	SJPN Trust's <b>Hirasugar Institute of Technology, Nidasoshi.</b> <i>Inculcating Values, Promoting Prosperity</i>	Dept. of CSE Academic Course Plan
	Approved by AICTE, New Delhi, Permanently Affiliated to VTU, Belagavi Recognized under 2(f) & 12B of UGC Act, 1956	<b>2023-24 (EVEN)</b>
	Accredited at 'A' Grade by NAAC & Programmes Accredited by NBA:CSE & ECE	

### INSTITUTE VISION

*“To be a preferred institution in Engineering Education by achieving excellence in teaching and research and to remain as a source of pride for its commitment to holistic development of individual and society”*

### INSTITUTE MISSION

*“To continuously strive for the overall development of students by educating them in a state-of-the-art-infrastructure, by retaining the best practices, faculties and inspire them to imbibe real time problem solving skills, leadership qualities, human values and societal commitments, so that they emerge as competent professionals”.*

### DEPARTMENT VISION

*“To be a center of excellence in providing education in the field of Computer Science and Engineering to produce technically competent and socially responsible IT professionals”*

### DEPARTMENT MISSION


*“To provide a theoretical foundation in computing with the exposure of latest tools and technologies, IT infrastructure and encourage students for continuous learning to make them competent professionals”*

### PROGRAM EDUCATIONAL OBJECTIVES (PEO's) :

1. *Pursue a successful career in the field of Computer Science & Engineering utilizing his/her knowledge and contribute to the profession as an excellent employee, or as an entrepreneur.*
2. *Apply the knowledge of mathematics & computer science fundamentals to analyze & formulate the solution to solve real time problems.*
3. *Exhibit the professional and ethical values, communication & teamwork skills, lifelong learning, multidisciplinary approach to address computer engineering and societal issues.*

### PROGRAM OUTCOMES (PO's) :

1. **Engineering knowledge:** *Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.*
2. **Problem analysis:** *Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.*
3. **Design/development of solutions:** *Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the 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 modeling 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.*

	SJPN Trust's	Dept. of CSE
	<b>Hirasugar Institute of Technology, Nidasoshi.</b>	Academic
	<i>Inculcating Values, Promoting Prosperity</i>	Course Plan
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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 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.


### PROGRAM SPECIFIC OUTCOMES (PSO's) :

**PSO1:** Understand, design and analyze computer programs in the areas related to Algorithms, System Software, Web design, Bigdata Analytics, Machine Learning and Networking.

**PSO2:** Make use of modern computer tools for creating innovative career paths to be an entrepreneur and desire for higher studies.


### Contents

Sl. No.	TOPIC	PAGE NO
1	Student Help Desk	III
2	Departmental Resources	
3	Teaching Faculty Details	IV
4	Institute Academic Calendar	V
5	Department Academic Calendar	VI
6	Scheme of Teaching & Examination 6 <sup>th</sup> Semester	VIII
<b>Theory – Course Plans and Question Bank</b>		
1.	Software Engineering & Project Management	01
2.	Fullstack Development	08
3.	Computer Graphics and Fundamentals of Image Processing	17
4.	Advance Java Programming	24
5.	Sensors & Actuator	32
6.	Renewable Energy Resources	38
7.	Project Management	46
8.	Computer Graphics and Image Processing Laboratory	56

	<b>SJPN Trust's</b> <b>Hirasugar Institute of Technology, Nidasoshi.</b> <i>Inculcating Values, Promoting Prosperity</i>	<b>Dept. of CSE</b>
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		<b>Course Plan</b>

## 1.0 Student Help Desk

Sl. No.	Purpose	Contact Person	
		Faculty	Instructor
1	Head of Department ,NBA Criteria 1 Coordinator Module Coordinator, NAAC Criteria 2 Coordinator VTU/LIC Coordinator, Students Mentor	Dr. K. B. Manwade	Mr. A R Bhiste
2	Website Coordinator, Feedback Coordinator NBA Criteria 4 Coordinator, NAAC Criteria 2,3,5 Co- Coordinator, Module Coordinator Students Mentor	Dr. Mahesh. G. Huddar	Mr. Suyash Badi
3	Innovation Club Coordinator, Dept. NBA Coordinator AICTE/NIRF activity point Coordinator, NBA Criteria 7 and 10 Coordinator, NAAC Criteria 4 Coordinator ,Research Center Coordinator ,Module Coordinator	Dr. S. V. Manjaragi	Mr. Suyash Badi
4	Dept. ED Cell Coordinator , NBA Criteria 6 Coordinator, Module Coordinator, Class Teacher for VII Sem, Microprocessor Lab and IoT Lab Incharge Students Mentor	Prof. N K Honnagoudar	Mr. A K Badakar
5	EMS/IA Coordinator, Alumni Coordinator NBA Criteria 3 Coordinator, NAAC Criterion-7 Co- Coordinator, Dept. Time table Coordinator / Meeting Coordinator, Module coordinator Students Mentor	Prof. A A Daptardar	Miss. Supriya Hugar
6	Department Association Coordinator ( STAC) , Dept. T&P coordinator, Technical magazine / Newsletter Professional body Coordinator (IEEE/ISTE) NBA Criteria 5 Coordinator , NACC Criteria 1,5 Co- ordinator, Students Mentor	Prof. Prasanna. G. Patil	Mr. A K Badakar
7	Project/KSCST Coordinator, NBA Criteria 2 Coordinator, Class Teacher for III Sem A-DIV Web Programming Lab Incharge, Students Mentor	Prof. S. I. Mane	Miss. S B Vairagi
8	NBA Criterion 9 Coordinator, Class Teacher for V Sem Conference / FDP / Workshop, IIC/Internship Coordinator, Student Registration Coordinator Students Mentor, C Programming Lab Incharge	Prof. M. G. Ganachari	Mr. A R Bhiste
9	Final year seminar Coordinator, System Programming Lab Incharge, GATE/Pre-placement Coaching Coordinator, . Class Teacher for III Sem B-DIV Students Mentor	Prof. Sapna Patil	Miss. S B Vairagi
10	Mini Project Coordinator , Project Lab incharge	Prof. S. S. Kumbar	Miss. Supriya Hugar
10	Dept. Library	Mr. A. R. Bhiste	
<b>Institute Level</b>			
12.	Dean Student Welfare Convener	Dr. Mahesh G. Huddar (7411043272)	
13.	Dean Placements and III Cell	Prof. P. V. Patil (9731104059)	
14.	Anti Ragging Convener	Prof. Girish Zulapi (9480213587)	
15.	Anti Squad Convener	Prof. Girish Zulapi (9480213587)	
16.	Internal Complaint Committee Convener	Prof. S. S. Kamte (9008696825)	
17.	Grievance Redressal Convener	Prof. S. S. Tabhaj (9901398134)	
18.	Sports & Cultural/Extra-Curricular Activities Convener	Sri. S.B. Sarawadi (9739109383)	

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		<b>Course Plan</b>

## 2.0 Departmental Resources

Department of Computer Science and Engineering was established in the year 1996 and is housed in a total area of 1206 Sq. Mtrs.

## 2.1 Faculty Position

Sl.No.	Category	No. in Position	Average experience (in years)
1.	Teaching Faculty	10	13
2.	Technical Supporting Staff	07	15
3.	Helper Staff	03	19

## 2.2 Major Laboratories

Sl.No.	Name of the laboratory	Area in Sq. Mtrs	Amount Invested (Rs. in Lakhs)
1.	System Programming Lab.	70	23.58
2.	C Programming Lab/ Algorithms/ Network Lab.	70	19.34
3.	Project Laboratory	70	20.06
4.	Microprocessors Lab.	70	22.14
5.	Web Programming/DBA Lab.	70	16.76
6.	Computer Center	220	254.25
7.	IoT Lab	70	0.11

Total Investment in the Department

Rs. 356.13 Lakhs

## 3.0 Teaching Faculty Details

Sl. No.	Name	Designation	Qualification	Specialization	Professional Membership	Teaching Exp (in yrs)	Phone No.
1	Dr. K. B. Manwade	Professor & HOD	BE, M. Tech, Ph.D	CSE	LMISTE	20.00	8412968254
2	Dr. Mahesh. G. Huddar	Assoc. Prof	BE, M. Tech, Ph.D	CSE	LMISTE	15.00	7411043272
3	Dr. S. V. Manjaragi	Asst. Prof.	BE, M. Tech. Ph.D	CSE	LMISTE	19.08	9986658309
4	Prof. N K Honnagoudar	Asst. Prof.	BE, M.E	ECE	LMISTE	22.00	9449495302
5	Prof. A A Daptardar	Asst. Prof	BE, M. Tech.	CSE	LMISTE	18.00	9620851002
6	Prof. Prasanna. G. Patil	Asst. Prof	BE, M. Tech	CSE	LMISTE, CSI, IE	12.00	9743202717
7	Prof. S. I. Mane	Asst. Prof	BE, M. Tech	CNE	--	09.00	7406825910
8	Prof. M. G. Ganachari	Asst. Prof	M. Tech	IE	-	13.00	8904879471
9	Prof. Sapna Patil	Asst. Prof	M. Tech	DE	--	01.5	9740875627
10	Prof. S. S. Kumbar	Asst. Prof	M. Tech	IT	--	05.00	9483603451



**4.0 Institute Academic Calendar**

**ACADEMIC CALENDAR OF EVENTS-02 (CoE-02) OF IV & VI SEMs FOR THE AY: 2023-24**

Ref: 1) VTU CoE Revised Notification No.: VTU/BGM/AC-MBA/2023-24/6901, Dated 27<sup>th</sup> March 2024  
 2) VTU Tentative Academic Calendar Notification No.: VTU/BOS/AC-PG-6<sup>th</sup> sem BE/2023-24 /239, Dated 15<sup>th</sup> April 2024

Calendar							Date	Events & Holidays
<b>April -2024</b>							<b>2<sup>nd</sup> April 2024</b>	<b>Technovision-24</b>
Sun	Mon	Tue	Wed	Thu	Fri	Sat	<b>9<sup>th</sup> April 2024</b>	<b>GH: Yugadi Festival</b>
	1	2	3	4	5	6	<b>11<sup>th</sup> April 2024</b>	<b>GH: Kutub-A-Ramjan</b>
7	8	9	10	11	12	13	<b>22<sup>nd</sup> April. 2024</b>	<b>Commencement of IV Semester Classes</b>
14	15	16	17	18	19	20	<b>29<sup>th</sup> April. 2024</b>	<b>Commencement of VI Semester Classes</b>
21	22	23	24	25	26	27	<b>30<sup>th</sup> April 2024</b>	<b>Institute Sports Events</b>
28	29	30					<b>1<sup>st</sup> May 2024</b>	<b>GH: Labours Day</b>
<b>May-2024</b>							<b>7<sup>th</sup> May 2024</b>	<b>GH: Lok Sabha Election</b>
Sun	Mon	Tue	Wed	Thu	Fri	Sat	<b>2<sup>nd</sup> -6<sup>th</sup> May 2024</b>	<b>Fun Week (Social &amp; Cultural Activities)</b>
			1	2	3	4	<b>8<sup>th</sup> May 2024</b>	<b>HSIT Shambhrama-24 &amp; World- Red-Cross Day</b>
5	6	7	8	9	10	11	<b>9<sup>th</sup> May 2024</b>	<b>Graduation Day-24</b>
12	13	14	15	16	17	18	<b>10<sup>th</sup> May 2024</b>	<b>GH: Basav Jayanti/Akhsay Trutiya</b>
19	20	21	22	23	24	25	<b>13<sup>th</sup> May 2024</b>	<b>Final Year Project Exhibition</b>
26	27	28	29	30	31		<b>29<sup>th</sup>-31<sup>st</sup> May 2024</b>	<b>1<sup>st</sup> IA Test for IV &amp; VI Sems.</b>
<b>June-2024</b>							<b>31<sup>st</sup> May 2024</b>	<b>1<sup>st</sup> Feedback on Teaching-Learning (IV &amp; VI Sems.)</b>
Sun	Mon	Tue	Wed	Thu	Fri	Sat	<b>5<sup>th</sup> June 2024</b>	<b>Display of 1<sup>st</sup> IA Test Marks of IV &amp; VI Sems.</b>
30						1	<b>21<sup>st</sup>-22<sup>nd</sup> June 2024</b>	<b>Lab IA Test-I (IV &amp; VI Sem. 2021 &amp; 2022 Schemes)</b>
2	3	4	5	6	7	8	<b>21<sup>st</sup> June 2024</b>	<b>International Yoga Day</b>
9	10	11	12	13	14	15	<b>27<sup>th</sup>-29<sup>th</sup> June 2024</b>	<b>2<sup>nd</sup> IA Test for IV &amp; VI Sems.</b>
16	17	18	19	20	21	22	<b>29<sup>th</sup> June 2024</b>	<b>2<sup>nd</sup> Feedback on Teaching-Learning (IV &amp; VI Sems.)</b>
23	24	25	26	27	28	29	<b>3<sup>rd</sup> July 2024</b>	<b>Display of 1<sup>st</sup> IA Test Marks of IV &amp; VI Sems.</b>
<b>July-2024</b>							<b>17<sup>th</sup> June 2024</b>	<b>GH: Bakreed</b>
Sun	Mon	Tue	Wed	Thu	Fri	Sat	<b>3<sup>rd</sup> July 2024</b>	<b>International Plastic Bag Free Day</b>
	1	2	3	4	5	6	<b>11<sup>th</sup> July 2024</b>	<b>World Population Day</b>
7	8	9	10	11	12	13	<b>15<sup>th</sup> July 2024</b>	<b>World Youth Skills Day</b>
14	15	16	17	18	19	20	<b>17<sup>th</sup> July 2024</b>	<b>GH: Last Day of Moharam</b>
21	22	23	24	25	26	27	<b>25<sup>th</sup>-27<sup>th</sup> July 2024</b>	<b>3<sup>rd</sup> IA Test for IV &amp; VI Sems.</b>
28	29	30	31				<b>28<sup>th</sup> July 2024</b>	<b>World Nature Conservation Day</b>
<b>August-2024</b>							<b>30<sup>th</sup> July 2024</b>	<b>Display of 3<sup>rd</sup> IA Test Marks of IV &amp; VI Sems.</b>
Sun	Mon	Tue	Wed	Thu	Fri	Sat	<b>29<sup>th</sup>-30<sup>th</sup> July 2024</b>	<b>Lab IA Test-II (IV &amp; VI Sem. 2021 &amp; 2022 Schemes)</b>
				1	2	3	<b>31<sup>st</sup> July 2024</b>	<b>Last Working Day of the VI Semester Classes</b>
4	5	6	7	8	9	10	<b>7<sup>th</sup> August 2024</b>	<b>Last Working Day of the IV Semester Classes</b>
11	12	13	14	15	16	17	<b>12<sup>th</sup> August 2024</b>	<b>International Youth Day</b>
18	19	20	21	22	23	24	<b>15<sup>th</sup> August 2024</b>	<b>GH: Independence Day Celebration</b>
25	26	27	28	29	30	31	<b>8<sup>th</sup> -17<sup>th</sup> August 2024</b>	<b>VTU IV Sem Practical Examinations</b>
<b>September-2024</b>							<b>19<sup>th</sup> Aug.-12<sup>th</sup> Sept. 2024</b>	<b>VTU IV Sem Theory Examinations</b>
Sun	Mon	Tue	Wed	Thu	Fri	Sat	<b>1<sup>st</sup>-10<sup>th</sup> August 2024</b>	<b>VTU VI Sem Practical Examinations</b>
							<b>12<sup>th</sup> Aug.-14<sup>th</sup> Sept. 2024</b>	<b>VTU VI Sem Theory Examinations</b>
							<b>20<sup>th</sup> August 2024</b>	<b>Sadbhavna Diwas</b>
							<b>26<sup>th</sup> August 2024</b>	<b>Women's Equality Day</b>
							<b>16<sup>th</sup> Sept. 2024</b>	<b>Commencement of V Sem of AY: 2024-25</b>

Dr.S.N.Topannavar  
 IQAC Coordinator & Dean (Academics)

GH: General Holiday, Local Holiday

Dr.S.C.Kamate  
 Principal

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SJPN Trust's

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Dept. of CSE

Academic

Course Plan

2023-24 (EVEN)

5.0

## Department Academic Calendar

### DEPARTMENT OF COMPUTER SCIENCE & ENGG. CALENDAR OF EVENTS FOR THE IV & VI SEMESTER 2023-24 (Even)


Calendar							Date	Events & Holidays
<b>April -2024</b>							<b>2<sup>nd</sup> April 2024</b>	<b>Technovision-24</b>
Sun	Mon	Tue	Wed	Thu	Fri	Sat	9 <sup>th</sup> April 2024	GH: Yugadi Festival
	1	2	3	4	5	6	11 <sup>th</sup> April 2024	GH: Kutub-A-Ramjan
7	8	9	10	11	12	13	22 <sup>nd</sup> April, 2024	Commencement of IV Semester Classes
14	15	16	17	18	19	20	29 <sup>th</sup> April, 2024	Commencement of VI Semester Classes
21	22	23	24	25	26	27	30 <sup>th</sup> April 2024	Institute Sports Events
28	29	30					1 <sup>st</sup> May 2024	GH: Labours Day
<b>May -2024</b>							3 <sup>rd</sup> May 2024	Fun Week-HSIT Shambhrama-24
Sun	Mon	Tue	Wed	Thu	Fri	Sat	8 <sup>th</sup> May 2024	Graduation Day-24 & World Red Cross Day
			1	2	3	4	9 <sup>th</sup> May 2024	Final Year Project Exhibition
5	6	7	8	9	10	11	14 <sup>th</sup> May 2024	Project Exhibition for VIII Sem
12	13	14	15	16	17	18	25 <sup>th</sup> May 2024	Farewell - 2024
19	20	21	22	23	24	25	29 <sup>th</sup> -31 <sup>st</sup> May 2024	1 <sup>st</sup> IA Test for IV & VI Sem.
26	27	28	29	30	31		31 <sup>st</sup> May 2024	1 <sup>st</sup> Feedback on Teaching-Learning (IV & VI Sem)
<b>June -2024</b>							5 <sup>th</sup> June 2024	Display of 1 <sup>st</sup> IA Test Marks of IV & VI Sem.
Sun	Mon	Tue	Wed	Thu	Fri	Sat	14 <sup>th</sup> June 2024	Indoor Sports
						1	14 <sup>th</sup> June 2024	Infosys Spring Board Certification
2	3	4	5	6	7	8	17 <sup>th</sup> June 2024	GH: Bakreed
9	10	11	12	13	14	15	21 <sup>st</sup> - 22 <sup>nd</sup> June 2024	Lab IA Test-I (IV & V Sem. 2021 & 2022 Schemes)
16	17	18	19	20	21	22	21 <sup>st</sup> June 2024	International Yoga Day
23	24	25	26	27	28	29	27 <sup>th</sup> -29 <sup>th</sup> June 2024	2 <sup>nd</sup> IA Test for IV & VI Sems.
<b>July -2024</b>							29 <sup>th</sup> June 2024	2 <sup>nd</sup> Feedback on Teaching-Learning (IV & VI Sem)
Sun	Mon	Tue	Wed	Thu	Fri	Sat	3 <sup>rd</sup> July 2024	Display of 1 <sup>st</sup> IA Test Marks of IV & VI Sem
	1	2	3	4	5	6	5 <sup>th</sup> July 2024	Webinar on Latest Technology on Latest
7	8	9	10	11	12	12	12 <sup>th</sup> July 2024	Technical Talk on "AI Prompt Engineering"
14	15	16	17	18	19	20	15 <sup>th</sup> July 2024	3 Days Workshop on "Web Development" & "Deep Learning"
21	22	23	24	25	26	27	3 <sup>rd</sup> July 2024	International Plastic Bag Free Day
28	29	30	31				11 <sup>th</sup> July 2024	World Population Day
<b>August -2024</b>							15 <sup>th</sup> July 2024	World Youth Skills Day
Sun	Mon	Tue	Wed	Thu	Fri	Sat	17 <sup>th</sup> July 2024	GH: Last Day of Moharam
				1	2	3	19 <sup>th</sup> July 2024	Poster Presentation
4	5	6	7	8	9	10	20 <sup>th</sup> July 2024	Webinar on Latest Technology on "AI ML"
11	12	13	14	15	16	17	25 <sup>th</sup> -27 <sup>th</sup> July 2024	3 <sup>rd</sup> IA Test for IV & VI Sem
18	19	20	21	22	23	24	30 <sup>th</sup> July 2024	Display of 3 <sup>rd</sup> IA Test Marks of IV & VI Sem
25	26	27	28	29			29 <sup>th</sup> -30 <sup>th</sup> July 2024	Lab IA Test-II (IV & VI Sem 2021 & 2022 Schemes)
<b>September -2024</b>							31 <sup>st</sup> July 2024	Mini Project Exhibition cum Competition
Sun	Mon	Tue	Wed	Thu	Fri	Sat	31 <sup>st</sup> July 2024	Last Working Day of the VI Semester Classes
							7 <sup>th</sup> August 2024	Last Working Day of the IV Semester Classes
							12 <sup>th</sup> August 2024	International Youth Day
							15 <sup>th</sup> August 2024	GH: Independence Day Celebration
							8 <sup>th</sup> -17 <sup>th</sup> August 2024	VTU IV Sem Practical Examinations
							19 <sup>th</sup> Aug.-12 <sup>th</sup> Sept. 2024	VTU IV Sem Theory Examinations
							1 <sup>st</sup> -10 <sup>th</sup> August 2024	VTU VI Sem Practical Examinations
							12 <sup>th</sup> Aug.-14 <sup>th</sup> Sept. 2024	VTU VI Sem Theory Examinations
							20 <sup>th</sup> August 2024	Sadbhavana Diwas
							26 <sup>th</sup> August 2024	Women's Equality Day
							16 <sup>th</sup> September 2024	Commencement of V Sem of AY: 2024-25

GH: General Holiday, LH: Local Holiday

Prof. Prasanna Patil  
STAC Coordinator


Dr. K. B. Manwade  
HOD

Nidasoshi, Taq: Hukkeri, Dist: Belgaum, Karnataka - 591 236  
Phone: +91-8333-278887, Fax: 278886, Web: www.hsit.ac.in, Mail: principal@hsit.ac.in

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		<b>Course Plan</b>
		<b>2023-24 (EVEN)</b>

## 6.0 Scheme of Teaching & Examination

<b>VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI</b> <b>B.E. in Computer Science and Engineering</b> <b>Scheme of Teaching and Examinations 2021</b> <b>Outcome Based Education(OBE) and Choice Based Credit System (CBCS)</b> <b>(Effective from the academic year 2021 - 22)</b>												
<b>III SEMESTER</b>												
Sl. No	Course and Course Code	Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Teaching Hours /Week				Examination			Credits	
				Theory Lecture	Tutorial	Practical/ Drawing	Self - Study	Duration in hours	CIE Marks	SEE Marks		Total Marks
				L	T	P	S					
1	BSC 21MAT31	Transform Calculus, Fourier Series and Numerical Techniques	Maths	3	0	0		03	50	50	100	3
2	IPCC 21CS32	Data Structures and Applications	Any CS Board Department	3	0	2		03	50	50	100	4
3	IPCC 21CS33	Analog and Digital Electronics		3	0	2		03	50	50	100	4
4	PCC 21CS34	Computer Organization and Architecture		3	0	0		03	50	50	100	3
5	PCC 21CSL35	Object Oriented Programming with JAVA Laboratory		0	0	2		03	50	50	100	1
6	UHV 21UH36	Social Connect and Responsibility	Any Department	0	0	2		01	50	50	100	1
7	HSMC 21KSK37/47	Samskrutika Kannada	TD and PSB:HSMC	1	0	0		01	50	50	100	1
	HSMC 21KKB37/47	Balake Kannada										
	OR											
	HSMC 21CIP37/47	Constitution of India and Professional Ethics										
8	AEC 21CS38X/21 CSL38X	Ability Enhancement Course - III	TD: Concerned department PSB: Concerned Board	If offered as Theory Course				01	50	50	100	1
				1	0	0						
				If offered as lab. course				02				
0	0	2										
<b>Total</b>									<b>400</b>	<b>400</b>	<b>800</b>	<b>18</b>
9	Scheduled activities for III to VIII semesters	NMDC 21NS83	National Service Scheme(NSS)	NSS	All students have to register for any one of the course namely National Service Scheme, Physical Education (PE)(Sports and Athletics) and Yoga with the concerned coordinator of the course during the first week of III semester. The activities shall be carried out from (for 5 semesters) between III semester to VIII semester. SEE in the above courses shall be conducted during VIII semester examinations and the accumulated CIE marks shall be added to the SEE marks. Successful completion of the registered course is mandatory for the award of the degree.  The events shall be appropriately scheduled by the colleges and the same shall be reflected in the colander prepared for the NSS, PE and Yoga activities.							
		NMDC 21PE83	Physical Education (PE)(Sports and Athletics)	PE								
		NMDC 21YO83	Yoga	Yoga								
<b>Course prescribed to lateral entry Diploma holders admitted to III semester</b>												

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			<b>Academic</b>
			<b>Course Plan</b>
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B.E./B.Tech programs												
1	NCMC 21MATDIP31	Additional Mathematics - I	Maths	02	02	--	--	---	100	---	100	0
<b>Note:</b> BSC: Basic Science Course, IPCC: Integrated Professional Core Course, PCC: Professional Core Course, INT –Internship, HSMC: Humanity and Social Science & Management Courses, AEC–Ability Enhancement Courses. UHV: Universal Human Value Course. <b>L</b> –Lecture, <b>T</b> – Tutorial, <b>P</b> - Practical/ Drawing, <b>S</b> – Self Study Component, <b>CIE</b> : Continuous Internal Evaluation, <b>SEE</b> : Semester End Examination. <b>TD</b> - Teaching Department, <b>PSB</b> : Paper Setting department <b>21KSK37/47</b> Samskrutika Kannada is for students who speak, read and write Kannada and <b>21KBK37/47</b> Balake Kannada is for non-Kannada speaking, reading, and writing students. <b>Integrated Professional Core Course (IPCC):</b> Refers to Professional Theory Core Course Integrated with Practical's of the same course. Credit for IPCC can be 04 and its Teaching–Learning hours (L : T : P) can be considered as (3 : 0 : 2) or (2 : 2 : 2). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper. For more details, the regulation governing the Degree of Bachelor of Engineering /Technology (BE/B.Tech.) 2021-22 may be referred.												

**21INT49 Inter/Intra Institutional Internship:** All the students admitted to engineering programs under the lateral entry category shall have to undergo a mandatory 21INT49 Inter/Intra Institutional Internship of 03 weeks during the intervening period of III and IV semesters. The internship shall be slated for CIE only and will not have SEE. The letter grade earned through CIE shall be included in the IV semester grade card. The internship shall be considered as a head of passing and shall be considered for vertical progression and for the award of degree. Those, who do not take up / complete the internship shall be declared fail and shall have to complete during subsequently after satisfying the internship requirements. The faculty coordinator or mentor shall monitor the students' internship progress and interact with them for the successful completion of the internship.

**Non-credit mandatory courses (NCMC):**

**(A) Additional Mathematics I and II:**

(1) These courses are prescribed for III and IV semesters respectively to lateral entry Diploma holders admitted to III semester of B.E./B.Tech., programs. They shall attend the classes during the respective semesters to complete all the formalities of the course and appear for the Continuous Internal Evaluation (CIE). In case, any student fails to register for the said course/fails to secure the minimum 40 % of the prescribed CIE marks, he/she shall be deemed to have secured an F grade. In such a case, the student has to fulfill the course requirements during subsequent semester/s to earn the qualifying CIE marks. These courses are slated for CIE only and has no SEE.

(2) Additional Mathematics I and II shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the courses shall be mandatory for the award of degree.

(3) Successful completion of the courses Additional Mathematics I and II shall be indicated as satisfactory in the grade card. Non-completion of the courses Additional Mathematics I and II shall be indicated as Unsatisfactory.

**(B) National Service Scheme/Physical Education (Sport and Athletics)/ Yoga:**

(1) Securing 40 % or more in CIE, 35 % or more marks in SEE and 40 % or more in the sum total of CIE + SEE leads to successful completion of the registered course.


(2) In case, students fail to secure 35 % marks in SEE, they have to appear for SEE during the subsequent examinations conducted by the University. (3) In case, any student fails to register for NSS, PE or Yoga/fails to secure the minimum 40 % of the prescribed CIE marks, he/she shall be deemed to have not completed the requirements of the course. In such a case, the student has to fulfill the course requirements during subsequent semester/s to earn the qualifying CIE marks.

(4) Successful completion of the course shall be indicated as satisfactory in the grade card. Non-completion of the course shall be indicated as Unsatisfactory.

(5) These courses shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the courses shall be mandatory for the award of degree.

Ability Enhancement Course - III			
21CSL381	Mastering Office	21CS383	
21CS382	Programming IN c++	21CS384	



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		<b>Academic</b>
		<b>Course Plan</b>
		<b>2023-24 EVEN</b>

Subject Title		SOFTWARE ENGINEERING & PROJECT MANAGEMENT	
Subject Code	21CS61	CIE Marks	50
		SEE Marks	50
Number of Lecture Hrs / Week	2:2:0:0	Total Marks	100
Total Number of Lecture Hrs	40	Exam Hours	03
<b>Credits: 3</b>			

#### FACULTY DETAILS:

<b>Name:</b> Prof. Sapna Patil	<b>Designation:</b> Assistant Professor	<b>Experience:</b> 1 year
<b>No. of times course taught:01(including present)</b>		<b>Specialization:</b> Digital Electronics and VLSI

### 1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	Computer Science and Engg.	I / II /III	Programming Fundamentals, Data Structures and Algorithms, Computer Science Fundamentals


### 2.0 Course Objectives

1. Outline software engineering principles and activities involved in building large software programs. Identify ethical and professional issues and explain why they are of concern to Software Engineers.
2. Describe the process of requirement gathering, requirement classification, requirement specification and requirements validation.
3. Infer the fundamentals of object oriented concepts, differentiate system models, use UML diagrams and apply design patterns.
4. Explain the role of DevOps in Agile Implementation.
5. Discuss various types of software testing practices and software evolution processes.
6. Recognize the importance Project Management with its methods and methodologies.
7. Identify software quality parameters and quantify software using measurements and metrics. List software quality standards and outline the practices involved

### 3.0 Course Outcomes

At the end of the course the students should be able to:

COs	Course Outcome	Cognitive Level	POs/PSO
C310.1	Understand the activities involved in software engineering and analyze the role of various process models	L1, L2	PO1, PO3
C310.2	Explain the basics of object-oriented concepts and build a suitable class model using modelling techniques	L2	PO3
C310.3	Describe various software testing methods and to understand the importance of agile methodology and DevOps	L3, L1	PO2, PO1
C310.4	Illustrate the role of project planning and quality management in software development	L3	PO2, PO3
C310.5	Understand the importance of activity planning and different planning models	L1, L2	PO1, PO3
Total Hours of instruction			40

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		<b>Academic</b>
		<b>Course Plan</b>
		<b>2023-24 EVEN</b>
<b>Accredited at 'A' Grade by NAAC</b> <b>Programmes Accredited by NBA: CSE &amp; ECE</b>		

## 4.0 Course Content

### Module-1

**Introduction:** The evolving role of software, Software, The changing nature of software, Software engineering, A Process Framework, Process Patterns, Process Assessment, Personal and Team Process Models, Process Technology, Product and Process.

**Textbook 1: Chapter 1: 1.1 to 1.3**

**Process Models:** Prescriptive models, Waterfall model, Incremental process models, Evolutionary process models, Specialized process models.

**Textbook 1: Chapter 2: 2.1, 2.2, 2.4 to 2.7**

**Requirements Engineering:** Requirements Engineering Task, Initiating the Requirements Engineering process, Eliciting Requirements, Developing use cases, Building the analysis model, Negotiating Requirements, Validating Requirements, Software Requirement Document (**Sec 4.2**)

**Textbook 1: Chapter 3: 3.1 to 3.6, Textbook 5: Chapter 4: 4.2**

### Module-2

**Introduction, Modelling Concepts and Class Modelling:** What is Object orientation? What is OO development? OO Themes; Evidence for usefulness of OO development; OO modelling history. Modelling as Design technique: Modelling, abstraction, The Three models. Class Modelling: Object and Class Concept, Link and associations concepts, Generalization and Inheritance, A sample class model, Navigation of class models, Introduction to RUP (**Textbook: 5 Sec 2.4**) and UML diagrams

**Textbook 2: Chapter 1,2,3**

**Building the Analysis Models:** Requirement Analysis, Analysis Model Approaches, Data modeling Concepts, Object Oriented Analysis, Scenario-Based Modeling, Flow-Oriented Modeling, class Based Modeling, Creating a Behavioral Model.

**Textbook 1: Chapter 8: 8.1 to 8.8**

### Module-3

**Software Testing:** A Strategic Approach to Software Testing, Strategic Issues, Test Strategies for Conventional Software, Test Strategies for Object -Oriented Software, Validation Testing, System Testing, The Art of Debugging.

**Textbook 1: Chapter 13: 13.1 to 13.7**

**Agile Methodology & DevOps:** Before Agile – Waterfall, Agile Development,

**Self-Learning Section:**

What is DevOps?, DevOps Importance and Benefits, DevOps Principles and Practices, 7 C's of DevOps Lifecycle for Business Agility, DevOps and Continuous Testing, How to Choose Right DevOps Tools?, Challenges with DevOps Implementation.

**Textbook 4: Chapter 2: 2.1 to 2.9**

### Module-4

**Introduction to Project Management:**

Introduction, Project and Importance of Project Management, Contract Management, Activities Covered by Software Project Management, Plans, Methods and Methodologies, Some ways of categorizing Software Projects, Stakeholders, Setting Objectives, Business Case, Project Success and Failure, Management and Management Control, Project Management life cycle, Traditional versus Modern Project Management Practices.

**Textbook 3: Chapter 1: 1.1 to 1.17**

### Module-5

**Activity Planning:**


Objectives of Activity Planning, When to Plan, Project Schedules, Sequencing and Scheduling Activities, Network Planning Models, Forward Pass– Backward Pass, Identifying critical path, Activity Float, Shortening Project Duration, Activity on Arrow Networks.

**Textbook 3: Chapter 6: 6.1 to 6.16**

**Software Quality:**

Introduction, The place of software quality in project planning, Importance of software quality, software quality models, ISO 9126, quality management systems, process capability models, techniques to enhance software quality, quality plans.

**Textbook 3: Chapter 13: (13.1 to 13.6 , 13.9, 13.11, 13.14),**

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		<b>Academic</b>
		<b>Course Plan</b>
		<b>2023-24 EVEN</b>

## 5.0 Relevance to future subjects

Sl.No.	Semester	Subject	Topics
01	VII	Object oriented modeling and design	-
02	VII	Software architecture and design patterns	-

## 6.0 Relevance to Real World

Sl.No	Real World Mapping
01	By understanding the subjects, students gain a deeper appreciation for its importance and are better equipped to apply their knowledge effectively in professional software engineering roles.

## 7.0 Gap Analysis and Mitigation

Sl. No	Delivery Type	Details
01	Tutorial	Topic: Introduction, Process Models, Requirements Engineering, Object Oriented Modeling and design, Software testing, Agile Methodology and DevOps, Software quality
02	NPTEL	Topic: Introduction to project management, Activity Planning

## 8.0 Books Used and Recommended to Students


Text Books
1. Roger S. Pressman: Software Engineering-A Practitioners approach, 7th Edition, Tata McGraw Hill. 2. Michael Blaha, James Rumbaugh: Object Oriented Modelling and Design with UML, 2nd Edition, Pearson Education, 2005. 3. Bob Hughes, Mike Cotterell, Rajib Mall: Software Project Management, 6th Edition, McGraw Hill Education, 2018. 4. Deepak Gaikwad, Viral Thakkar, DevOps Tools From Practitioner's Viewpoint, Wiley. 5. Ian Sommerville: Software Engineering, 9th Edition, Pearson Education, 2012.
Reference Books
1. Pankaj Jalote: An Integrated Approach to Software Engineering, Wiley India.

## 9.0 Relevant Websites (Reputed Universities and Others) for Notes/ Animation/ Videos Recommended

Website and Internet Contents References
1. <a href="https://onlinecourses.nptel.ac.in/noc20_cs68/preview">https://onlinecourses.nptel.ac.in/noc20_cs68/preview</a> 2. <a href="https://www.youtube.com/watch?v=WxkP5KR_Emk&amp;list=PLrjkTql3jnm9b5nr-ggx7Pt1G4UAHeFIJ">https://www.youtube.com/watch?v=WxkP5KR_Emk&amp;list=PLrjkTql3jnm9b5nr-ggx7Pt1G4UAHeFIJ</a> 3. <a href="http://elearning.vtu.ac.in/econtent/CSE.php">http://elearning.vtu.ac.in/econtent/CSE.php</a> 4. <a href="http://elearning.vtu.ac.in/econtent/courses/video/CSE/15CS42.html">http://elearning.vtu.ac.in/econtent/courses/video/CSE/15CS42.html</a> 5. <a href="https://nptel.ac.in/courses/128/106/128106012/">https://nptel.ac.in/courses/128/106/128106012/</a> (DevOps)

## 10.0 Magazines/Journals Used and Recommended to Students

Sl.No	Magazines/Journals	Website
1	IEEE Transactions on Software Engineering (TSE):	<a href="https://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=32">https://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=32</a>
2	ACM Transactions on Software Engineering and Methodology (TOSEM):	<a href="https://dl.acm.org/journal/tosem">https://dl.acm.org/journal/tosem</a>
3	Journal of Software Engineering Research and Development (JSERD):	<a href="https://jserd.springeropen.com/">https://jserd.springeropen.com/</a>

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		<b>Academic</b>
		<b>Course Plan</b>
		<b>2023-24 EVEN</b>

## 11.0 Examination Note

### Assessment Details (both CIE and SEE)

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

### Continuous Internal Evaluation:

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

1. First test at the end of 5<sup>th</sup> week of the semester
2. Second test at the end of the 10<sup>th</sup> week of the semester
3. Third test at the end of the 15<sup>th</sup> week of the semester

Two assignments each of **10 Marks**

4. First assignment at the end of 4<sup>th</sup> week of the semester
5. 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)**

6. 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**

(to have less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course).

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

### Semester End Examination:


Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject **(duration 03 hours)**

1. The question paper will have ten questions. Each question is set for 20 marks. Marks scored shall be proportionally reduced to 50 marks
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

**The students have to answer 5 full questions, selecting one full question from each module.**


### SPECIAL INSTRUCTIONS

1. The total exam duration is 3 hours.
2. Use black ink ball point pen for writing examination.
3. Drawing should be drawn using dark pencil.
4. Read the questions carefully.
5. Answer the questions up to the point.

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		<b>Academic</b>
		<b>Course Plan</b>
		<b>2023-24 EVEN</b>

## 12.0 Course Delivery Plan

Module	Lecture No./Practical Session	Content of Lecture	% of Portion
Module-1	L1	The evolving role of software, Software, The changing nature of software, Software engineering,	20
	L2	A Process Framework, Process Patterns, Process Assessment, Personal and Team Process Models,	
	L3	Process Technology, Product and Process, Prescriptive models	
	L4	Waterfall model, Incremental process models,	
	L5	Evolutionary process models, Specialized process models.	
	L6	Requirements Engineering Task, Initiating the Requirements Engineering process, Eliciting Requirements,	
	L7	Developing use cases, Building the analysis model,	
	L8	Negotiating Requirements, Validating Requirements, Software Requirement Document	
Module-2	L1	What is Object orientation? What is OO development? OO Themes; Evidence for usefulness of OO development; OO modelling history	20
	L2	. Modelling as Design technique: Modelling, abstraction, The Three models.	
	L3	Class Modelling: Object and Class Concept, Link and associations concepts, Generalization and Inheritance,	
	L4	A sample class model, Navigation of class models, Introduction to RUP and UML diagrams	
	L5	Requirement Analysis, Analysis Model Approaches, Data modeling Concepts,	
	L6	Object Oriented Analysis, Scenario-Based Modeling	
	L7	Flow-Oriented Modeling, class Based Modeling, Creating a Behavioral Model.	
	L8	Creating a Behavioral Model.	
Module-3	L1	A Strategic Approach to Software Testing, Strategic Issues, Test Strategies for Conventional Software, Test Strategies for Object -Oriented Software, Validation Testing, System Testing, The Art of Debugging.	20
	L2	Strategic Issues,	
	L3	, Test Strategies for Conventional Software	
	L4	Test Strategies for Object -Oriented Software,	
	L5	Validation Testing,	
	L6	System Testing, The Art of Debugging.	
	L7	Agile Methodology & DevOps: Before Agile – Waterfall, Agile Development,	
	L8	Self-Learning Section: What is DevOps?, DevOps Importance and Benefits, DevOps Principles and Practices, 7 C's of DevOps Lifecycle for Business Agility, DevOps and Continuous Testing, How to Choose Right DevOps Tools?, Challenges with DevOps Implementation.	
Module-4	L1	Introduction, Project and Importance of Project Management,	20
	L2	Contract Management, Activities Covered by Software Project Management,	
	L3	Plans, Methods and Methodologies, Some ways of categorizing Software Projects,	
	L4	Stakeholders, Setting Objectives,	
	L5	Project Success and Failure	
	L6	Management and Management Control,	
	L7	Project Management life cycle,	
	L8	Traditional versus Modern Project Management Practices.	
Module-5	L1	Objectives of Activity Planning, When to Plan	20
	L2	, Project Schedules, Sequencing and Scheduling Activities	
	L3	Network Planning Models, Forward Pass– Backward Pass, Identifying critical path,	
	L4	Activity Float, Shortening Project Duration, Activity on Arrow Networks.	
	L5	Introduction, The place of software quality in project planning	
	L6	Importance of software quality, software quality models, ISO 9126	
	L7	quality management systems, process capability models,	
	L8	techniques to enhance software quality, quality plans.	

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		<b>Academic</b>
		<b>Course Plan</b>
		<b>2023-24 EVEN</b>
	<b>Accredited at 'A' Grade by NAAC</b> <b>Programmes Accredited by NBA: CSE &amp; ECE</b>	

## 13.0

## QUESTION BANK

### Module -1

1. Define software engineering. What are the different types of software products (06 Marks)
2. Explain briefly the Software Engineering Ethics. (06 Marks)
3. List and explain the different types of Application Softwares. (08 Marks)
4. What are the fundamental software process activities? With neat diagram, explain requirement engineering process. (08 Marks)
5. With neat diagram, explain Bohem's Spiral model. (08 Marks)
6. Explain Re-use oriented Software Engineering. (04 Marks) Feb/Mar 2022
7. Define Software Engineering? Briefly discuss the attributes of good software? (10 Marks)
8. Through a neat diagram, explain the incremental development process? Also mention the benefits of this model when compared to waterfall model? (10 Marks)
9. Give the sketch of requirement engineering process and explain the different stages?(10 Marks)
10. Indicate why requirement validation is needed. Discuss different checks to be carried out during requirement validation process. (10 Marks)

### Module 2


1. What is object orientation? Explain the characteristics of object oriented approach. (10 Marks)
2. Define model, Explain the three different models of object orientation. (10 Marks)
3. Explain the following with suitable diagrams
  - (i) Links and Associations
  - (ii) Generalization (10 Marks)
4. With neat diagram, explain the class model of the windows systems (10 Marks)
5. What is object orientation? List and explain the aspects of object oriented approach?(10 Marks)
6. Why models are created? Summarize the three different models of objects oriented development.(10 Marks)
7. Explain the object and class diagram concepts with example. (10 Marks)
8. State the following terms with example
  - i) Multiplicity ii) Association end 4) Ordering iv) Bags and sequences
  - v) Association class. (10 Marks)

### Module 3

1. With neat diagram, explain the context model for MHC-PMS system. (10 Marks)
2. Explain the state diagram of microwave oven. (10 Marks)
3. Explain Rational Unified Process. (06 Marks)
4. Explain design pattern with UML model of the observer model. (08 Marks)
5. What are the implementation issues of Software Engineering? (06 Marks)
6. Illustrate the state diagram of microwave oven application in event driven model. (10 Marks)
7. Describe the following with examples
  - i) Class diagram and association ii) Generalization iii) Aggregation. (10 Marks)
8. What is design pattern? Briefly describe the essential elements of design pattern. (10 Marks)
9. With a neat block diagram, explain the phases of Rational Unified Model (RUD). (10 Marks)

### Module 4

1. What are the two distinct goals of Software Testing? (05 Marks)
2. Explain the three different types of testing carried out during software development.(05 Marks)
3. What are the different types of user testing? With neat diagram, explain the six stages of acceptance testing process. (10 Marks)
4. Write the Lemman's law of program dynamic evolution. (06 Marks)
5. With neat diagram, explain the software reengineering process activities. (08 Marks)
6. What are the four strategic options for Legacy Systems? (06 Marks)
7. Write a note on software testing? Illustrate the idea of component interface testing.(10 Marks)
8. Describe Test Driven Development (TDD) with its process and benefits. (10 Marks)
9. What is user testing? Explain six stages of acceptance testing. (10 Marks)

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		<b>Academic</b>
		<b>Course Plan</b>
		<b>2023-24 EVEN</b>
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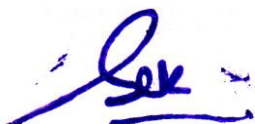
10. Outline Leburans laws of program evaluation dynamics (Any five) (10 Marks)


#### Module 5

1. What are the factors affecting the pricing of software product?
2. With neat diagram, explain the project planning process.
3. With neat diagram, explain the COCOMO ~— II estimation model.
4. Explain the product standards and process standards in software quality management (06 Marks)
5. Explain three phases of software review process. (08 Marks)
6. Explain the various inspection checks in the program inspection. (06 Marks) Feb/Mar 2022
7. Define software pricing. Discuss the factors affecting software process. (10 Marks)
8. Name of project plan sections and explain in detail. (10 Marks)
9. How would you define software Quality? Briefly discuss the software quality attributes.
10. Elaborate the purpose of program inspection? Analyze the different inspection checks, fault classes done during program inspection. (10 Marks)

## 14.0 University Result

Examination	FCD	FC	SC	% Passing
NIL	NIL	NIL	NIL	NIL

Prepared by	Checked by		
 Prof. Sapna Patil	 Dr. K. B. Manwade	 HOD	 Principal

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		<b>Academic</b>
		<b>Course Plan</b>
		<b>2023-24 EVEN</b>

<b>FULLSTACK DEVELOPMENT</b>			
<b>Course Code</b>	<b>21CS62</b>	<b>CIE Marks</b>	<b>50</b>
<b>Course Type</b>	<b>Integrated</b>	<b>SEE Marks</b>	<b>50</b>
<b>Teaching Hours/Week (L:T:P:S)</b>	<b>3:0:2:0</b>	Total marks(CIE + SEE)	<b>100</b>
<b>Total Hours of Pedagogy</b>	<b>40 T + 20 P</b>	SEE Hours	<b>03</b>
<b>Credits</b>	<b>04</b>		

<b>FACULTY DETAILS:</b>		
<b>Name:</b> Dr. K. B. Manwade	<b>Designation:</b> Professor	<b>Experience:</b> 20 Yrs
<b>No. of times course taught:</b> 01	<b>Specialization:</b> Computer Science and Engineering	

## 1.0 Perquisite Subjects:

Sl. No	Branch	Semester	Subject
01	CSE	III, IV	Python programming, Web programming

## 2.0 Course Objectives


CLO 1.	Explain the use of learning full stack web development.
CLO 2.	Make use of rapid application development in the design of responsive web pages.
CLO 3.	Illustrate Models, Views and Templates with their connectivity in Django for full stack web development.
CLO 4.	Demonstrate the use of state management and admin interfaces automation in Django.
CLO 5.	Design and implement Django apps containing dynamic pages with SQL databases.

## 3.0 Course Outcomes [C145]

**At the end of the course the student will be able to:**

CO	Course Outcome	RBT Level	POs
C145.1	Understand the working of MVT based full stack web development with Django.	L1,L2,L3	1,2,3,8,10
C145.2	Designing of Models and Forms for rapid development of web pages.	L1,L2,L3	1,2,3,8,10
C145.3	Template Inheritance and Generic views for developing full stack web applications.	L1,L2,L3	1, 2, 3,8,10
C145.4	Apply the Django framework libraries to render non HTML contents like CSV and PDF.	L1,L2,L3	1, 2,3,8,10
C145.5	Perform jQuery based AJAX integration to Django Apps to build responsive full stack web applications,	L1,L2,L3	1, 2,3,8,10



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		<b>Course Plan</b>
		<b>2023-24 EVEN</b>
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## 4.0 Course Content

### Module-1: MVC based Web Designing (08 Hours)

Web framework, MVC Design Pattern, Django Evolution, Views, Mapping URL to Views, Working of Django URL Confs and Loose Coupling, Errors in Django, Wild Card patterns in URLs.

**Textbook 1: Chapter 1 and Chapter 3**

### Module-2: Django Templates and Models (08 Hours)

Template System Basics, Using Django Template System, Basic Template Tags and Filters, MVT Development Pattern, Template Loading, Template Inheritance, MVT Development Pattern.

Configuring Databases, Defining and Implementing Models, Basic Data Access, Adding Model String Representations, Inserting/Updating data, Selecting and deleting objects, Schema Evolution

**Textbook 1: Chapter 4 and Chapter 5**

### Module-3: Django Admin Interfaces and Model Forms (08 Hours)

Activating Admin Interfaces, Using Admin Interfaces, Customizing Admin Interfaces, Reasons to use Admin Interfaces.

Form Processing, Creating Feedback forms, Form submissions, custom validation, creating Model Forms, URLConf Ticks, Including Other URLConfs.

**Textbook 1: Chapters 6,7 and 8**

### Module-4: Generic Views and Django State Persistence (08 Hours)

Using Generic Views, Generic Views of Objects, Extending Generic Views of objects, Extending Generic Views.

MIME Types, Generating Non-HTML contents like CSV and PDF, Syndication Feed Framework, Sitemap framework, Cookies, Sessions, Users and Authentication.

**Textbook 1: Chapters 9, 11 and 12**


### Module-5: jQuery and AJAX Integration in Django (08 Hours)

Ajax Solution, Java Script, XMLHttpRequest Request and Response, HTML, CSS, JSON, iFrames, Settings of Java Script in Django, jQuery and Basic AJAX, jQuery AJAX Facilities, Using jQuery UI Autocomplete in Django

**Textbook 2: Chapters 1, 2 and 7**

### Programming Exercises:

1. Installation of Python, Django and Visual Studio code editors can be demonstrated.
2. Creation of virtual environment, Django project and App should be demonstrated
3. Develop a Django app that displays current date and time in server
4. Develop a Django app that displays date and time four hours ahead and four hours before as an offset of current date and time in server.
5. Develop a simple Django app that displays an unordered list of fruits and ordered list of selected students for an event
6. Develop a layout.html with a suitable header (containing navigation menu) and footer with copyright and developer information. Inherit this layout.html and create 3 additional pages: contact us, About Us and Home page of any website.
7. Develop a Django app that performs student registration to a course. It should also display list of students registered for any selected course. Create students and course as models with enrolment as ManyToMany field.
8. For student and course models created in Lab experiment for Module2, register admin interfaces, perform migrations and illustrate data entry through admin forms.

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		<b>Academic</b>
		<b>Course Plan</b>
		<b>2023-24 EVEN</b>

9. Develop a Model form for student that contains his topic chosen for project, languages used and duration with a model called project.
10. For students enrolment developed in Module 2, create a generic class view which displays list of students and detailview that displays student details for any selected student in the list.
11. Develop example Django app that performs CSV and PDF generation for any models created in previous laboratory component.
12. Develop a registration page for student enrolment as done in Module 2 but without page refresh using AJAX.
13. Develop a search application in Django using AJAX that displays courses enrolled by a student being searched.

## 5.0 Relevance to future subjects

S. No	Semester	Subject	Topics
01	VII	Cloud computing	For web site hosting
02	VIII	Project work	For web based projects

## 6.0 Relevance to Real World

S. No	Real World Mapping
1.	Developing websites.

## 7.0 Analysis and Mitigation

S. No	Delivery Type	Details
01	content	<a href="https://www.w3schools.com/django/index.php">https://www.w3schools.com/django/index.php</a>

## 8.0 Books Used and Recommended to Students

Books
1. Adrian Holovaty, Jacob Kaplan Moss, The Definitive Guide to Django: Web Development Done Right, Second Edition, Springer-Verlag Berlin and Heidelberg GmbH & Co. KG Publishers, 2009
2. Jonathan Hayward, Django Java Script Integration: AJAX and jQuery, First Edition, Pack Publishing, 2011

### Links and Video Lectures (e-Resources):


1. MVT architecture with Django: <a href="https://freevideolectures.com/course/3700/django-tutorials">https://freevideolectures.com/course/3700/django-tutorials</a>
2. Using Python in Django: <a href="https://www.youtube.com/watch?v=2BqoLiMT3Ao">https://www.youtube.com/watch?v=2BqoLiMT3Ao</a>
3. Model Forms with Django: <a href="https://www.youtube.com/watch?v=gMM1rtTwKxE">https://www.youtube.com/watch?v=gMM1rtTwKxE</a>
4. Real time Interactions in Django: <a href="https://www.youtube.com/watch?v=3gHmfoeZ45k">https://www.youtube.com/watch?v=3gHmfoeZ45k</a>
5. 5. AJAX with Django for beginners: <a href="https://www.youtube.com/watch?v=3VaKNyjlxAU">https://www.youtube.com/watch?v=3VaKNyjlxAU</a>

### Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

1. Real world problem solving - applying the Django framework concepts and its integration with AJAX to develop any shopping website with admin and user dashboards.
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## 9.0 Relevant Websites (Reputed Universities and Others) for Notes /Animation / Videos Recommended

Website and Internet Contents References
1. <a href="https://github.com/django/django">https://github.com/django/django</a>
2. <a href="https://docs.djangoproject.com/en/5.0/">https://docs.djangoproject.com/en/5.0/</a>

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		<b>Academic</b>
		<b>Course Plan</b>
		<b>2023-24 EVEN</b>
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## 10.0 Magazines/Journals Used and Recommended to Students

S. No	Magazines/Journals	website
1	The Python Papers (ISSN: 1834-3147)	<a href="https://journals.indexcopernicus.com/search/details?id=782">https://journals.indexcopernicus.com/search/details?id=782</a>
2	n Periodicals	<a href="https://wiki.python.org/moin/PythonPeriodicals">https://wiki.python.org/moin/PythonPeriodicals</a>

## 11.0 Examination Note

### 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 (CIE):

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

1. First test at the end of 5th week of the semester
2. Second test at the end of the 10th week of the semester
3. Third test at the end of the 15th week of the semester

Two assignments each of 10 Marks

4. First assignment at the end of 4th week of the semester
5. Second assignment at the end of 9th week of the semester

**Practical Sessions need to be assessed by appropriate rubrics and viva-voce method. This will contribute to 20 marks.**

- Rubrics for each Experiment taken average for all Lab components – 15 Marks.
- Viva-Voce– 5 Marks (more emphasized on demonstration topics)

The sum of three tests, two assignments, and practical sessions will be out of 100 marks and will be scaled down to 50 marks (to have a less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course).

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

#### Semester End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (duration 03 hours)

1. The question paper will have ten questions. Each question is set for 20 marks. Marks scored shall be proportionally reduced to 50 marks
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module.

The students have to answer 5 full questions, selecting one full question from each module.



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**2023-24 EVEN**

**12.0**

**Course Delivery Plan**


Module	Lecture No.	Content of Lecture	Teaching-Learning Process	% of Portion
		<b>PART - A</b>		
<b>1</b>	L1.	Introduction to web programming	Chalk &board, PPT, Animation, Active Learning	20
	L2.	Web framework		
	L3.	MVC Design Pattern,		
	L4.	Django Evolution		
	L5.	Views		
	L6.	Mapping URL to Views		
	L7.	Working of Django URL Confs and Loose Coupling		
	L8.	Errors in Django, Wild Card patterns in URLs.		
<b>2</b>	L9.	Template System Basics, Using Django Template System	Chalk & board, Active Learning, Problem based learning	20
	L10.	Basic Template Tags and Filters, MVT Development Pattern		
	L11.	Template Loading, Template Inheritance		
	L12.	MVT Development Pattern		
	L13.	Configuring Databases, Defining and Implementing Models		
	L14.	Basic Data Access, Adding Model String Representations		
	L15.	Inserting/Updating data		
	L16.	Selecting and deleting objects, Schema Evolution		
<b>3</b>	L17.	Activating Admin Interfaces	Chalk & board, PPT, Animation, NPTEL, Active Learning	20
	L18.	Using Admin Interfaces		
	L19.	Customizing Admin Interfaces		
	L20.	Reasons to use Admin Interfaces		
	L21.	Form Processing, Creating Feedback forms		
	L22.	Form submissions, custom validation		
	L23.	creating Model Forms, URLConf Ticks		
	L24.	Including Other URLConfs		
<b>4</b>	L25.	Using Generic Views	Chalk& board, Problem based learning	20
	L26.	Generic Views of Objects		
	L27.	Extending Generic Views of objects		
	L28.	Extending Generic Views		
	L29.	Extending Generic Views		
	L30.	Generating Non-HTML contents like CSV and PDF		
	L31.	Syndication Feed Framework, Sitemap framework		
	L32.	Cookies, Sessions, Users and Authentication		
<b>5</b>	L33.	Ajax Solution	Chalk & board, MOOC	20
	L34.	<b>Java Script</b>		
	L35.	XHTMLHttpRequest and Response		
	L36.	HTML, CSS, JSON		
	L37.	iFrames, Settings of Java Script in Django		
	L38.	jQuery and Basic AJAX		
	L39.	jQuery AJAX Facilities		
	L40.	Using jQuery UI Autocomplete in Django		
<b>Practical component</b>				

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		<b>Academic</b>
		<b>Course Plan</b>
		<b>2023-24 EVEN</b>

P1.	Installation of Python, Django and Visual Studio code editors can be demonstrated.	Conduction of Experiments in laboratory and viva-voce	20
P2.	Creation of virtual environment, Django project and App should be demonstrated		
P3.	Develop a Django app that displays current date and time in server		
P4.	Develop a Django app that displays date and time four hours ahead and four hours before as an offset of current date and time in server.		
P5.	Develop a simple Django app that displays an unordered list of fruits and ordered list of selected students for an event		
P6.	Develop a layout.html with a suitable header (containing navigation menu) and footer with copyright and developer information. Inherit this layout.html and create 3 additional pages: contact us, About Us and Home page of any website.		
P7.	Develop a Django app that performs student registration to a course. It should also display list of students registered for any selected course. Create students and course as models with enrolment as ManyToMany field.		
P8.	For student and course models created in Lab experiment for Module2, register admin interfaces, perform migrations and illustrate data entry through admin forms.		
P9.	Develop a Model form for student that contains his topic chosen for project, languages used and duration with a model called project.		
P10.	For students enrolment developed in Module 2, create a generic class view which displays list of students and detailview that displays student details for any selected student in the list.		
P11.	Develop example Django app that performs CSV and PDF generation for any models created in previous laboratory component.		
P12.	Develop a registration page for student enrolment as done in Module 2 but without page refresh using AJAX.		
P13.	Develop a search application in Django using AJAX that displays courses enrolled by a student being searched.		

### 13.0 Assignments, Quiz,GD, Mini Project, Seminars

S. No.	Title	Outcome expected	Related Study	Week No.	Individual / Group activity	Reference: book/website /Paper
1	<b>Assignment-1:</b> Introduction to Computer Hardware & Software.(10Marks)	Students study the Topic and write the Answers.	Chapter-1 of Module-1	4	Individual Activity.	Book 1, 2 of the reference list.
2	<b>Assignment-2:</b> Character Array & Stings including problems. (10Marks)	Students study the Topics and write the Answers.	Chapter-2 of Module-3	9	Individual Activity.	Book 1, 2 of the reference list.
3	Quiz/Seminar/GD/Activity (20Marks)	Students study the Topics and answer the Quiz / present seminar.	Will be Notified later.	13	Individual/Group activity.	Book 1, 2 of the reference list.

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		<b>Academic</b>
		<b>Course Plan</b>
		<b>2023-24 EVEN</b>
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## 14.0

## QUESTION BANK

### Module: 1


1. What is a web framework?
2. Why would you use a web framework?
3. What does MVC stand for, and what are its components?
4. How does the MVC design pattern benefit web application development?
5. What are some key features of Django?
6. How has Django evolved over time?
7. What is a view in Django?
8. How do you create a simple view in Django?
9. How does Django map URLs to views?
10. Provide an example of a URL pattern mapping to a view in Django.
11. What is a URLconf in Django?
12. What is loose coupling in the context of Django?
13. What are common types of errors you might encounter in a Django application?
14. How can you handle errors in Django?
15. What is a wildcard pattern in Django URLs?
16. Give an example of using a wildcard pattern in a Django URL.

### Module -2

1. What is the purpose of the template system in Django?
2. What are templates in Django typically used for?
3. How do you use a template in a Django view?
4. What are template tags in Django?
5. What are template filters in Django?
6. Give an example of a basic template tag and a filter.
7. What does MVT stand for in Django, and how does it differ from MVC?
8. How does Django find and load templates?
9. What is template inheritance in Django?
10. Provide an example of template inheritance in Django.
11. How do you configure a database in Django?
12. What is a model in Django?
13. How do you define a basic model in Django?
14. How do you perform basic data access operations in Django?
15. How do you retrieve all objects from a model?
16. Why is it important to add string representations to models?
17. How do you add a string representation to a Django model?
18. How do you insert a new record into a Django model?
19. How do you update an existing record in Django?
20. How do you select a single object in Django?
21. How do you delete an object in Django?
22. What is schema evolution in Django?
23. How do you apply schema changes in Django?
24. How do you create and apply migrations in Django?

### Module- 3

1. How do you activate the Django admin interface?

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		<b>Course Plan</b>
		<b>2023-24 EVEN</b>


2. What is the Django admin interface used for?
3. How do you access the Django admin interface?
4. How do you access the Django admin interface?
5. What are some reasons to use the Django admin interface?
6. What is form processing in Django?
7. How do you create a feedback form in Django?
8. How do you display a feedback form in a template?
9. How do you handle form submissions in Django views?
10. How do you add custom validation to a Django form?
11. What are model forms in Django?
12. How do you create a model form in Django?

#### Module- 4

1. What are the benefits of using generic views in Django?
2. What are some common built-in generic views in Django? (e.g., ListView, DetailView)
3. How can I customize the context data passed to templates from a generic view?
4. How do I extend a generic view to add custom functionality?
5. How can I use generic views to display lists and details of specific model objects?
6. What is the queryset attribute used for in generic views?
7. How can I change the variable name used in templates for a list of objects? (e.g., from object\_list to book\_list)
8. When is it appropriate to extend a generic view rather than writing a custom view from scratch?
9. How can I override methods in a subclassed generic view to modify its behavior?
10. What are some examples of common customizations for generic views of objects? (e.g., filtering objects, adding extra context data)
11. What are the different ways to extend generic views in Django? (e.g., subclassing, mixing concerns)
12. How can I handle different HTTP methods (GET, POST, etc.) in a custom generic view?
13. What are some best practices for writing maintainable and reusable extended generic views?
14. MIME Types: What are MIME types and how are they used in Django to specify content types for responses?
15. Non-HTML Content: How can I generate responses in formats like CSV and PDF in Django?
16. Syndication Feeds: How can I use Django to create RSS or Atom feeds for my website?
17. Sitemap Framework: What are the benefits of using a sitemap framework in Django and how do I get started?
18. Cookies & Sessions: How can I use cookies and sessions to store user data in Django?
19. Users & Authentication: How do I implement user authentication and authorization in a Django application?




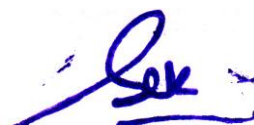
#### Module- 5

1. What is AJAX? How does it differ from traditional page reloads?
2. What are the components of an AJAX request? (JavaScript, XMLHttpRequest, HTML, CSS)
3. How does a web browser handle an AJAX request? (Sending and receiving data)
4. What is JSON and why is it commonly used with AJAX?
5. How can I interact with Django views using JavaScript's XMLHttpRequest object?
6. How do I send data (e.g., form data) to Django in an AJAX request?
7. How do I handle the response from a Django view in JavaScript? (Updating the DOM)
8. What is jQuery and how does it simplify AJAX development?
9. What are some common jQuery methods used for AJAX requests (e.g., \$.get, \$.post)?
10. How can I use jQuery UI Autocomplete to create a search bar with suggestions fetched via AJAX from Django?
11. How do I configure Django to handle security concerns related to AJAX requests (e.g., CSRF protection)?
12. How can I handle errors and loading states during AJAX requests?
13. What are some best practices for writing maintainable and efficient AJAX code?
14. How can I integrate real-time features like WebSockets with Django for a more dynamic user experience?


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		<b>Academic</b>
		<b>Course Plan</b>
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## 15.0 University Result

Examination	S+	S	A	B	C	D	E	F	% Passing
-	-	-	-	-	-	-	-	-	-

Prepared by	Checked by		
			
Dr. K. B. Manwade	Dr. Mahesh. G. Huddar	HOD	Principal



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		<b>Course Plan</b>
		<b>2023-24 EVEN</b>

<b>Subject Title</b>	<b>Computer Graphics and Fundamentals Of Image Processing</b>		
<b>Subject Code</b>	21CS63	<b>IA Marks</b>	50
<b>Number of Lecture Hrs. / Week</b>	3:0:0:0	<b>Exam Marks</b>	50
<b>Total Number of Lecture Hrs.</b>	40	<b>Exam Hours</b>	03
<b>CREDITS – 03</b>			

<b>FACULTY DETAILS:</b>		
<b>Name:</b> Dr. Mahesh Huddar	<b>Designation:</b> Associate Professor	<b>Experience:</b> 14.5
<b>No. of times course taught:</b> 07	<b>Specialization:</b> Computer Science and Engineering	

## 1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	Mathematics (Knowledge of Matrices)	I/II/III/IV	Mathematics-I/II/III/IV
02	programming	I/II	Programming in C and Data Structures
03	Computer Science and Engineering	V	Artificial Intelligence and Machine Learning

## 2.0 Course Objectives

1. Overview of Computer Graphics along with its applications.
2. Exploring 2D and 3D graphics mathematics along with OpenGL API's.
3. Use of Computer graphics principles for animation and design of GUI's .
4. Introduction to Image processing and Open CV.
5. Image segmentation using Open CV.

## 3.0 Course Outcomes

Having successfully completed this course, the student will be able to :

CO	Course Outcome	Cognitive Level	POs
C312.1	Construct geometric objects using Computer Graphics principles and OpenGL APIs.	L2	PO1, 2, 3, 5, 8, 10
C312.2	Use OpenGL APIs and related mathematics for 2D and 3D geometric Operations on the objects.	L2	PO1, 2, 3, 5, 8, 10
C312.3	Design GUI with necessary techniques required to animate the created objects	L3	PO1, 2, 3, 5, 8, 10
C312.4	Apply OpenCV for developing Image processing applications.	L3	PO1, 2, 3, 5, 8, 10
C312.5	Apply Image segmentation techniques along with programming, using OpenCV, for developing simple applications.	L2	PO1, 2, 3, 5, 8, 10
<b>Total Hours of instruction</b>			<b>40</b>


## 4.0 Course Content

### MODULE-1

Overview: Computer Graphics hardware and software and OpenGL: Computer Graphics: Video Display Devices, Raster-Scan Systems Basics of computer graphics, Application of Computer Graphics. OpenGL: Introduction to OpenGL, coordinate reference frames, specifying two-dimensional world coordinate reference frames in OpenGL, OpenGL point functions, OpenGL line functions, point attributes, line attributes, curve attributes, OpenGL point attribute functions, OpenGL line attribute functions, Line drawing algorithms (DDA, Bresenham's).

Textbook 1: Chapter -1,2,3, 5(1 and 2 only)

Self-study topics: Input devices, hard copy devices, coordinate representation, graphics functions, fill area primitives, polygon fill

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		<b>Academic</b>
		<b>Course Plan</b>
		<b>2023-24 EVEN</b>

areas, pixel arrays, Parallel Line algorithms

**8 Hours**

#### MODULE-2

Transformations, matrix representations and homogeneous coordinates, 2D Composite transformations, other 2D transformations, raster methods for geometric transformations, OpenGL raster transformations, OpenGL geometric transformation's function, 3D Geometric Transformations: Translation, rotation, scaling, composite 3D transformations, other 3D transformations, OpenGL geometric transformations functions

Textbook 1: Chapter -6, 8

Self-study topics: Transformation between 2D coordinate system, OpenGL geometric-transformation, Transformation between 3D coordinate system

**8 Hours.**

#### MODULE-3

Interactive Input Methods and Graphical User Interfaces: Graphical Input Data, Logical Classification of Input Devices, Input Functions for Graphical Data, Interactive Picture-Construction Techniques, Virtual-Reality Environments, OpenGL Interactive Input-Device Functions, OpenGL Menu Functions, Designing a Graphical User Interface.

Computer Animation: Design of Animation Sequences, Traditional Animation Techniques, General Computer-Animation Functions, Computer-Animation Languages, Character Animation, Periodic Motions, OpenGL Animation Procedures.

Textbook 1: Chapter -11, 18

Self-study topics: Raster methods for computer animation, Key frame systems, Motion specification.

**8 Hours**

#### MODULE-4

Introduction to Image processing: overview, Nature of IP, IP and its related fields, Digital Image representation, types of images. Digital Image Processing Operations: Basic relationships and distance metrics, Classification of Image processing Operations.

Textbook 2: Chapter 3

(Below topics is for experiential learning only, No questions in SEE)

Computer vision and OpenCV: What is computer vision, Evolution of computer vision, Application of Computer vision, Feature of OpenCV, OpenCV library modules, OpenCV environment, Reading, writing, and storing images using OpenCV. OpenCV drawing Functions. OpenCV Geometric Transformations.

**Web Source:** <https://www.tutorialspoint.com/opencv/>

**8 Hours**

#### MODULE-5

Image Segmentation: Introduction, classification, detection of discontinuities, Edge detection (up to canny edge detection(included)).

Textbook 2: Chapter 9: 9.1 to 9.4.4.4

(Below topics is for experiential learning only, No questions in SEE)

Image processing with Open CV: Resizing, Rotation/ Flipping, Blending, creating region of Interest (ROI), Image Thresholding, Image Blurring and smoothing, Edge Detection, Image contours and Face Detection on images using OpenCV.

Web source: <https://medium.com/analytics-vidhya/introduction-to-computer-vision-opencv-in-python-fb722e805e8b>

**8 Hours**


## 5.0 Relevance to future subjects

Semester	Subject	Topics
VII and VIII	Project work	Machine learning and Image Processing Projects

## 6.0 Relevance to Real World

SL. No	Real World Mapping
01	Animated Movies
02	Simulations
03	Development of a Machine learning and Image Processing applications

## 7.0 Gap Analysis and Mitigation

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Sl. No	Delivery Type	Details
01	Animation Videos	Topic: Working of Displays, 2D and 3D viewing

## 8.0 Books Used and Recommended to Students

Books
1. Donald D Hearn, M Pauline Baker and Warren Carithers: Computer Graphics with OpenGL 4th Edition, Pearson, 2014 2. S. Sridhar, Digital Image Processing, second edition, Oxford University press 2016.
Reference Books
1. Edward Angel: Interactive Computer Graphics- A Top Down approach with OpenGL, 5th edition. Pearson Education, 2008 2. James D Foley, Andries Van Dam, Steven K Feiner, John F Huges Computer graphics with OpenGL: Pearson education
Additional Study material & e-Books
1. <a href="https://nptel.ac.in/courses/106/106/106106090/">https://nptel.ac.in/courses/106/106/106106090/</a> 2. <a href="https://nptel.ac.in/courses/106/102/106102063/">https://nptel.ac.in/courses/106/102/106102063/</a> 3. <a href="https://nptel.ac.in/courses/106/103/106103224/">https://nptel.ac.in/courses/106/103/106103224/</a> 4. <a href="https://nptel.ac.in/courses/106/102/106102065/">https://nptel.ac.in/courses/106/102/106102065/</a> 5. <a href="https://www.tutorialspoint.com/opency/">https://www.tutorialspoint.com/opency/</a>

## 9.0 Relevant Websites (Reputed Universities and Others) for Notes/Animation/Videos Recommended

Website and Internet Contents References
1. <a href="https://nptel.ac.in/courses/106/106/106106090/">https://nptel.ac.in/courses/106/106/106106090/</a> 2. <a href="https://nptel.ac.in/courses/106/102/106102063/">https://nptel.ac.in/courses/106/102/106102063/</a> 3. <a href="https://nptel.ac.in/courses/106/103/106103224/">https://nptel.ac.in/courses/106/103/106103224/</a> 4. <a href="https://nptel.ac.in/courses/106/102/106102065/">https://nptel.ac.in/courses/106/102/106102065/</a> 5. <a href="https://www.tutorialspoint.com/opency/">https://www.tutorialspoint.com/opency/</a>

## 10.0 Magazines/Journals Used and Recommended to Students

Sl.No	Magazines/Journals	Website
1	An International Journal of Systems & Applications in Computer Graphics	<a href="https://www.journals.elsevier.com/computers-and-graphics/">https://www.journals.elsevier.com/computers-and-graphics/</a>
2	International Journal of Computer Graphics and Animation(IJCGA)	<a href="http://airccse.org/journal/ijcga/index.html">http://airccse.org/journal/ijcga/index.html</a>
3	Journal of Real-Time Image Processing	<a href="https://link.springer.com/journal/11554">https://link.springer.com/journal/11554</a>

## 11.0 Examination Note


### Assessment Details (both CIE and SEE)

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

### Continuous Internal Evaluation:

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

1. First test at the end of 5<sup>th</sup> week of the semester
2. Second test at the end of the 10<sup>th</sup> week of the semester
3. Third test at the end of the 15<sup>th</sup> week of the semester

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		<b>Academic</b>
		<b>Course Plan</b>
		<b>2023-24 EVEN</b>

Two assignments each of **10 Marks**

4. First assignment at the end of 4<sup>th</sup> week of the semester
5. 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)**

6. 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**

(To have less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course).

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

#### Semester End Examination:


Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject **(duration 03 hours)**

1. The question paper will have ten questions. Each question is set for 20 marks. Marks scored shall be proportionally reduced to 50 marks
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

The students have to answer 5 full questions, selecting one full question from each module.

## 12.0 Course Delivery Plan

Module	Lecture No.	Content of Lecturer	% of Portion
1	1	Computer Graphics hardware and software and OpenGL	20
	2	Computer Graphics: Video Display Devices, Raster-Scan Systems Basics of computer graphics,	
	3	Application of Computer Graphics.	
	4	OpenGL: Introduction to OpenGL, coordinate reference frames, specifying two-dimensional world coordinate reference frames in OpenGL	
	5	OpenGL point functions, OpenGL line functions, point attributes, line attributes, curve attributes,	
	6	OpenGL point attribute functions, OpenGL line attribute functions,	
	7	DDA Line drawing algorithms	
	8	Bresenham's Line drawing algorithms	
2	9	2D Geometric Transformations	20
	10	Basic 2D Geometric Transformations, matrix representations and homogeneous coordinates	
	11	2D Composite transformations, other 2D transformations,	
	12	raster methods for geometric transformations,	
	13	OpenGL raster transformations, OpenGL geometric transformations function,	
	14	Translation, rotation, scaling,	
	15	composite 3D transformations, other 3D transformations	
	16	OpenGL geometric transformations functions	
3	17	Graphical Input Data ,Logical Classification of Input Devices,	20
	18	Input Functions for Graphical Data ,	
	19	Interactive Picture-Construction Techniques, Virtual-Reality Environments,	
	20	OpenGL Interactive Input-Device Functions,	
	21	OpenGL Menu Functions , Designing a Graphical User Interface.	
	22	Design of Animation Sequences, Traditional Animation Techniques	
	23	General Computer-Animation Functions, Computer-Animation Languages,	
	24	Character Animation, Periodic Motions, OpenGL Animation Procedures.	
4	25	Introduction to Image processing	20

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		<b>Academic</b>
		<b>Course Plan</b>
		<b>2023-24 EVEN</b>

	26	Nature of IP, IP and its related fields, Digital Image representation, types of images	
	27	Digital Image Processing Operations	
	28	Basic relationships and distance metrics	
	29	Classification of Image processing Operations.	
	30	What is computer vision, Evolution of computer vision, Application of Computer vision, Feature of OpenCV,	
	31	OpenCV library modules, OpenCV environment, Reading, writing and storing images using OpenCV.	
	32	OpenCV drawing Functions. OpenCV Geometric Transformations	
5	33	Image Segmentation	20
	34	classification	
	35	detection of discontinuities	
	36	Edge detection (up to canny edge detection(included))	
	37	Image processing with Open CV	
	38	Resizing , Rotation/ Flipping, Blending,	
	39	Creating region of Interest (ROI), Image Thresholding,	
	40	Image Blurring and smoothing, Edge Detection, Image contours and Face Detection on images using OpenCV.	


### 13.0 Assignments, Pop Quiz, Mini Project, Seminars

Sl.No.	Title	Outcome expected	Allied study	Week No.	Individual / Group activity	Reference: book/website /Paper
1	Assignment 1: Some important expected University Questions on module one and module two	Students study the Topics and write the Answers. Get practice to solve questions.	Module 1 of the syllabus	4	Individual Activity. Printed solution expected	Text book
2	Assignment 2: Some important University Questions on module four and five	Students study the Topics and write the Answers. Get practice to solve questions	Module 5 of the syllabus	9	Individual Activity. Printed Answers expected	Text book
3	Quiz	Students study the Topics and write the Answers. Get practice to solve questions	Module 2, 3, 4 of the syllabus	13	Individual Activity	Text book

### 14.0 QUESTION BANK

#### MODULE-1

1. What is Computer Graphics? List and explain application of computer graphics.
2. Explain Refresh Cathode Ray Tube with diagram.
3. Develop Bresenham's line drawing algorithm.
4. Write Bresenham's circle drawing algorithm. Given circle radius  $r = 10$ , solve the Bresenham's circle drawing algorithm by determining positions along the circle octant  $x=0$  to  $x=y$ .
5. With the help of code snippets, explain the OpenGL point and line functions.
6. What is DDA? Explain the disadvantages of DDA.
7. Explain the working of Raster Scan Displays.
8. Digitize the line from (20, 10) to (30, 18) on a raster screen using Bresenham's straight line drawing algorithm.
9. Compare the raster scan displays with random scan displays.
10. What is OpenGL? Explain the library organization of OpenGL and give general structure of OpenGL Program.
11. What is DDA? With the help of suitable example demonstrate the working principle of bresenham's line drawing algorithm for all slopes.
12. With the help of suitable example demonstrate the bresenham's circle drawing algorithm.

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		<b>Course Plan</b>
		<b>2023-24 EVEN</b>

13. With the neat diagram, explain the architecture of a raster display system with integrated display processor.
14. With the necessary steps explain the bresenham's line drawing algorithm. Consider the line from (5, 5) to (13, 9) use bresenham's algorithm and rasterize the line.
15. Explain with diagram the different cartesian reference frames are used in the process of constructing and displaying the scene.
16. Explain the basic operation of CRT with its primary components with neat diagram.
17. Explain the DDA line drawing algorithm with steps.
18. Illustrate the sequence of coordinate transformations from modeling coordinates to device coordinates.

## MODULE-2

1. Explain with example any two algorithms used for to identify the interior area of a polygon. (06 Marks) (Dec.2019/Jan.2020)
2. Explain with illustrations the basic 2-dimension geometric transformations used in computer graphics. (06 Marks) (Dec.2019/Jan.2020)
3. Explain the scan line polygon filling algorithm. Also explain the use of sorted edge table and active edge list. (08 Marks) (Dec.2019/Jan.2020)
4. What is the need of homogeneous coordinates? Give 2-dimension homogeneous coordinate matrix for translation, rotation, and scaling. (04 Marks) (Dec.2019/Jan.2020)
5. Obtain a matrix representation for rotation of a object about a specified pivot point in 2-dimension. (04 Marks) (Dec.2019/Jan.2020)
6. Explain scan line polygon fill algorithm. Determine the content of the active edge table to fill the polygon with vertices A(2, 4), B(4, 6) and C(4, 1) for  $y=1$  to  $y=6$ . (06 Marks) (June/July 2019)
7. Develop composite homogeneous transformation matrix to rotate an object with respect to a Pivot point. For the triangle A(3, 2) B(6,2), C(6, 6) rotate it in anticlockwise direction by 90 degree keeping A(3, 2) fixed, draw the new polygon. (06 Marks) (June/July 2019)
8. With the help of a diagram explain shearing and reflection transformation technique. (04 Marks) (June/July 2019)
9. Explain the data structures used by scan line polygon fill algorithm. Determine the content of active edge table to fill the polygon with vertices A(2, 4), B(2, 7), C(4, 9) and D(4, 6). (06 Marks) (June/July 2019)
10. Give the reason to convert transformation matrix to homogeneous co-ordinate representation and show the process of conversion. Shear the polygon A(1, 1), B(3, 1), C(3,3) D(2, 4), E(1, 3) along x-axis with a shearing factor of 0.2. (06 Marks) (June/July 2019)
11. Prove that two
  - I. successive 2D rotation are additive.
  - II. successive scaling are multiplicative. (04 Marks) (June/July 2019)
12. How do you classify the polygon? Explain OpenGL polygon fill primitives. (07 Marks) (Dec.2018/Jan.2019)
13. Explain translation, scaling, rotation in 2D homogeneous coordinate system with matrix representations. (09 Marks) (Dec.2018/Jan.2019)
14. Explain general scan-line polygon-fill algorithm in detail. (10 Marks) (Dec.2018/Jan.2019)
15. What are the entities required to perform rotation? Show that two successive rotations are additive. (06 Marks) (Dec.2018/Jan.2019)
16. With neat diagram, explain the two commonly used algorithms for identifying interior areas of a plane figure. (08 Marks) (June/July 2018)
17. Explain general two-dimensional pivot point rotation and derive the composite matrix. (08 Marks) (June/July 2018)
18. Explain General scan line polygon fill algorithm support your claim with a neat diagram. (08 Marks) (June/July 2018)
19. Explain two-dimensional viewing transformation pipeline. (08 Marks) (June/July 2018)
20. Given a 2D object with the vertices (1, 1), (3, 1), (2,3). Rotate this object about the origin by  $90^\circ$ , Calculate the new values by using 2D rotation matrix, Draw the original and the rotated object. (06 Marks) (Dec.2016/Jan.2017)
21. A square in a 2D system is specified by its vertices (6, 6) (10, 6) (10, 19) and (6, 10). Implement the following by its first finding a composite transformation matrix for the sequence of transformation.
  - i. Rotate the square by  $45^\circ$  about its vertex (6, 6)
  - ii. Scale the original square by a factor of 2 about its center. (10 Marks) (June/July.2019)
22. Explain translation rotation, scaling and shearing with respect to 2-dimensions. (08 Marks) (Dec.2017/Jan.2018)
23. A square in a two-dimensional system is specified by its vertices (6, 6), (10, 6), (10, 10) and (6, 10). Implement the following by its first finding a composite transformation matrix for the sequence of transformation involved. Sketch the original and transformed square.
  - i. Rotate the square by  $45^\circ$  about its vertex (6, 6)
  - ii. Scale the original square by a factor of 2 about its center. (10 Marks) (June/July.2017)

### MODULE-3

- List and explain physical input devices.
- Explain the logical classifications of input devices with examples.
- Discuss request mode, sample mode and event mode with figures.
- List the various features that a good interactive program should include.
- Explain how an event driven input can be performed for a keyboard and mouse device, Also explain window event.
- What are display lists? Explain the steps to develop interactive models and animating interactive programs.
- Explain the major characteristics that describe the logical behavior of an input device. Explain how OpenGL provides the functionality of each of the classes of logical input devices.
- What is Display List? Write OpenGL code-segment that generates a blue colored square using display list.
- What is double buffering? How it is implemented in OpenGL.
- Differentiate event mode with request mode.
- With the program snapshot, explain the creation of Menus in OpenGL.
- Discuss various input modes with examples.
- Explain rotating square in animating interactive programs.
- List the properties of Bezier curve and explain Bezier techniques of generating curves.
- Write a short note on (any two)
  - Curve and Quadric surfaces
  - OpenGL curve and surface functions
  - Bezier curve and surfaces.
- Write a short note on (any two)
  - Logic operations (graphics)
  - Input devices or clients and servers
  - Bezier spline curve and OpenGL curve functions.
- Explain Bezier spline curves with equations and demonstrate the appearance of Bezier curves for various selection of control points.
- Give the equation representing control points of the Bezier spline curves. Discuss its properties. Also draw Bezier curve with 4 and 3 control points.
- Explain OpenGL i) Quadric surface functions ii) cubic surface functions.

### MODULE-4

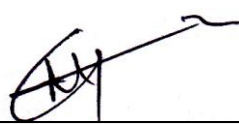
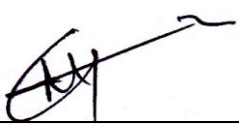

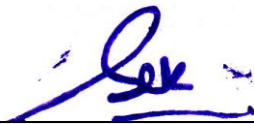
- What is image processing? Explain
- List and explain nature and related fields of IP.
- Explain how image is represented digitally.
- List and explain the types of images.
- List and explain the distance metrics in IP.
- Explain classification of images operations.


### MODULE-5

- What is image segmentation? Explain.
- What is image classification? Explain.
- How to detect discontinuities in images.
- Explain edge detection algorithms.

## 15.0 University Result

Examination	FCD	FC	SC	FAIL	Pass %

Prepared by	Checked by		
 <b>Dr. Mahesh Huddar</b>	 <b>Dr. Mahesh Huddar</b>	 <b>HOD</b>	 <b>Principal</b>

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		<b>Academic</b>
		<b>Course Plan</b>
		<b>2023-24 EVEN</b>

<b>Subject Title</b>	<b>ADVANCED JAVA PROGRAMMING</b>		
<b>Subject Code</b>	21CS642	<b>CIE Marks</b>	50
<b>Teaching Hours/Week (L:T:P: S)</b>	3:0:0:0	<b>SEE Marks</b>	50
<b>Total Hours of Pedagogy</b>	40	<b>Total marks</b>	100
<b>Credits</b>	03	<b>Exam Hours</b>	03

#### FACULTY DETAILS:

<b>Name:</b> Dr. S V Manjaragi	<b>Designation:</b> Assistant Professor	<b>Experience:</b> 19.07 Years
<b>No. of times course taught:</b> 01	<b>Specialization:</b> Computer Science & Engineering	

### 1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	Computer Science and Engineering	I	Principles of Programming using C
02	Computer Science and Engineering	III	Object Oriented Programming with JAVA Laboratory

### 2.0 Course Objectives

This course will enable students to

CLO 1: Understanding the fundamental concepts of Enumerations and Annotations

CLO 2: Apply the concepts of Generic classes in Java programs

CLO 3: Demonstrate the fundamental concepts of String operations

CLO 4: Design and develop web applications using Java servlets and JSP


CLO 5: Apply database interaction through Java database Connectivity

### 3.0 Course Outcomes

At the end of the course the student will be able to:

	Course Outcome	RBT Level	POs
C314.1	Understanding the fundamental concepts of Enumerations and Annotations.	L2	PO1, PO2, PO3, PO4, PO5, PO8, PO10, PO12
C314.2	Apply the concepts of Generic classes in Java programs.	L3	PO1, PO2, PO3, PO4, PO5, PO8, PO10, PO12
C314.3	Demonstrate the concepts of String operations in Java.	L3	PO1, PO2, PO3, PO4, PO5, PO8, PO10, PO12
C314.4	Develop web based applications using Java servlets and JSP	L3	PO1, PO2, PO3, PO4, PO5, PO8, PO10, PO12
C314.5	Illustrate database interaction and transaction processing in Java	L2, L3	PO1, PO2, PO3, PO4, PO5, PO8, PO10, PO12
<b>Total Hours of instruction</b>			<b>40</b>



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		<b>Course Plan</b>
		<b>2023-24 EVEN</b>

## 4.0 Course Content

<b>Module – 1</b> Enumerations, Autoboxing and Annotations: Enumerations, Enumeration fundamentals, the values() and valueOf() methods, Java enumerations are class types, enumerations inherits Enum, example, type wrappers, Autoboxing, Autoboxing methods, Autoboxing/Unboxing occurs in Expressions, Autoboxing/Unboxing, Boolean and character values, Autoboxing/Unboxing helps prevent errors, A word of warning Annotations, Annotation basics, specifying retention policy, obtaining annotations at run time by use of reflection, Annotated element interface, Using default values, Marker Annotations, Single member annotations, Built in annotations. <b>Textbook 1: Chapter 12</b>	<b>8 Hours</b>
<b>Module – 2</b> Generics: What are Generics, A Simple Generics Example, A Generic Class with Two Type Parameters, The General Form of a Generic Class, Bounded Types, Using Wildcard Arguments, Bounded Wildcards, Creating a Generic Method, Generic Interfaces, Raw types and Legacy code, Generic Class Hierarchies, Erasure, Ambiguity errors, Some Generic Restrictions. <b>Textbook 1: Chapter 14</b>	<b>8 Hours</b>
<b>Module – 3</b> String Handling: The String Constructors, String Length, Special String Operations, Character Extraction, String Comparison, Searching Strings, Modifying a String, Data Conversion Using valueOf(), Changing the case of characters within a String, String Buffer, String Builder. <b>Textbook 1: Chapter 15</b>	<b>8 Hours</b>
<b>Module – 4</b> Background; The life cycle of a servlet; A simple servlet; the servlet API; The javax.servlet package Reading servlet parameter; the javax.servlet.http package; Handling HTTP Requests and Responses; using Cookies; Session Tracking, Java Server Pages (JSP); JSP tags, Variables and Objects, Methods, Control statements, Loops, Request String, Parsing other information, User sessions, Cookies, Session Objects. <b>Textbook 1: Chapter 31 Textbook 2: Chapter 11</b>	<b>8 Hours</b>
<b>Module – 5</b> The concept of JDBC; JDBC Driver Types; JDBC packages; A brief overview of the JDBC Process; Database Connection; Associating the JDBC/ODBC Bridge with the Database; Statement Objects; ResultSet; Transaction Processing; Metadata, Data Types; Exceptions. <b>Textbook 2: Chapter 6</b>	<b>8 Hours</b>

## 5.0 Relevance to future subjects


Sl No	Semester	Subject	Topics
1	VI	Fullstack Development	Java Script, Server Side Programming
2	III	Project work	Implementation of the projects using Java and J2EE.

## 6.0 Relevance to Real World

S. No	Real World Mapping
01	Designing commercial e-commerce website, android applications.
02	Developing scientific application and financial applications like electronic trading systems.

## 7.0 Gap Analysis and Mitigation

Sl. No	Delivery Type	Details
01	Tutorial	Topic: Module I-Module V
02	NPTEL	Servlet, JSP and JDBC Videos

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		<b>Course Plan</b>
		<b>2023-24 EVEN</b>

## 8.0 Books Used and Recommended to Students

<b>Books</b>
<ol style="list-style-type: none"> <li>Herbert Schildt: JAVA the Complete Reference. 9th Edition, Tata McGraw-Hill</li> <li>Jim Keogh, The Complete Reference J2EE, Tata McGraw-Hill</li> </ol>
<b>Reference Books</b>
<ol style="list-style-type: none"> <li>Y. Daniel Liang: Introduction to JAVA Programming, 7th Edition, Pearson Education, 2007</li> </ol>
<b>Additional Study material &amp; e-Books</b>
<ol style="list-style-type: none"> <li><a href="https://docs.oracle.com/javase/tutorial/">https://docs.oracle.com/javase/tutorial/</a></li> <li><a href="http://javabeginnerstutorial.com/core-java">http://javabeginnerstutorial.com/core-java</a></li> <li><a href="http://onlinevideolecture.com/ebooks/?subject=j2ee">http://onlinevideolecture.com/ebooks/?subject=j2ee</a></li> <li><a href="https://www.youtube.com/playlist?list=PLS1QulWo1RlbfTjQvTdj8Y6yyq4R7g-AI">https://www.youtube.com/playlist?list=PLS1QulWo1RlbfTjQvTdj8Y6yyq4R7g-AI</a></li> <li><a href="http://www.codejava.net/books/4-best-free-java-e-books-for-beginners">www.codejava.net/books/4-best-free-java-e-books-for-beginners</a></li> </ol>

## 9.0 Relevant Websites (Reputed Universities and Others) for Notes /Animation / Videos Recommended

<b>Website and Internet Contents References</b>
<ol style="list-style-type: none"> <li><a href="http://www.nptelvideos.com/java/java_video_lectures_tutorials.php">www.nptelvideos.com/java/java_video_lectures_tutorials.php</a></li> <li><a href="https://www.cse.iitb.ac.in/~nlp-ai/javalect_august2004.html">https://www.cse.iitb.ac.in/~nlp-ai/javalect_august2004.html</a></li> <li><a href="http://freevideolectures.com/Course/3616/Java/J2EE-and-SOA">http://freevideolectures.com/Course/3616/Java/J2EE-and-SOA</a></li> <li><a href="https://nptel.ac.in/courses/106/105/106105191/">https://nptel.ac.in/courses/106/105/106105191/</a></li> <li><a href="https://nptel.ac.in/courses/106/105/106105225/">https://nptel.ac.in/courses/106/105/106105225/</a></li> </ol>

## 10.0 Magazines/Journals Used and Recommended to Students

Sl.No	Magazines/Journals	website
1	Java Magazine - Oracle	<a href="http://www.oracle.com/technetwork/java/javamagazine/">www.oracle.com/technetwork/java/javamagazine/</a>
2.	IEEE Conferences, Publications, and Resources	<a href="https://www.computer.org/software-magazine/">https://www.computer.org/software-magazine/</a>
3.	Developer's Journal - Steven Gould	<a href="https://jserd.springeropen.com/">https://jserd.springeropen.com/</a>

## 11.0 Examination Note

### Assessment Details (both CIE and SEE)

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


### Continuous Internal Evaluation:

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

- First test at the end of 5th week of the semester
- Second test at the end of the 10th week of the semester
- Third test at the end of the 15th week of the semester

### Two assignments each of 10 Marks:

- First assignment at the end of 4th week of the semester
- Second assignment at the end of 9th week of the semester

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		<b>Academic</b>
		<b>Course Plan</b>
		<b>2023-24 EVEN</b>


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

The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be scaled down to 50 marks (to have less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course).

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

## 12.0 Course Delivery Plan

Module	Lecture No.	Content of Lecturer	% of Portion
		<b>PART - A</b>	
<b>MODULE 1</b>	1	<b>Enumerations, Autoboxing and Annotations(metadata):</b> Enumerations, Enumeration fundamentals, the values() and valueOf() Methods, java enumerations are class types	20%
	2	enumerations Inherits Enum, example	
	3	type wrappers, Autoboxing, Autoboxing and Methods, Autoboxing/Unboxing occurs in Expressions	
	4	Autoboxing/Unboxing, Boolean and character values, Autoboxing/Unboxing helps prevent errors. A word of Warning.	
	5	Annotations, Annotation basics, specifying retention policy	
	6	Obtaining Annotations at run time by use of reflection, Annotated element Interface	
	7	Using Default values, Marker Annotations	
	8	Single Member annotations, Built-In annotations.	
<b>MODULE 2</b>	9	Generics: What are Generics, A Simple Generics Example	20%
	10	A Generic Class with Two Type Parameters, The General Form of a Generic Class	
	11	Bounded Types, Using Wildcard Arguments	
	12	Bounded Wildcards, Creating a Generic Method	
	13	Generic Interfaces, Raw types and Legacy code	
	14	Generic Class Hierarchies, Erasure	
	15	<b>Ambiguity errors</b>	
	16	Some Generic Restrictions	
<b>MODULE 3</b>	17	String Handling: The String Constructors	20%
	18	String Length, Special String Operations	
	19	Character Extraction, String Comparison	
	20	Searching Strings, Modifying a String	
	21	Data Conversion Using valueOf(),	
	22	Changing the case of characters within a String	
	23	String Buffer	
	24	String Builder	
<b>MODULE 4</b>	25	Background; The Life Cycle of a Servlet; Using Tomcat for Servlet Development;	20%
	26	A simple Servlet; The Servlet API	
	27	The Javax.servlet Package, The Javax.servlet Package	
	28	The Javax.servlet.http package; Handling HTTP Requests and Responses	
	29	Using Cookies; Session Tracking.	
	30	Java Server Pages (JSP): JSP, JSP Tags, Tomcat	
	31	Request String, User Sessions	
	32	Cookies, Session Objects	
<b>MODULE 5</b>	33	The Concept of JDBC; JDBC Driver Types	20%
	34	JDBC Packages; A Brief Overview of the JDBC process	
	35	Database Connection	

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		<b>Academic</b>
		<b>Course Plan</b>
		<b>2023-24 EVEN</b>

	36	Associating the JDBC/ODBC Bridge with the Database	
	37	Statement Objects	
	38	ResultSet	
	39	Transaction Processing; Metadata	
	40	Data types; Exceptions.	


### 13.0 Assignments, Pop Quiz, Mini Project, Seminars

Sl.No.	Title	Outcome expected	Allied study	Week No.	Individual / Group activity	Reference: book/website /Paper
1	Assignment 1: University Questions on Enumerations, Autoboxing and Annotations(metadata)	Students study the Topics and write the Answers. Get practice to solve university questions.	Module I of the syllabus	2	Individual Activity. Printed solution expected.	Book 1 of the reference list. Website of the Reference list
2	Assignment 4: University Questions on Servlets and JSP	Students study the Topics and write the Answers. Get practice to solve university questions.	Module IV of the syllabus	9	Individual Activity. Printed solution expected.	Book 1 of the reference list. Website of the Reference list
3	Quiz	Students shall answer the MCQ questions covering entire syllabus	All modules	13	Individual Activity.	Book 1, Book 2 of the text book list. Website of the Reference list

### 14.0 QUESTION BANK

#### Module: 1

1. What are enumerations? Explain with syntax, declaring enum, creating & assigning values to enum variable and comparing numerations.
2. Write a Java program to demonstrate the use of values() and valuesOf() methos.
3. Illustrate Enumerations are class types.
4. Explain the inheritance in Enumerations.
5. Explain Type Wrappers.
6. What do you mean by type wrapper? Explain numeric type wrapper with an example program in JAVA. (Jan-2019)
7. What is autoboxing? Explain with programming example.
8. What is auto-boxing? Write a program to demonstrate autoboxing/unboxing. (Jan-2019)
9. Discuss autoboxing and unboxing in epressions.
10. Explain how autoboxing and unboxing prevents errors.
11. What are Annotations? Explain with example.
12. Discuss the annotation retention policies.
13. With an example explain obtaining the annotations at runtime by use of reflection.
14. Explain AnnotatedElement Interface.
15. Demonstrate single annotation with an example. (Jan-2019)
16. Explain Maker Annotations.
17. Explain Built-in Annotations.
18. What are enumerations? Explain values() and valueOf() methods with an example program. (Jan-2018)
19. What is Autoboxing? Write a Java program that demonstrates autoboxing and unboxing. (Jan-2018)
20. What are Annotations? Explain the following Built-in annotations with program as an example @override @inherited @Retention. (Jan-2018, Jan-2019)
21. Explain different retention policies for annotations in Java. (Jan-2019)
22. Explain the following methods to java.lang.Enum with an example program. (Jan-2019)
  - i) ordinal()

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		<b>Academic</b>
		<b>Course Plan</b>
		<b>2023-24 EVEN</b>
<b>Accredited at 'A' Grade by NAAC</b> <b>Programmes Accredited by NBA: CSE &amp; ECE</b>		

- ii) compareTo( )
  - iii) equals( )
23. Explain how to obtain Annotations at runtime by use of Reflection. (Jan-2018)

### Module: 2


1. What are Java Generics and what problem do they solve in programming?
2. How do you declare a generic class in Java?
3. Explain the concept of type parameters and type arguments in Java Generics.
4. What is the purpose of the wildcard "?" in Java Generics? Provide examples.
5. Discuss the difference between bounded wildcards and unbounded wildcards in Java Generics.
6. How does type erasure work in Java Generics? What are its implications?
7. Explain the "diamond operator" feature introduced in Java 7 and its relation to Generics.
8. Discuss the use of Generics in collections framework in Java.
9. What is type inference in Java Generics? Provide examples.
10. How can Generics improve code readability, safety, and reusability in Java programming? Provide scenarios.
11. Describe how Generics are used in methods and constructors in Java.
12. Discuss the limitations of Generics in Java and any workarounds or best practices to address them.
13. How do you ensure type safety when working with Generics in Java?
14. Explain the concept of variance (covariance and contravariance) in relation to Java Generics.
15. Compare and contrast Generics in Java with other programming languages that support similar features.

### Module: 3

1. With examples explain String constructors.
2. Explain String conversions and toString().
3. Discuss Char extraction methods.
4. With syntax, example explain equals( ) and equalsIgnoreCase( ), regionMatches( ), startsWith( ) and endsWith( ).
5. Write a program to demonstrate indexOf( ), lastIndexOf( ).
6. With example explain substring( ), concat( ), replace( ).
7. What is String buffer? Explain StringBuffer Constructors.
8. Differentiate String and StringBuffer class. Write a program to demonstrate different construction of String class. (Jan-2019)
9. Explain delete( ) and deleteCharAt( ) with example.
10. Write a program to demonstrate replace( ) method.
11. Write a program to remove duplicate characters from a given string and display the resultant string. (Jan-2019)
12. What is String in java? Write a Java program that demonstrates any four constructors of String class. (Jan-18)
13. Differentiate between equals( ) and == with respect to string comparisons. (Jan-2018, Jan-2019)
14. Explain the following character extraction methods. (Jan-2018,Jan-2019)
  - i) charAt( )
  - ii) toChar( )
15. Explain how to modify a string by using following methods (Jan-2018)
  - i) substring( )
  - ii) concat( )
  - iii) replace( )
  - iv) trim( )
16. Explain the following methods of StringBuffer Class (Jan-2018)
  - i) append( )
  - ii) insert( )
  - iii) reverse( )
  - iv) replace( )
17. Explain the following methods of StringBuffer Class (Jan-2019)
  - i) append( )
  - ii) insert( )
  - iii) replace( )
  - iv) substring( )

### Module: 4


1. Explain life cycle of Servlets. (Jan-2018)
2. What is the role of Tomcat server? Explain different steps involved in configuring for development of servlet program execution. (Jan-2019)
3. List and explain core classes and interfaces in javax.servlet package. (Jan-2018)
4. Write a short note on HTTP request and response. (Jan-2018)

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		<b>Academic</b>
		<b>Course Plan</b>
		<b>2023-24 EVEN</b>

5. Write a Java servlet program to accept two parameter from webpage, find the sum of them, and display the result in web page. Also give necessary html script to create web page. (Jan-2019)
6. What is a Cookie? List out methods defined by Cookie? Write a Java program to add a Cookie. (Jan-2018)
7. Define JSP. Explain different types of JSP tags by taking suitable examples. (Jan-2018)
8. What are the Java Servlets? Briefly explain the application of servlets in web programming. (Dec.10)
9. Distinguish between Java Servlets and CGI. (May/June.10)
10. Explain the life cycle of Java Servlets. (Dec.09, Dec.10, Jun.10, Jun-13, Jun-14, dec-14))
11. How are servlets different from applets? Explain the benefits & the life cycle of a java servlets. (Jun-15)
12. Explain in detail, how tomcat webserver is configured for development of servlet. (Dec.09/Jan.10)
13. Describe the simple html file to pass parameters to servlets & display the parameter values accepted by servlets. (Dec-14)
14. Write a Java servlet which read two parameters from the web page, say value 1 and value 2, which are of type integers, and finds the sum of the two values, and return back the result as webpage. (Dec.10)
15. Write a servlet program which contains HTML page to accept username & display greeting message as "Hello username, How are you?" in browser window.(Dec-12)
16. Write a Java program to handle HTTP GET and PUT requests.
17. What is Cookie? List out the methods defined by the Cookie. Write a program in HTML for adding a Cookie. (May/June.10, Jun-13, Jun -14)
18. What is a cookie? List & explain the various cookie attributes. (Jun-15)
19. Define cookie. Explain how the cookies are created using java servlets. (Dec-14)
20. With code snippet, explain how session tracking is handled in Java with servlets. (Dec.09, Jun-15)
21. List and explain core classes that are provided by javax.servlet package. (Dec.09/Jan.10)
22. Write a note on HTTP status code. (Jun-13)
23. Illustrate the use of session information in servlets. (Dec-12)
24. Briefly explain the following: i)Servlet interface ii) Generic Servlet class iii) Cookie class (Dec-12)
25. Write a program to describe parameter reading using servlets. (Jun-14)
26. What are the advantages of JSP? (Jun.10)
27. Define JSP. Explain the two types of control statements used by JSP by taking suitable example. (Dec-12)
28. Explain different JSP tags with a program to demonstrate all tags. (Jan-2019)
29. What is JSP? Explain different types of tags that can be used in a JSP program. (Jun-15)
30. What is the difference between servlets and JSP? Explain different types of JSP tags with syntax. (Dec.09/Jan.10, Jun-13, Jun-14)
31. List & Explain different JSP tags. (Dec.10, Jun.10, Dec-14)
32. List & explain the three methods that are automatically called when a JSP is requested & terminated normally. (Jun-15)
33. Mention the purpose of use of JSP and JAVA RMI. (Dec.10)
34. Write JSP to create and read cookie named userid that stores the value JB0007. (Dec.09/Jan.10)
35. Write JSP to create and read cookie named EMPID that stores the value AN2356. (Dec-12)
36. What are cookies? How cookies are handled in JSP? Write a program to create with name "Username" and cookie value "xyz". Also display stored cookie in webpage. (Jan-2019)

### Module: 5




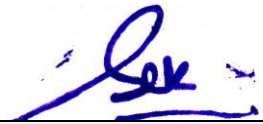
1. Explain four types of JDBC drivers. (Jan-2018, Jan-2019)
2. Describe various steps of JDBC with code snippets. (Jan-2018)
3. Write a Java program to execute a database transaction. (Jan-2018)
  - i) Callable statement Object
  - ii) Prepared statement Object
4. Explain J2EE Multi-tier architecture with neat diagram. (Dec.09, Dec-12, Jun-13)
5. Explain the working of JDBC. (Dec.10)
6. What are database drivers? Mention different types of drivers used in JDBC. (Dec.10, Jun-14)
7. Explain the various steps of JDBC process, with code snippets. (Dec.09, Dec-12, Jun-13, Dec-14, Jun-14, Jun-15, Jan-19)
8. Provide various classes, interfaces and exceptions provided by java.sql package, along with their purpose. (Dec.10)
9. Write a note on result set. (Jun-13)
10. List and explain various statement objects in JDBC. (Jan-2019)
11. what is resultSet? How to set scroll options to resultset? Explain. (Dec-14)
12. What is transaction processing? Write a program to execute a database transaction. (Jun.10, jun-15)
13. Briefly explain the Callable statement object. Write a program to call stored procedure. (May/June.10)
14. Give the Java syntax for the following....
  1. Connecting to a database using JDBC/ODBC bridge, which has url ="jdbc:odbc:SDB", Username: "scott", password="tiger".
  2. Running a query "select emp-age from emp" over that connected database.


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		<b>Course Plan</b>
		<b>2023-24 EVEN</b>

3. Counting number of employees, with condition emp-age>50. (Dec.10)
15. Write a note on Database metadata object methods & Resultset metadata object methods. (Dec.09, Dec-14)
16. What are the data types for use setxxx() and getxxx() methods.
17. Explain : i) Callable statement ii) Prepared statement (Jun-14)
18. Write a program to connect to database with following information: (Jan-2019)  
 Drive: JDBC/ODBC bridge  
 URL: "jdbc:odbc:Ex"  
 Username: "xyz"  
 Password: "123"  
 Retrieve all rows with marks > 60 using prepared statement object. Assume following table:  
 Table Name : STUDENT  
 Fields : USN-Varchar (20)  
 Marks-int  
 Name-Varchar (25)

## 15.0 University Result

Examination	FCD	FC	SC	%
--	--	--	--	--

Prepared by	Checked by		
 <b>Dr. S V Manjaragi</b>	 <b>Dr. Mahesh. G. Huddar</b>	 <b>HOD</b>	 <b>Principal</b>

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		<b>Course Plan</b>
		<b>2023-24 EVEN</b>

<b>Subject Title</b>	<b>Sensors &amp; Actuators</b>		
<b>Subject Code</b>	21EC655	<b>IA Marks</b>	50
<b>Number of Lecture Hrs/ Week</b>	03 L	<b>Exam Marks</b>	50
<b>Total Number of Lecture Hrs</b>	40	<b>Exam Hours</b>	03

#### FACULTY DETAILS:

<b>Name:</b> Prof. K.S.Patil.	<b>Designation:</b> Asst. Professor	<b>Experience:</b> 30yrs
<b>No. of times course taught:</b> 00	<b>Specialization:</b> VLSI & Embedded Systems	

### 1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	ECE	III	Sensors & Instrumentation
02	ECE	III	Electronic Principles & Circuits

### 2.0 Course Objectives


1. To provide the fundamental knowledge about sensors and measurement system.
2. To impart the knowledge of static and dynamic characteristics of instruments and understand the Factors in selection of instruments for measurement..
3. To discuss the principle, design and working of transducers for the measurement of physical time varying quantities.
4. Understand the working of various actuators suitable in industrial process control systems.
5. Understand the principle and application of smart sensors.

### 3.0 Course Outcomes

Having successfully completed this course, the student will be able to draw and analyze.

	Course Outcome	Cognitive Level	POs
<b>C321.1</b>	Discuss the fundamental concepts related to sensors and measurement, functional elements of System	U	PO1, PO2, PO4 PO5,PO7
<b>C321.2</b>	Interpret and analyze the static and dynamic characteristics of instruments.	U	PO2, PO3, PO5,PO6
<b>C321.3</b>	Elucidate the working principle and usage of different transducers, for temperature, displacement	U	PO2, PO3,PO4 PO5,PO6, PO7
<b>C321.4</b>	Discuss the principle and working of different types of actuators used in industrial application.	U	PO3, PO4, PO5 PO6,PO7,PO12
<b>C321.5</b>	Discuss the principle and working of strain, force and torque measurement.	U	PO1, PO2, PO10 PO12
<b>Total Hours of instruction</b>			<b>40</b>




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	<b>Accredited at 'A' Grade by NAAC</b> <b>Programmes Accredited by NBA: CSE &amp; ECE</b>	<b>Academic</b>
		<b>Course Plan</b>
		<b>2023-24 EVEN</b>

## 4.0

## Course Content

Module	Teaching Hours	Bloom's Taxonomy (RBT) level
<b>Module 1:</b> <b>Sensors and measurement system:</b> Sensors and transducers, Classifications of transducers-primary & secondary, active & passive, analog and digital transducers. Smart sensors. <b>Measurement:</b> Definition, significance of measurement, instruments and measurement systems. mechanical, electrical and electronic instruments. Elements of generalized measurement system with example. Input-output configuration of measuring instruments and measurement systems, methods of correction for interfering and modifying inputs.	08 Hours	L1, L2,L3
<b>Module 2:</b> <b>Static and Dynamic Characteristics:</b> Static calibration and error calibration curve, accuracy and precision, indications of precision, static error, scale range and scale span, reproducibility and drift ,repeatability, signal to noise ratio, sensitivity, linearity, hysteresis, threshold, dead zone and dead time, resolution, signal to noise ratio, factors influencing the choice of transducers/instruments. <b>Dynamic response</b> – Dynamic characteristics, Transfer function of generalized first order system, time constant. Transfer function of generalized second order system, natural frequency and Damping ratio.	08 Hours	L1,L2,L3
<b>Module 3:</b> <b>Measurement of Temperature:</b> RTD, Thermistor, Thermocouple, laws of thermocouple, Thermopile, AD590. <b>Measurement of Displacement:</b> Introduction, Principles of Transduction, Variable resistance devices, variable Inductance Transducer, Variable Capacitance Transducer, Hall Effect Devices, Proximity Devices,Digital Transducer.	08 Hours	L1,L2,L3
<b>Module 4:</b> <b>Measurement of Strain:</b> Introduction, Types of Strain Gauges, Theory of operation of resistance strain gauges, Types of Electrical Strain Gauges –Wire gauges, unbounded strain gauges, foil gauges,semiconductor strain gauges (principle, types & list of characteristics only), Strain gauge Circuits –Wheatstone bridge circuit, Applications. <b>Measurement of Force &amp; Torque:</b> Introduction, Force measuring sensor –Load cells – column types devices, proving rings, cantilever beam, pressductor. Hydraulic load cell, electronic weighing system. <b>Torque measurement:</b> Absorption type, transmission type, stress type & deflection type.	08 Hours	L1,L2,L3
<b>Module 5:</b> <b>Actuators and process control system:</b> Introduction. Block diagram and description of process control system with an example. Introduction, Block diagram of Final control operation, Signal conversions analog, digital, pneumatic signal. Actuators, Control elements. <b>Electrical actuating systems:</b> Solid-state switches, Solenoids, Electric Motors- Principle of operation and its application: D.C motors, AC motors, Synchronous Motor, Stepper motors. Pneumatic Actuators: Principle and working of pneumatic actuators. (Numerical problems on thetopic). <b>Hydraulic Actuators:</b> Principle and working of Hydraulic actuators. (Numerical problems on the topic).	08 Hours	L1,L2,L3

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		<b>Academic</b>
		<b>Course Plan</b>
		<b>2023-24 EVEN</b>

## 5.0 Relevance to future subjects

Sl No	Semester	Subject	Topics
	VII	Open Elective	Bio Medical Signal Processing
	VIII	Projects on VLSI	Projects and Research

## 6.0 Relevance to Real World

SL.No	Real World Mapping
01	Analyze different types of sensors
02	Design of different types Electrical actuating Systems

## 7.0 Gap Analysis and Mitigation


Sl. No	Delivery Type	Details
01	Tutorial	Topic: Measuring Instruments
02	NPTEL	Demonstration and Application

## 8.0 Books Used and Recommended to Students

Text Books
<b>Text Books:</b> 1. Electrical and Electronic Measurements and Instrumentation, A K Sawhney, 17th Edition, (Reprint 2004), Dhanpat Rai & Co. Pvt. Ltd., 2004. 2. Instrumentation: Devices and Systems, C S Rangan, G R Sarma, V S V Mani, 2nd Edition (32 Reprint), McGraw Hill Education (India), 2014. 3. Process Control Instrumentation Technology by C D Johnson, 7th Edition, Pearson Education Private Limited, New Delhi 2002.
Reference Books
<b>Reference Books:</b> 1. Sensors and Actuators By Francsco
Additional Study material & e-Books
1. VTU on line notes.

## 9.0 Relevant Websites (Reputed Universities and Others) for Notes/Animation/Videos Recommended

Website and Internet Contents References
<a href="https://www.nist.gov/how-do-you-measure-it/how-d...">https://www.nist.gov/how-do-you-measure-it/how-d...</a>
<a href="https://technav.ieee.org/topic/sensors-and-actuators">https://technav.ieee.org/topic/sensors-and-actuators</a>
<a href="https://apmonitor.com/pdc/index.php/Main/Feed...">https://apmonitor.com/pdc/index.php/Main/Feed...</a>
<a href="https://nptel.co.in">https://nptel.co.in</a> <a href="https://cti-ct.com/article_75_Industrial-Valves-Actuato...">https://cti-ct.com/article_75_Industrial-Valves-Actuato...</a>
<a href="https://www.edx.org/school/iitbombay?utm_source=bing&amp;utm_medium=cpc&amp;utm_term=iit-bombay&amp;utm_campaign=partner-iit-bombay">https://www.edx.org/school/iitbombay?utm_source=bing&amp;utm_medium=cpc&amp;utm_term=iit-bombay&amp;utm_campaign=partner-iit-bombay</a>

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		<b>Academic</b>
		<b>Course Plan</b>
		<b>2023-24 EVEN</b>

## 10.0 Magazines/Journals Used and Recommended to Students

Sl.No	Magazines/Journals	website
1	IEEE Xplorer	<a href="http://iee.com">http://iee.com</a>
2	International Journal of Science and Technology	<a href="http://www.sciencedirect.com/science/journal/00207683">http://www.sciencedirect.com/science/journal/00207683</a>
3	Journal of Communication Engineering	<a href="http://iee.com">http://iee.com</a>

## 11.0 Examination Note

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

### Continuous Internal Evaluation:

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

1. First test at the end of 5<sup>th</sup> week of the semester
2. Second test at the end of the 10<sup>th</sup> week of the semester
3. Third test at the end of the 15<sup>th</sup> week of the semester

Two assignments each of **10 Marks**

4. First assignment at the end of 4<sup>th</sup> week of the semester
5. 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)**

6. 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**

(to have less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course).

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

### Semester End Examination:

Theory SEE will be conducted by university as per the scheduled timetable, with common question papers for the subject (**duration 03 hours**)


1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

The students have to answer 5 full questions, selecting one full question from each module.

Marks scored out of 100 shall be reduced proportionally to 50 marks

## 12.0 Course Delivery Plan

MODULE	LECTURE NO.	CONTENT OF LECTURE	% OF PORTION
1	1	Sensors and transducers, Classifications of transducers-primary & secondary	20
	2	active & passive, analog and digital transducers.	
	3	Definition, significance of measurement, instruments and measurement systems.	
	4	mechanical, electrical and electronic instruments.	
	5	Elements of generalized measurement system with Examples	
	6	Input-output configuration of measuring instruments and measurement systems,	
	7	Methods of correction for interfering and modifying inputs.	

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		<b>Course Plan</b>
		<b>2023-24 EVEN</b>

	8	Over view, continued	
2	9	Static calibration and error calibration curve,	
	10	accuracy and precision, indications of precision, static error,	
	11	scale range and scale span, reproducibility and drift, repeatability, signal to noise	
	12	sensitivity, linearity, hysteresis, threshold, dead zone and dead time,	
	13	resolution, signal to <b>noise ratio, factors</b>	
	14	factors influencing the choice of transducers/instruments.	
	15	Dynamic characteristics, Transfer function of generalized first order system,	
	16	Transfer function of generalized second order system frequency Damping	
3	17	RTD, Thermistor, Thermocouple, laws of thermocouple,	60
	18	Thermopile, AD590.	
	19	Measurement of Displacement: Introduction, Principles of Transduction,	
	20	Variable resistance devices,	
	21	variable Inductance Transducer, Variable Capacitance Transducer,	
	22	Hall Effect Devices,	
	23	Proximity Devices,	
24	Digital Transducer.		
4	25	Types of Strain Gauges, Theory of operation	80
	26	Types of Electrical Strain Gauges –Wire gauges, unbounded strain gauges, foil	
	27	semiconductor strain gauges	
	28	Strain gauge Circuits Wheatstone bridge circuit, Applications.	
	29	Introduction, Force measuring sensor –Load cells	
	30	column types devices, proving rings,	
	31	cantilever beam, pressductor. Hydraulic load cell,	
32	Torque measurement: Absorption type, transmission type, stress type & deflection		
5	33	Block diagram and description of process control	100
	34	Block diagram of Final control operation,	
	35	Signal conversions analog, digital, pneumatic signal.	
	36	Actuators, Control elements.	
	37	Solid-state switches, Solenoids, Electric Motors-	
	38	D.C motors, AC motors, Synchronous Motor, Stepper motors.	
	39	Principle and working of pneumatic actuators.	
	40	Principle and working of Hydraulic actuators.	

### 13.0

### QUESTION BANK

#### MODULE -1

1. Define Sensor & transducer.
2. Give the classification of transducers
3. Define, significance of measurement
4. Explain mechanical, electrical and electronic instruments
5. Explain Input-output configuration of measuring instruments and measurement systems
6. Mention Methods of correction for interfering and modifying inputs

#### MODULE -2

1. Explain Static calibration and error calibration curve
2. Define accuracy and precision
3. Define static error, scale range and scale span, reproducibility
4. Explain signal to noise ratio, sensitivity, linearity, hysteresis

5. Explain factors influencing the choice of transducers/instruments.
6. Explain Dynamic characteristics, Transfer function of generalized first order system

### MODULE -3

1. Explain RTD
2. Explain , Thermostat
3. Explain Thermocouple, laws of thermocouple
4. Explain Thermopile, AD590
5. Write a note Principles of Transduction
6. Explain Variable resistance devices
7. Explain Transfer function of generalized second order system,

### MODULE -4




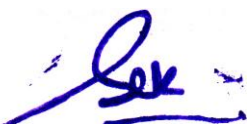
1. What are Types of Strain Gauges
2. Explain Theory of operation of resistance strain gauges.
3. Explain, foil gauges, semiconductor strain gauges
4. Explain Strain gauge Circuits
5. Explain Wheatstone bridge circuit, with Applications.
6. Mention the applications of resistance strain gauges,
7. Explain Force measuring sensor –Load cells – column types devices
8. Explain Torque measurement by Absorption type.
9. Explain Torque measurement: by transmission type, stress type & deflection type.
10. Explain Torque measurement: by stress type & deflection type.


### MODULE-5

1. Explain Block diagram and description of process control system with an example.
2. Explain Block diagram of Final control operation
3. Explain , Signal conversions analog, digital, pneumatic signal. Actuators, Control elements.
4. Explain Solid-state switches, Solenoids
5. Explain Principle of operation and its application: D.C motors,
6. Explain Principle of operation and its application AC motors
7. Explain Principle of operation and its application Synchronous Motor.
8. Explain Principle of operation and its application, Stepper motors
9. Explain : Principle and working of pneumatic actuators
10. Mention the Applications of Stepper Motor

## 15.0 University Result

Examination	FCD	FC	SC	% Passing
---				

Prepared by	Checked by		
 <b>Prof. K. S. Patil</b>	 <b>Prof. D. M. Kumbar</b>	 <b>HOD</b>	 <b>Principal</b>

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		<b>Academic</b>
		<b>Course Plan</b>
		<b>2023-24 EVEN</b>

<b>Subject Title</b>	<b>RENEWABLE ENERGY RESOURCES</b>		
<b>Subject Code</b>	21EE652	<b>CIE Marks</b>	50
<b>Number of Lecture Hrs / Week(L:T:P:S)</b>	3:0:0:0	<b>SEE Marks</b>	50
<b>Total Hours of Pedagogy</b>	40	<b>Exam Hours</b>	03
<b>CREDITS – 03</b>			

<b>FACULTY DETAILS:</b>		
<b>Name:</b> Prof.O.B.Heddurshetti	<b>Designation:</b> Asst.Professor	<b>Experience:</b> 18
<b>No. of times course taught:</b> 01	<b>Specialization:</b> PowerElectronics	

### 1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	PUC	1 <sup>st</sup> &2 <sup>nd</sup> Year	Physics, Mathematics


### 2.0 Course Objectives

- To discuss causes of energy scarcity and its solution, energy resources and availability of renewable energy.
- To explain sun – earth geometric relationship, Earth – Sun Angles and their Relationships.
- To discuss about solar energy reaching the Earth’s surface and solar thermal energy applications.
- To discuss types of solar collectors, their configurations and their applications.
- To explain the components of a solar cell system, equivalent circuit of a solar cell, its characteristics and applications.
- To discuss benefits of hydrogen energy, production of hydrogen energy, storage its advantages and disadvantages.
- To discuss wind turbines, wind resources, site selection for wind turbine.
- To discuss geothermal systems, their classification and geothermal based electric power generation
- To discuss waste recovery management systems, advantages and disadvantages.
- To discuss biomass composition, production, types of biomass gasifiers, properties of producer gas benefits.
- To discuss tidal energy resources, energy availability, power generation.
- To explain motion in the sea wave, power associated with sea wave and energy availability and the devices for harnessing wave energy.

### 3.0 Course Outcomes

Having successfully completed this course, the student will be able to

	<b>Course Outcome</b>	<b>RBT Level</b>	<b>POs</b>
C320.1	Discuss causes of energy scarcity and its solution, energy resources and availability of renewable energy, energy from sun, energy reaching the Earth’s surface and solar thermal energy applications	L2	1,2,6,7,8,12
C320.2	Discuss types of solar collectors, their configurations, solar cell system, its characteristics and their applications.	L2	1,2,6,7,8,12

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		<b>2023-24 EVEN</b>

C320.3	Explain generation of energy from hydrogen, wind, geothermal system, solid waste and agriculture refuse.	L2	1,2,6,7,8,12
C320.4	Discuss production of energy from biomass, biogas.	L2	1,2,6,7,8,12
C320.5	Summarize tidal energy resources, sea wave energy and ocean thermal energy.	L2	1,2,6,7,8,12

## 4.0 Course Content

### Module-1

**Introduction:** Causes of Energy Scarcity, Solution to Energy Scarcity, Factors Affecting Energy Resource Development, Energy Resources and Classification, Renewable Energy – Worldwide Renewable Energy Availability, Renewable Energy in India.

**Energy from Sun:** Sun- earth Geometric Relationship, Layer of the Sun, Earth – Sun Angles and their Relationships, Solar Energy Reaching the Earth's Surface, Solar Thermal Energy Applications.

### Module-2

**Solar Thermal Energy Collectors:** Types of Solar Collectors, Configurations of Certain Practical Solar Thermal Collectors, Material Aspects of Solar Collectors, Concentrating Collectors, Parabolic Dish – Stirling Engine System, Working of Stirling or Brayton Heat Engine, Solar Collector Systems into Building Services, Solar Water Heating Systems, Passive Solar Water Heating Systems, Applications of Solar Water Heating Systems, Active Solar Space Cooling, Solar Air Heating, Solar Dryers, Crop Drying, Space Cooling, Solar Cookers, Solar pond.

**Solar Cells:** Components of Solar Cell System, Elements of Silicon Solar Cell, Solar Cell materials, Practical Solar Cells, I – V Characteristics of Solar Cells, Efficiency of Solar Cells, Photovoltaic panels (series and parallel arrays).

### Module-3

**Hydrogen Energy:** Benefits of Hydrogen Energy, Hydrogen Production Technologies, Hydrogen Energy Storage, Use of Hydrogen Energy, Advantages and Disadvantages of Hydrogen Energy, Problems Associated with Hydrogen Energy.

**Wind Energy:** Windmills, Wind Turbines, Wind Resources, Wind Turbine Site Selection.

**Geothermal Energy:** Geothermal Systems, Classifications, Geothermal Resource Utilization, Resource Exploration, Geothermal Based Electric Power Generation, Associated Problems, environmental Effects.

**Solid waste and Agricultural Refuse:** Waste is Wealth, Key Issues, Waste Recovery Management Scheme, Advantages and Disadvantages of Waste Recycling, Sources and Types of Waste, Recycling of Plastics.


### Module-4

**Biomass Energy:** Biomass Production, Energy Plantation, Biomass Gasification, Theory of Gasification, Gasifier and Their Classifications, Chemistry of Reaction Process in Gasification, Updraft, Downdraft and Cross-draft Gasifiers, Fluidized Bed Gasification, Use of Biomass Gasifier, Gasifier Biomass Feed Characteristics, Applications of Biomass Gasifier, Cooling and Cleaning of Gasifiers.

**Biogas Energy:** Introduction, Biogas and its Composition, Anaerobic Digestion, Biogas Production, Benefits of Biogas, Factors Affecting the Selection of a Particular Model of a Biogas Plant, Biogas Plant Feeds and their Characteristics.

**Tidal Energy:** Introduction, Tidal Energy Resource, Tidal Energy Availability, Tidal Power Generation in India, Leading Country in Tidal Power Plant Installation, Energy Availability in Tides, Tidal Power Basin, Turbines for Tidal Power, Advantages and Disadvantages of Tidal Power, Problems Faced in Exploiting Tidal Energy.

### Module-5

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		<b>Academic</b>
		<b>Course Plan</b>
		<b>2023-24 EVEN</b>

**Sea Wave Energy:** Introduction, Motion in the sea Waves, Power Associated with Sea Waves, Wave Energy Availability, Devices for Harnessing Wave Energy, Advantages and Disadvantages of Wave Power.

**Ocean Thermal Energy:** Introduction, Principles of Ocean Thermal Energy Conversion (OTEC), Ocean Thermal Energy Conversion plants, Basic Rankine Cycle and its Working, Closed Cycle, Open Cycle and Hybrid Cycle, Carnot Cycle, Application of OTEC in Addition to Produce Electricity, Advantages, Disadvantages and Benefits of OTEC.

## 5.0 Relevance to future subjects

Sl No	Semester	Subject	Topics
01	VII & VIII	Project work	Implementation of renewable energy based projects

## 6.0 Relevance to Real World

Sl. No	Real World Mapping
01	Electrical power generation using renewable energy sources like wind and solar.
02	Generation of heat energy by using solar and biomass.
03	Conservation of non-renewable energy sources.

## 7.0 Gap Analysis and Mitigation


Sl No	Delivery Type	Details
01	Practical Assignment	Practical assignments could be given to the students to construct a model to demonstrate generation of heat and electricity using solar and wind energy.
02	Industrial visit	To provide practical exposure to the students' industrial visit to solar power plants and wind mills could be arranged.

## 8.0 Books Used and Recommended to Students

Books
1. Nonconventional Energy Resources, ShobhNath Singh, Pearson, 1st Edition, 2015.
Reference Books
1. Nonconventional Energy Resources, B.H. Khan, McGraw Hill, 3rd Edition.
2. Renewable Energy; Power for a sustainable Future, Godfrey Boyle, Oxford, 3rd Edition, 2012.
3. Renewable Energy Sources: Their Impact on global Warming and Pollution, TasneemAbbasi S.A. Abbasi, PHI, 1st Edition, 2011.
Additional Study material & e-Books
1. Nonconventional Energy sources, G D Rai, Khanna Publication, Fourth Edition

## 9.0 Relevant Websites (Reputed Universities and Others) for Notes/Animation/Videos Recommended



	<b>S J P N Trust's</b> <b>Hirasugar Institute of Technology, Nidasoshi</b> <i>Inculcating Values, Promoting Prosperity</i> Approved by AICTE, Recognized by Govt. of Karnataka and Permanently Affiliated to VTU Belagavi. <b>Accredited at 'A' Grade by NAAC</b> <b>Programmes Accredited by NBA: CSE &amp; ECE</b>	<b>Dept. of CSE</b>
		<b>Academic</b>
		<b>Course Plan</b>
		<b>2023-24 EVEN</b>

### Website and Internet Contents References

- E-book URL: <https://www.pdfdrive.com/non-conventional-energy-sources-e10086374.html>
- E-book URL: <https://www.pdfdrive.com/non-conventional-energy-systems-nptel-d17376903.html>
- E-book URL: <https://www.pdfdrive.com/renewable-energy-sources-and-their-applications-e33423592.html>
- E-book URL: <https://www.pdfdrive.com/lecture-notes-on-renewable-energy-sources-e34339149.html>
- <https://onlinecourses.nptel.ac.in/noc18ge09/preview>

## 10.0 Magazines/Journals Used and Recommended to Students

Sl.No	Magazines/Journals	website
1	Energy & Environment	<a href="https://en.wikipedia.org/wiki/Energy_%26_Environment">https://en.wikipedia.org/wiki/Energy_%26_Environment</a>
2	Journal of Renewable and Sustainable Energy	<a href="https://en.wikipedia.org/wiki/Journal_of_Renewable_and_Sustainable_Energy">https://en.wikipedia.org/wiki/Journal_of_Renewable_and_Sustainable_Energy</a>
3	Solar Energy Journal	<a href="https://en.wikipedia.org/wiki/Solar_Energy_(journal)">https://en.wikipedia.org/wiki/Solar_Energy_(journal)</a>
4	Renewable and Sustainable Energy Reviews	<a href="https://en.wikipedia.org/wiki/Renewable_and_Sustainable_Energy_Reviews">https://en.wikipedia.org/wiki/Renewable_and_Sustainable_Energy_Reviews</a>

## 11.0 Examination Note

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

### Continuous Internal Evaluation:

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

1. First test at the end of 5th week of the semester
2. Second test at the end of the 10th week of the semester
3. Third test at the end of the 15th week of the semester

Two assignments each of **10 Marks**

4. First assignment at the end of 4th week of the semester
5. Second assignment at the end of 9th week of the semester

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

6. At the end of the 13th week of the semester

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

(to have less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course).


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

### Semester End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours**)


- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

The students have to answer 5 full questions, selecting one full question from each module.

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		<b>Academic</b>
		<b>Course Plan</b>
		<b>2023-24 EVEN</b>

## 12.0 Course Delivery Plan

Module	Lecture No.	Content of Lecturer	% of Portion
1	1	Causes of Energy Scarcity, Solution to Energy Scarcity	20
	2	Factors Affecting Energy Resource Development, Energy Resources and Classification,	
	3	Renewable Energy – Worldwide Renewable Energy Availability, Renewable Energy in India.	
	4	Sun- earth Geometric Relationship	
	5	Layer of the Sun	
	6	Earth – Sun Angles and their Relationships	
	7	Solar Energy Reaching the Earth's Surface	
	8	Solar Thermal Energy Applications	
2	9	Types of Solar Collectors, Configurations of Certain Practical Solar Thermal Collectors	20
	10	Material Aspects of Solar Collectors, Concentrating Collectors	
	11	Parabolic Dish – Stirling Engine System, Working of Stirling or Brayton Heat Engine	
	12	Solar Collector Systems into Building Services, Solar Water Heating Systems, Passive Solar Water Heating Systems, Applications of Solar Water Heating Systems	
	13	Active Solar Space Cooling, Solar Air Heating, Solar Dryers, Crop Drying, Space Cooing, Solar Cookers, Solar pond	
	14	Components of Solar Cell System, Practical Solar Cells	
	15	Elements of Silicon Solar Cell, Solar Cell materials	
	16	I – V Characteristics of Solar Cells, Efficiency of Solar Cells, Photovoltaic panels (series and parallel arrays)	
3	17	Benefits of Hydrogen Energy, Hydrogen Production Technologies, Hydrogen Energy	20
	18	Storage, Use of Hydrogen Energy, Advantages and Disadvantages of Hydrogen Energy, Problems Associated with Hydrogen Energy	
	19	Windmills, Wind Turbines, Wind Resources, Wind Turbine Site Selection	
	20	Geothermal Systems, Classifications, Geothermal Resource Utilization, Resource	
	21	Exploration, Geothermal Based Electric Power Generation, Associated Problems, environmental Effects	
	22	Waste is Wealth, Key Issues	
	23	Waste Recovery Management Scheme, Advantages and Disadvantages of Waste Recycling	
	24	Sources and Types of Waste, Recycling of Plastics	
4	25	Biomass Production, Energy Plantation, Biomass Gasification	20
	26	Theory of Gasification, Gasifier and Their Classifications, Chemistry of Reaction Process in Gasification, Updraft, Downdraft and Cross-draft Gasifiers	
	27	Fluidized Bed Gasification, Use of Biomass Gasifier, Gasifier Biomass Feed Characteristics, Applications of Biomass Gasifier, Cooling and Cleaning of Gasifiers	
	28	Introduction, Biogas and its Composition, Anaerobic Digestion, Biogas Production, Benefits of Biogas	
	29	Factors Affecting the Selection of a Particular Model of a Biogas Plant, Biogas Plant Feeds and their Characteristics	
	30	Introduction, Tidal Energy Resource, Tidal Energy Availability, Tidal Power Generation in India	
	31	Leading Country in Tidal Power Plant Installation, Energy Availability in Tides	

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		<b>Academic</b>
		<b>Course Plan</b>
		<b>2023-24 EVEN</b>

	32	Tidal Power Basin, Turbines for Tidal Power, Advantages and Disadvantages of Tidal Power, Problems Faced in Exploiting Tidal Energy	
<b>5</b>	33	Introduction, Motion in the sea Waves, Power Associated with Sea Waves	<b>20</b>
	34	Wave Energy Availability, Devices for Harnessing Wave Energy, Advantages and Disadvantages of Wave Power	
	35	Introduction	
	36	Principles of Ocean Thermal Energy Conversion (OTEC)	
	37	Ocean Thermal Energy Conversion plants, Basic Rankine Cycle and its Working	
	38	Closed Cycle, Open Cycle and Hybrid Cycle, Carnot Cycle	
	39	Application of OTEC in Addition to Produce Electricity	
	40	Advantages, Disadvantages and Benefits of OTEC	

### 13.0 Assignments, Pop Quiz, Mini Project, Seminars

Sl.No.	Title	Outcome expected	Allied study	Week No.	Individual / Group activity	Reference: book/website /Paper
1	Assignment 1: Introduction to Renewable Energy Sources, Solar Energy	Students study the Topics and write answer. Get practice to solve university questions.	1,2 module of the syllabus	04	Individual Activity.	Book 1, 2 of the reference list. Website of the Reference list
2	Assignment 1: Wind Energy, Biomass energy, wave energy, tidal energy, OTEC and green energy.	Students study the Topics and write answer. Get practice to solve university questions.	3,4 module of the syllabus	09	Individual Activity.	Book 1, 2 of the reference list. Website of the Reference list
3	Quiz: All the module	Students study the Topics and prepare the multiple choice questioner with answer.	5 Module of the syllabus	13	Group Activity.	Book 1, 2 of the reference list. Website of the Reference list

### 15.0 QUESTION BANK

Sample Questions	Questions
<b>1.</b>	<b>Module 1</b> 1. Explain principles of renewable energy 2. Explain Energy and sustainable development, 3. Give fundamentals and social implications. 4. Describe worldwide renewable energy availability and renewable energy availability in India 5. Briefly describe solar energy 6. Briefly describe wind energy 7. Briefly describe tidal energy 8. Briefly describe wave energy 9. Briefly describe ocean thermal energy 10. Briefly describe biomass energy 11. Briefly describe geothermal energy and oil shale. 12. Explain Introduction to Internet of energy (IOE)



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Course Plan





2023-24 EVEN


2.	<b>Module 2</b> <ol style="list-style-type: none"><li>1. Explain Solar Radiation geometry</li><li>2. discuss Estimation of solar radiation on horizontal and inclined surfaces</li><li>3. Explain solar radiation Measurements- Pyrheliometers, Pyrometer, Sunshine Recorder.</li><li>4. Explain with sketch working of solar Flat plate collector</li><li>5. Explain with sketch working of Solar distillation</li><li>6. Explain with sketch working of solar pond electric power plant.</li><li>7. Explain Principle of Solar cell,</li><li>8. Explain with sketch working of Photovoltaic system for electric power generation,</li><li>9. Give advantages, Disadvantages solar photovoltaic system</li><li>10. Give applications of solar photovoltaic system.</li></ol>
3.	<b>Module 3</b> <ol style="list-style-type: none"><li>1. What is wind power explain briefly?</li><li>2. Describe with a neat sketch the working of wind energy system with main components</li><li>3. How power extracted by wind turbine?</li><li>4. List out type of wind turbine and what are the wind power plants are grouped</li><li>5. Discuss the advantages and disadvantages of horizontal and vertical axis wind mill.</li><li>6. What methods are used to overcome the fluctuate power generation of wind mill?</li><li>7. What are the advantages and disadvantages of wind turbine?</li><li>8. How performance of the wind turbine is determined? Explain its operational characteristics.</li><li>11. What is biomass, bio-fuel, bio energy and biogas?</li><li>12. What are the methods used for biomass conversion to energy? Explain in brief?</li><li>13. What are the factors affecting the generation of bio gas?</li><li>14. What are the constituents of biomass materials?</li><li>15. What is fermentation, aerobic and anaerobic, hydrolysis explain each.</li><li>16. Explain fixed dome bio digester with sketch</li><li>17. With a neat sketch explain downdraft biomass gasifier?</li></ol>
4.	<b>Module 4</b> <ol style="list-style-type: none"><li>1. What is tide? Explain tidal energy and its conversion with neat diagram</li><li>2. Explain the basic components of a tidal thermal power plant</li><li>3. What are advantages and disadvantages tidal power generation.</li><li>4. What is the nature of tidal power extracted from single basin arrangement and double basin arrangement?</li><li>5. What are the wave energy conversion machines, explain any one conversion methods.</li><li>6. What is the basic principle of ocean thermal energy conversion?</li><li>7. What are the main types of OTEC power plants? Describe their working in brief.</li><li>8. What are advantages and disadvantages</li></ol>
5.	<b>Module 5</b> <ol style="list-style-type: none"><li>1. What are Fuel cells</li><li>2. Classify of fuel cells</li><li>3. Explain Operating principles of fuel cells</li><li>4. Explain Zero energy Concepts.</li><li>5. What are Benefits of hydrogen energy</li><li>6. Explain hydrogen production technologies electrolysis method</li><li>7. Describe hydrogen energy storage</li><li>8. Give applications of hydrogen energy</li><li>9. What are problems associated with hydrogen energy.</li></ol>

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			<b>2023-24 EVEN</b>

**15.0 University Result**

Examination	FCD	FC	SC	% Passing
---				

Prepared by	Checked by		
 <b>Prof. O. B. Heddurshetti</b>	 <b>Prof. O. B. Heddurshetti</b>	 <b>HOD</b>	 <b>Principal</b>

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		<b>Academic</b>
		<b>Course Plan</b>
		<b>2023-24 EVEN</b>

<b>Subject Title</b>	PROJECT MANAGEMENT		
<b>Subject Code</b>	21ME651	<b>IA Marks</b>	50
<b>Number of Lecture Hrs / Week</b>	03	<b>SEE</b>	50
<b>Total Number of Lecture Hrs</b>	40	<b>Exam Hours</b>	03
<b>CREDITS – 03</b>			

<b>FACULTY DETAILS:</b>		
<b>Name:</b> Girish Zulapi	<b>Designation:</b> Asst. Professor	<b>Experience:</b> 15
<b>No. of times course taught:</b> 00		<b>Specialization:</b> Product Design and Manufacturing

## 1.0 Course Objectives

1. To understand how to break down a complex project into manageable segments and use of effective project management tools and techniques to arrive at solution and ensure that the project meets its deliverables and is completed within budget and on schedule.
2. To impart knowledge on various components, phases and attributes of a project.
3. To prepare students to plan, develop, lead, manage and successfully implement and deliver projects within their chosen practice area.

## 2.0 Course Outcomes

On completion of the course, the students will be able to;

1. Understand the selection, prioritization and initiation of individual projects and strategic role of project management.
2. Understand the work breakdown structure by integrating it with organization also the scheduling and uncertainty in projects.
3. Understand risk management planning using project quality tools also the activities like purchasing, acquisitions, contracting, partnering and collaborations related to performing projects.
4. Determine project progress and results through balanced score card approach.
5. Draw the network diagram to calculate the duration of the project and reduce it using crashing.

## 3.0 Course Content

### MODULE – 1

#### INTRODUCTION

**08 Hours**


Definition of project, characteristics of projects, understand projects, types of projects, scalability of project tools, project roles Project Selection and Prioritization–Strategic planning process, Strategic analysis, strategic objectives, portfolio alignment–identifying potential projects, methods of selecting projects, financial mode/scoring models to select projects, prioritizing projects, securing and negotiating projects.

### MODULE 2

**08 Hours**

**Planning Projects:** Defining the project scope, Project scope check list, Project priorities, Work Breakdown Structure (WBS), Integrating WBS with organization, coding the WBS for the information system.

**Scheduling Projects:** Purpose of a project schedule, historical development, how project schedules are limited and created, develop project schedules, uncertainty in project schedules, Gantt chart.

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		<b>Course Plan</b>
		<b>2023-24 EVEN</b>

### MODULE 3

08 Hours

**Resourcing Projects:** Abilities needed when resourcing projects, estimate resource needs, creating staffing management plant, project team composition issues.

**Budgeting Projects:** Cost planning, cost estimating, cost budgeting, establishing cost control.

**Project Risk Planning:** Risk Management Planning, risk identification, risk analysis, risk response planning, **Project Quality Planning and Project Kickoff:** Development of quality concepts, project quality management plan, project quality tools, kickoff project, baseline and communicate project management plan using Microsoft Project for project baselines.

### MODULE 4

08 Hours

**Performing Projects:** Project supply chain management:-Plan purchasing and acquisitions, plan contracting, contact types, project partnering and collaborations, project supply chain management.

**Project Progress and Results:** Project Balanced Scorecard Approach, Internal project, customer, financial issues, **Finishing the project:** Terminate project early, finish projects on time, secure customer feedback and approval, knowledge management, perform administrative and contract closure.

### MODULE 5

08 Hours

**Network Analysis:** Introduction, network construction - rules, Fulkerson's rule for numbering the events, AON and AOA diagrams; Critical path method (CPM) to find the expected completion time of a project, floats; PERT for finding expected duration of an activity and project, determining the probability of completing a project, predicting the completion time of project; crashing of simple projects.

#### 4.0 Relevance to future subjects


Sl.No	Semester	Subject	Topics
01	VIII	Project work	Planning Projects, Scheduling Projects, Resourcing Projects, Budgeting Projects and Performing Projects.

#### 5.0 Relevance to Real World

Sl.No	Real World Mapping
01	While working in an industry on project.

#### 6.0 Gap Analysis and Mitigation

Sl. No	Delivery Type	Details
01	Tutorial	Topic: Agile Project Management
02	Tutorial	Topic: Project Manager
03	Tutorial	Topic: Human Factors and Project Team

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		<b>Academic</b>
		<b>Course Plan</b>
		<b>2023-24 EVEN</b>

## 7.0 Books Used and Recommended to Students

<b>Text Books</b>
1 Project Management Timothy J Kloppenborg Cengage Learning Edition 2009 2 Project Management-A systems approach to planning scheduling and controlling Harold kerzner CBS publication 3 Project Management S Choudhury McGraw Hill Education(India)Pvt.Ltd.NewDelhi2016
<b>Reference Books</b>
1 Project Management Pennington Lawrence McGrawHill 2 Project Management A Moder Joseph and Phillips New Yark Van Nostrand Reinhold 3 Project Management, Bhavesh M. Patel Vikas publishing House
<b>Additional Study material &amp; e-Books</b>
1. "Contemporary project management" by Thimothy J Kloppenberg

## 8.0 Relevant Websites (Reputed Universities and Others) for Notes/Animation/Videos Recommended

<b>Website and Internet Contents References</b>
1) <a href="https://en.wikipedia.org/wiki/Project_management">https://en.wikipedia.org/wiki/Project_management</a> 2) <a href="https://www.manage.gov.in/studymaterial/PPM-E.pdf">https://www.manage.gov.in/studymaterial/PPM-E.pdf</a> 3) <a href="https://www.scribd.com/document/475871105/FINAL-Word">https://www.scribd.com/document/475871105/FINAL-Word</a> 4) <a href="https://www.planview.com/resources/guide/what-is-project-management/">https://www.planview.com/resources/guide/what-is-project-management/</a>

## 9.0 Magazines/Journals Used and Recommended to Students

Sl.No	Magazines/Journals	website
1	Project management journal	<a href="https://journals.sagepub.com/toc/pmxa/current">https://journals.sagepub.com/toc/pmxa/current</a>
2	International journal of project management	<a href="https://www.sciencedirect.com/science/article/pii/S0263786315001027">https://www.sciencedirect.com/science/article/pii/S0263786315001027</a>
3	Complexity in project management	<a href="https://www.sciencedirect.com/science/article/pii/S1877050917323001">https://www.sciencedirect.com/science/article/pii/S1877050917323001</a>
4	Project management planning and control	<a href="https://www.sciencedirect.com/book/9780081020203/project-management-planning-and-control">https://www.sciencedirect.com/book/9780081020203/project-management-planning-and-control</a>

## 10.0 Examination Note

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

### Continuous Internal Evaluation:

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

- First test at the end of 5<sup>th</sup> week of the semester
- Second test at the end of the 10<sup>th</sup> week of the semester



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- Third test at the end of the 15<sup>th</sup> week of the semester
- Two assignments each of **10 Marks**
- First assignment at the end of 4<sup>th</sup> week of the semester
- 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 hour)
- 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**  
(To have less stressed CIE, the portion of the syllabus should not be common/repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course).

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

#### **Semester End Examination:**

Theory SEE will be conducted by University as per the scheduled time table, with common question papers for the subject (**duration 03 hours**)

- The question paper will have ten questions. Each question is set for 20 marks. Marks scored shall be reduced proportionally to 50 marks
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

The students have to answer 5 full questions, selecting one full question from each module

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

#### **Continuous Internal Evaluation:**

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

- First test at the end of 5<sup>th</sup> week of the semester
  - Second test at the end of the 10<sup>th</sup> week of the semester
  - Third test at the end of the 15<sup>th</sup> week of the semester
- Two assignments each of **10 Marks**
- First assignment at the end of 4<sup>th</sup> week of the semester



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

Group discussion/Seminar/quiz anyone of three suitably planned to attain the Cos and Pos for 20Marks (duration 01 hours)

- 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

(To have less stressed CIE, the portion of the syllabus should not be common/repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course).

**CIE methods/question paper is designed to attain the different levels of Bloom's taxonomy as per the**

**outcome defined for the course.**

**Semester End Examination:**

Theory SEE will be conducted by University as per the scheduled time table, with common question papers for the subject (**duration 03 hours**)

- The question paper will have ten questions. Each question is set for 20 marks. Marks scored shall be reduced proportionally to 50 marks
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
- The students have to answer 5 full questions, selecting one full question from each module.

**11.0 Course Delivery Plan**

Module	Lecture No.	Content of Lecturer	% of Portion
<b>Module 1:</b>	1	Introduction to Project Management, Definition of project, characteristics of projects, understand projects	20
	2	types of projects, scalability of project tools	
	3	project roles Project Selection and Prioritization – Strategic planning process	
	4	Strategic analysis, strategic objectives	
	5	portfolio alignment – identifying potential projects	
	6	methods of selecting projects	
	7	financial mode / scoring models to select projects	
	8	Prioritizing projects, Securing and negotiating projects.	
<b>Module 2:</b>	9	<b>Planning Projects:</b> Defining the project scope, Project scope checklist	20
	10	Project priorities, Work Breakdown Structure (WBS)	
	11	Integrating WBS with organization, coding the WBS for the information system.	
	12	<b>Scheduling Projects:</b> Purpose of a project schedule	
	13	historical development, how project schedules are limited and created	



	14	develop project schedules	
	15	uncertainty in project schedules	
	16	Gantt chart.	
<b>Module 3:</b>	17	<b>Resourcing Projects:</b> Abilities needed when resourcing projects, estimate resource needs	20
	18	creating staffing management plan, project team composition issues	
	19	<b>Budgeting Projects:</b> Cost planning, cost estimating	
	20	Cost budgeting, establishing cost control.	
	21	<b>Project Risk Planning:</b> Risk Management Planning, risk identification, risk analysis, risk response planning	
	22	<b>Project Quality Planning and Project Kick off:</b> Development of quality concepts, project quality management plan	
	23	project quality tools, kick off project, baseline and	
	24	Communicate project management plan using Microsoft Project for project baselines.	
<b>Module 4:</b>	25	<b>Performing Projects and Project supply chain management:</b> - Plan purchasing and acquisitions, plan contracting	20
	26	Contact types, project partnering and collaborations, project supply chain management.	
	27	<b>Project Progress and Results:</b> Project Balanced Scorecard Approach	
	28	Internal project, customer, financial issues	
	29	<b>Finishing the project:</b> Terminate project early, finish projects on time	
	30	secure customer feedback and approval	
	31	Knowledge management	
	32	Perform administrative and contract closure.	
<b>Module 5:</b>	33	<b>Network Analysis:</b> Introduction	20
	34	network construction - rules	
	35	Fulkerson's rule for numbering the events, AON and AOA diagrams	
	36	Critical path method (CPM) to find the expected completion time of a project floats	
	37	PERT for finding expected duration of an activity and project	
	38	determining the probability of completing a project	
	39	predicting the completion time of project	
	40	Crashing of simple projects.	

**12.0****Assignments, Pop Quiz, Mini Project, Seminars**

Sl.No.	Title	Outcome expected	Allied study	Week No.	Individual / Group activity	Reference: book /website /Paper
1	Assignment 1:	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 1 & 2 of the syllabus	4	Individual Activity.	Books 1, 2 and 3 of the text book list
2	Assignment 2:	Students study the Topics and write the Answers. Get practice to solve university questions.	Module 3,4 & 5 of the syllabus	9	Individual Activity.	Books 1, 2 and 3 of the text book list

**13.0****QUESTION BANK****Module 1**

1. What is a project?
2. What is project management?
3. What types of constraints are common to most projects?
4. Which deliverable authorizes the project team to move from Selecting & Initiating to Planning?
5. At what stage of a project life cycle are the majority of the "hands-on" tasks completed?
6. What are the five process groups of project management?
7. What are the 10 project management knowledge areas?
8. What two project dimensions are components of project performance?
9. How do you define project success?
10. How do you define project failure?
11. List four common causes of project failure.
12. What are three common ways of classifying projects?
13. List and describe each step in the strategic planning process.
14. Name five things that may be negotiated between a client company and a contractor company
15. What are some common reasons for project failure?

**Module 2**

1. List three reasons why understanding stakeholder is important to successful project management.
2. What is the difference between an internal and external stakeholder?
3. Which three criteria should you consider when prioritizing stakeholders?
4. Describe an AGILE "stand-up" meeting.
5. What three tasks comprise the "define scope" process?
6. Why is scope definition important?
7. What are two common causes of scope creep?
8. What does the acronym WBS stand for?
9. What are the advantages of using a WBS?
10. List three ways of organizing a WBS.
11. The lowest level of the WBS is known as?
12. What items are typically included in a work package description?
13. What is rolling wave planning?
14. What is uncontrolled change known as?
15. Why do project teams use change control systems?
16. List the major sections that should be included in a change request form, and tell why each is important.
17. When can the first draft of a project schedule be constructed?
18. What is the difference between an activity and a work package?
19. How can a **Gantt chart** be helpful in project planning?

**Module 3**

1. In addition to technical skills, what other skill must a project manager have in order to successful resource aproject?
2. Why is it important to involve workers in the planning phase of a project when possible?
3. What are two techniques used to compress a project schedule?
4. When crashing a project, what two criteria are considered when deciding which activities to speed up?
5. What type of costs does not depend on the size of a project?
6. During which phase of a project do recurring costs typically occur?
7. What are some examples of expedited costs?
8. What is the purpose of an order of magnitude cost estimate?
9. What is the "time value of money," and why is it relevant to project management?
10. For a routine project, what is a typical percentage of total project costs that should be placed into contingencyreserves? For an unusual project?
11. Should a project manager alone identify potential risks for the project? Why or why not?
12. During which stage of a project are most risks typically uncovered?
13. Are both qualitative and quantitative risk analyses used on all projects? Why or why not?
14. What is an example of transferring risk?
15. In the risk register, why should only one person be assigned "owner" of a risk?
16. Identify similarities and differences among TQM, ISO, and Six Sigma. What strengths and weaknesses areinherent in each of these approaches?
17. Discuss the areas of ISO. Which do you feel is most important and why?
18. Describe the process of achieving stakeholder satisfaction. Why is it important to consider stakeholdersatisfaction?
19. Describe the three outputs of quality control.
20. List the project quality tools you expect to use on your project. Tell where you plan to use each tool and why it isimportant.

**Module 4**

1. Do small businesses often outsource project work? Why or why not?
2. Which is the first of the four processes that make up project procurement management?
3. In supply chain management, what are some other names for the seller? What are some other names for thebuyer?
4. List three functional areas that are frequently outsourced by business organizations.
5. What are some potential issues related to outsourcing?
6. What are four potential information sources that organizations can use to identify potential sellers?
7. Describe two methods that can be used to evaluate potential suppliers.
8. What items are generally included in a request for proposal?
9. What is the primary reason for determining project progress and results?
10. Which five aspects of project success are evaluated in the balanced scorecard approach?
11. Give three categories of internal project issues and an example of each.
12. In addition to the WBS, what might trigger project work to be authorized and performed?
13. What is an advantage of letting workers self-control their work?
14. How does one calculate schedule variance?
15. What does cost performance index (CPI) measure?
16. When does a project move into the closing stage?
17. What is validate scope?
18. What is the purpose of a "punch list"?
19. What should a project manager refer back to in order to make sure that all planned work has, in fact, beencompleted?
20. When might a contract clause be invoked?
21. If an early termination of his project seems likely, what two avenues can a project manager explore to increase thelikelihood of being able to continue the project?

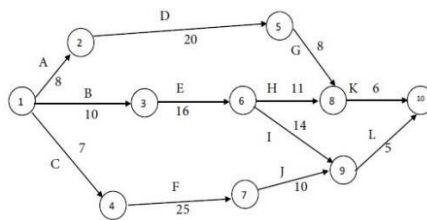
**Module 5**



1. What is network analyses? Write its salient feature.
2. Define following
  - i) Pert
  - ii) CPM
3. How 20 key project manager actions are organized? Explain.
4. What is material requirement planning (MRP)? define it with suitable example
5. How MRP is a 'push' system while JIT is a 'pull' system? explain it
6. Determine the critical path, the critical activities and the project completion time. The following details are available regarding a project:

Activity	Predecessor Activity	Duration (Weeks)
A	-	3
B	A	5
C	A	7
D	B	10
E	C	5
F	D,E	4

7. Find out the completion time and the critical activities for the following project:



8. Draw the network diagram and determine the critical path for the following project

Activity	Time estimate (Weeks)
1 - 2	5
1 - 3	6
1 - 4	3
2 - 5	5
3 - 6	7
3 - 7	10
4 - 7	4
5 - 8	2
6 - 8	5
7 - 9	6
8 - 9	4

9. Develop a network diagram for the project specified below

Activity	Immediate Predecessor Activity
A	-
B	A
C, D	B
E	C
F	D
G	E, F



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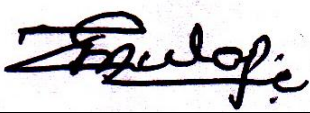



Course Plan


2023-24 ODD SEM

14.0

University Result

Examination	FCD	FC	SC	% Passing
		---		

Prepared by	Checked by		
			
Prof. Girish Zulapi	Prof. M A Hipparagi	HOD	Principal

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		<b>Course Plan</b>
		<b>2023-24 ODD SEM</b>

<b>Subject Title</b>	<b>Computer Graphics and Image Processing Laboratory</b>		
<b>Subject Code</b>	21CSL66	<b>IA Marks</b>	50
<b>Number of Lecture Hrs / Week</b>	0:0:2:0	<b>Exam Marks</b>	50
<b>Total Number of Lab Contact</b>	24	<b>Exam Hours</b>	03
<b>CREDITS – 01</b>			

<b>FACULTY DETAILS:</b>		
<b>Name:</b> Dr. Mahesh Huddar	<b>Designation:</b> Associate Professor	<b>Experience:</b> 14.5 Years
<b>No. of times course taught:</b> 05	<b>Specialization:</b> Computer Science and Engineering	

## 1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	Computer Science and Engineering	I/II	Programming in C and Data Structures
02	Computer Science and Engineering	VI	Computer Graphics and Visualization
03	Computer Science and Engineering	V	Artificial Intelligence and Machine Learning

## 2.0 Course Objectives

This course will enable students to

- Demonstrate the use of Open GL.
- Demonstrate the different geometric object drawing using OpenGL
- Demonstration of 2D/3D transformation on simple objects.
- Demonstration of lighting effects on the created objects.
- Demonstration of Image processing operations on image/s

## 3.0 Course Outcomes

Having successfully completed this course, the student will be able to:

	Course Outcome	Cognitive Level	Pos
C321.1	Use OpenGL /OpenCV for the development of mini Projects.	L3	1, 2, 3,5, 8,9, 10,11
C321.2	Analyze the necessity mathematics and design required to demonstrate basic geometric transformation techniques.	L3	1, 2, 3,5, 8,9, 10,11
C321.3	Demonstrate the ability to design and develop input interactive techniques	L3	1, 2, 3,5, 8,9, 10,11
C321.4	Apply the concepts to Develop user friendly applications using Graphics and IP concepts	L3	1, 2, 3,5, 8,9, 10,11
<b>Total Hours of instruction</b>			<b>24</b>

## 4.0 Course Content

### PART - A

List of problems for which student should develop program and execute in the Laboratory using OpenGL/openCV/Python

1. Develop a program to draw a line using Bresenham's line drawing technique
2. Develop a program to demonstrate basic geometric operations on the 2D object
3. Develop a program to demonstrate basic geometric operations on the 3D object



4. Develop a program to demonstrate 2D transformation on basic objects
5. Develop a program to demonstrate 3D transformation on 3D objects
6. Develop a program to demonstrate Animation effects on simple objects
7. Write a Program to read a digital image. Split and display image into 4 quadrants, up, down, right and left.
8. Write a program to show rotation, scaling, and translation on an image.
9. Read an image and extract and display low-level features such as edges and textures using filtering techniques.
10. Write a program to blur and smoothing an image.
11. Write a program to contour an image.
12. Write a program to detect a face/s in an image.

### PART - B (MINI-PROJECT)

Students should develop a mini project and it should be demonstrate in the laboratory examination, Some of the projects.

## 5.0 Relevance to future subjects

S. No	semester	Subject	Topics
1	VII	Artificial Intelligence	image Processing

## 6.0 Relevance to Real World

SL.No	Real World Mapping
01	Final year projects
02	Game development


## 7.0 Gap Analysis and Mitigation

Sl. No.	Delivery Type	Details
01	YouTube Videos	Computer graphics algorithms
02	YouTube Videos	Image Processing Algorithms

## 8.0 Books Used and Recommended to Students

itional Reference
<ul style="list-style-type: none"> <li>• Donald Hearn &amp; Pauline Baker: Computer Graphics with OpenGL Version, 3rd/4th Edition, Pearson Education, 2011</li> <li>• James D Foley, Andries Van Dam, Steven K Feiner, John F Huges Computer graphics with OpenGL: Pearson education</li> </ul>

## 9.0 Relevant Websites (Reputed Universities and Others) for Notes/Animation/Videos Recommended

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Website and Internet Contents References
<ol style="list-style-type: none"> <li><a href="https://nptel.ac.in/courses/106/106/106106090/">https://nptel.ac.in/courses/106/106/106106090/</a></li> <li><a href="https://nptel.ac.in/courses/106/102/106102063/">https://nptel.ac.in/courses/106/102/106102063/</a></li> <li><a href="https://nptel.ac.in/courses/106/103/106103224/">https://nptel.ac.in/courses/106/103/106103224/</a></li> <li><a href="https://nptel.ac.in/courses/106/102/106102065/">https://nptel.ac.in/courses/106/102/106102065/</a></li> <li><a href="https://www.tutorialspoint.com/opencv/">https://www.tutorialspoint.com/opencv/</a></li> <li><a href="https://medium.com/analytics-vidhya/introduction-to-computer-vision-opencv-in-python-fb722e805e8b">https://medium.com/analytics-vidhya/introduction-to-computer-vision-opencv-in-python-fb722e805e8b</a></li> </ol>

## 10.0 Magazines/Journals Used and Recommended to Students

Sl.No	Magazines/Journals	Website
1	Incorporating Modern OpenGL into Computer Graphics Education	<a href="http://ieeexplore.ieee.org/document/6855305/">http://ieeexplore.ieee.org/document/6855305/</a>
2	Computers & Graphics	<a href="https://www.journals.elsevier.com/computers-and-graphics/">https://www.journals.elsevier.com/computers-and-graphics/</a>
3	OpenCV	<a href="https://pypi.org/project/opencv-python/">https://pypi.org/project/opencv-python/</a>

## 11.0 Examination Note

### 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 course. The student has to secure not less than 35% (18 Marks out of 50) in the semester-end examination (SEE).

### Continuous Internal Evaluation (CIE):

CIE marks for the practical course is **50 Marks**.

The split-up of CIE marks for record/ journal and test are in the ratio **60:40**.

- Each experiment to be evaluated for conduction with observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments designed by the faculty who is handling the laboratory session and is made known to students at the beginning of the practical session.
- Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks.
- Total marks scored by the students are scaled down to 30 marks (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct 02 tests for 100 marks, the first test shall be conducted after the 8<sup>th</sup> week of the semester and the second test shall be conducted after the 14<sup>th</sup> week of the semester.
- In each test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability. Rubrics suggested in Annexure-II of Regulation book
- The average of 02 tests is scaled down to 20 marks (40% of the maximum marks).
- The Sum of scaled-down marks scored in the report write-up/journal and average marks of two tests is the total CIE marks scored by the student.


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### Semester End Evaluation (SEE):

- SEE marks for the practical course is 50 Marks.
- SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the University
- All laboratory experiments are to be included for practical examination.
- (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. OR based on the course requirement evaluation rubrics shall be decided jointly by examiners.
- Students can pick one question (experiment) from the questions lot prepared by the internal/external examiners jointly.
- Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.
- General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)
- Students can pick one experiment from the questions lot of PART A with equal choice to all the students in a batch.
- PART B : Student should develop a mini project and it should be demonstrated in the laboratory examination (with report and presentation).
- Weightage of marks for PART A is 60% and for PART B is 40%. General rubrics suggested to be followed for part A and part B.
- Change of experiment is allowed only once (in part A) and marks allotted to the procedure part to be made zero.
- The duration of SEE is 03 hours.

## 12.0 Course Delivery Plan

Expt. No.	Lab. No.	Content of Experiment	% of Portion
1	1	Develop a program to draw a line using Bresenham's line drawing technique	6.25
2	2	Develop a program to demonstrate basic geometric operations on the 2D object	6.25
3	3	Develop a program to demonstrate basic geometric operations on the 3D object	6.25
4	4	Develop a program to demonstrate 2D transformation on basic objects	6.25
5	5	Develop a program to demonstrate 3D transformation on 3D objects	6.25
6	6	Develop a program to demonstrate Animation effects on simple objects.	6.25
7	7	Write a Program to read a digital image. Split and display image into 4 quadrants, up, down, right and left.	6.25
8	8	Write a program to show rotation, scaling, and translation on an image.	6.25
9	9	Read an image and extract and display low-level features such as edges, textures using filtering techniques.	6.25
10	10	Write a program to blur and smoothing an image.	6.25

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			<b>Course Plan</b>
			<b>2023-24 ODD SEM</b>

11	11	Write a program to contour an image.	6.25
12	12	Write a program to detect a face/s in an image.	6.25
<b>Project: PART - B ( MINI-PROJECT)</b>			
13	13	Students should develop a mini project and it should be demonstrated in the laboratory examination, Some of the projects are listed and it is not limited to: <ul style="list-style-type: none"> <li>➤ Recognition of License Plate through Image Processing</li> <li>➤ Recognition of Face Emotion in Real-Time</li> <li>➤ Detection of Drowsy Driver in Real-Time</li> <li>➤ Recognition of Handwriting by Image Processing</li> <li>➤ Detection of Kidney Stone</li> <li>➤ Verification of Signature</li> <li>➤ Compression of Color Image</li> <li>➤ Classification of Image Category</li> <li>➤ Detection of Skin Cancer</li> <li>➤ Marking System of Attendance using Image Processing</li> <li>➤ Detection of Liver Tumor</li> <li>➤ IRIS Segmentation</li> <li>➤ Detection of Skin Disease and / or Plant Disease</li> <li>➤ Biometric Sensing System.</li> <li>➤ Projects which help to formers to understand the present developments in agriculture.</li> <li>➤ Projects which help high school/college students to understand scientific problems.</li> <li>➤ Simulation projects which help to understand innovations in science and technology</li> </ul>	25

## 13.0 QUESTION BANK

1. What is Computer Graphics?
2. What are applications of computer graphics?
3. What is OpenGL?
4. List Control functions in OpenGL.
5. List primitive functions in OpenGL.
6. What are the types of Text?
7. OpenGL functions to draw text.
8. What is the significance of glutMainLoop() function?
9. What are the 3 main OpenGL libraries?
10. What is glutImit() function?
11. What is the function used to set the display mode?
12. Name any 2 functions used to register the callback function?
13. What is the header file used to include OpenGL library function?
14. What is the Parameter need to glClear() function?
15. What is glFlush() function?
16. What are the functions needed to set the color of the window?
17. How to set the position of the window on screen?
18. What is the aspect ratio?
19. Name a few functions in OpenGL, needed to interact with keyboard.
20. Name a few functions in OpenGL, to interact with mouse?
21. Give any of the four properties of meshes.
22. What is model view matrix?
23. What is projection matrix?
24. What is viewport matrix?



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Course Plan

2023-24 ODD SEM

25. What is the significance of glMatrixMode()?
26. What is the significance of gluOrtho2D()?
27. What is the significance of glOrtho()?
28. How to compose affine transformation?
29. OpenGL functions used in Depth Buffer algorithm.
30. List logical OpenGL functions?
31. What is image processing? Explain
32. List and explain nature and related fields of IP.
33. Explain how image is represented digitally.
34. List and explain the types of images.
35. List and explain the distance metrics in IP.
36. Explain classification of images operations.
37. What is image segmentation? Explain.
38. What is image classification? Explain.
39. How to detect discontinuities in images.
40. Explain edge detection algorithms.

## 14.0 University Result

Examination	FCD	FC	SC	FAIL	Pass %
NIL	NIL	NIL	NIL	NIL	NIL

Prepared by	Checked by		
			
Dr. Mahesh Huddar	Dr. Mahesh Huddar	HOD	Principal