circle with member variables (radius and color) of type double,
 methods (getRadius(), getArea()) and constructors (Circle(radius), Circle(radius, color)). Derive subclass called Cylinder from the superclass Circle with member

variable (height) of type double, public methods (getHeight(), getVolume(), getArea()) and its constructors(Cylinder(height, radius), Cylinder(height, radius,color)). Create the two instances of cylinder and print similar cylinders if the area, volume and color of cylinders are same. Demonstrate the code reuse and polymorphism properties of Object oriented programming by inheriting the constructors and methods of the base class.

### **Package and Interfaces**

3 Create a class Thirdsem. Put this class into a package called CSE. Define a method Welcomemsg which prints a line "Welcome to CSE dept- 3rd sem young budding Engineers".

Create a class Csedept. Put this class into a package called RVCE.

Inherit the class Thirdsem in CSE package to Csedept class in RVCE package and call Welcomemsg method to display welcome message and also verify Public method Overriding, Private method overriding and default method overriding from different packages in java with the same program

Create two classes called Lion and Snake that implements all the methods defined in an interface Animal. Declare eat() method in Animal interface and display eating habits of that particular animal .Create an interface called Tired Animal. In Tired Animal interface add method definition to an existing interface by extending Animal interface to verify Extending Interface concept in java.

Note: Lion and Snake implement the required eat() method and has some of its own methods and instance variables

# **Exception handling**

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Design and implement a Java program for the following requirements:

a) An Exception class called **Demonetization Exception** which returns the statement that says "Deposit of Old currency of (Rs\_) crosses Rs. <u>5,000</u> and cannot be Deposited".

b) A class called 'Account' that creates account with 500 Rs minimum balance with following methods.

i.deposit(amount, currencyType) method to deposit amount. This class should handle "Demonetization Exception" and print the message defined in this Exception class. If a currency type is "OLD" and the amount is greater than 5,000 then throw the Demonetization Exception, otherwise update the balance.

i.currBalance() method that displays balance amount in the account.

i.withdraw(amount) method to withdraw amount and update the balance. Use proper control structure to check Balance should not go less than 500.

c) A 'Customer' class that creates Account object and call the methods deposit(), withdraw() and currBalance() based on the user choice.

# Multithreading

Design and develop a Java program for the fruit market problem. The farmer will be able to produce different types of fruits (apple, orange, grape, and watermelon), and

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put them in the market to sell. The market has limited capacity and farmers have to stand in a queue if the capacity is exceeded to sell their fruits. Consumers can come to the market any time and purchase their desired fruits; and if the fruits they want to buy runs out, they are willing to wait until the supply of that kind is ready. Examine and formulate an approach to address this problem and implement the same using Java constructs for programming.

Course	e Outcomes: After completing the course, the students will be able to
CO1	Explore the fundamentals of Object-oriented concepts and apply features of object- oriented programming of Java to solve real world problems.
CO2	Design Classes and establish relationship among Classes for various applications from problem definition.
CO3	Analyze and implement reliable object-oriented applications using Java features such as Exception Handling, Multithreaded Programming, Collection framework, Strings.
CO4	Design and develop real world applications using Object Oriented concepts and Java programming

# **Reference Books:**

1.	Object-Oriented Analysis And Design With applications, Grady Booch, Robert A	
	Maksimchuk, Michael W Eagle, Bobbi J Young, 3 <sup>rd</sup> Edition, 2013, Pearson education,	
	ISBN :978-81-317-2287-9.	
2.	The Complete Reference - Java, Herbert Schildt, 10th Edition, 2017, McGraw Hill	
	Education Publications, ISBN-10: 9789387432291, ISBN-13: 978-9387432291	
3.	Introduction to Java Programming, Y Daniel Liang, 10th Edition, 2014,	
	Comprehensive Version Pearson education, ISBN 10: 0-13-376131-2, ISBN 13: 978-0-	
	13-376131-3	
4.	Core Java – Vol 1, Cay S.Horstmann, 10 <sup>th</sup> Edition, 2016, Pearson Education, ISBN-10:	
	9332582718, ISBN-13: 978-9332582712	
ASSESSMENT AND EVALUATION PATTERN		
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	CIE	SEE
WEIGHTAGE	50%	50%
QUIZES		
Quiz-I	Each quiz is evaluated for 10 marks and the total marks obtained from two quizzes will be reduced to <b>10 MARKS</b> .	****
Quiz-II		
<b>THEORY COURSE</b> (Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating)		****
Test – I	Each test will be conducted for 25 Marks adding upto 50 marks. Final test marks will be reduced to <b>30 MARKS</b>	****
Test – II		
EXPERIENTIAL LEARNING (Maximum of 10 MARKS)		****
MAXIMUM MARKS FOR THE THEORY	50 MARKS	50 MARKS
PRACTICALS	50	50
TOTAL MARKS FOR THE COURSE	100	100

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## **Curriculum Design Process**



### **Academic Planning and Implementation**



#### **Process for Course Outcome Attainment**



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### **Final CO Attainment Process**



# **Program Outcome Attainment Process**



#### **PROGRAM OUTCOMES (POs)**

- 1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialisation for the solution of complex engineering problems.
- 2. **Problem analysis:** Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- 3. **Design/development of solutions:** Design solutions for complex engineering problems and designsystem components or processes that meet the specified needs with appropriate consideration for public health and safety, and cultural, societal, and environmental considerations.
- 4.Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- 5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling to complex engineering activities, with an understanding of the limitations.
- 6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- 7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- 8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- 9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- 10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with the society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- 11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- 12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life- long learning in the broadest context of technological change.