KARNATAK LAW SOCIETY'S

GOGTE INSTITUTE OF TECHNOLOGY

"JNANA GANGA" UDYAMBAG, BELAGAVI-590008,
KARNATAKA, INDIA.
Approved by AICTE and UGC
Permanently Affiliated and Autonomous Institution
Under
Visvesvaraya Technological University, Belagavi
www.git.edu

ESTD. 1939

ESTD. 1979

3rd and 4th Semester B.E.

Electronics and Communication Engineering

Scheme and Syllabus (2021 Scheme)

INSTITUTION VISION
Gogte Institute of Technology shall stand out as an institution of excellence in technical education and in training individuals for outstanding caliber, character coupled with creativity and entrepreneurial skills.

MISSION
To train the students to become Quality Engineers with High Standards of Professionalism and Ethics who have Positive Attitude, a Perfect blend of Techno-Managerial Skills and Problem-solving ability with an analytical and innovative mindset.

QUALITY POLICY
• Imparting value-added technical education with state-of-the-art technology in a congenial,disciplined and a research-oriented environment. • Fostering cultural, ethical, moral and social values in the human resources of the institution. • Reinforcing our bonds with the Parents, Industry, Alumni, and to seek their suggestions for innovating and excelling in every sphere of quality education.

DEPARTMENT VISION
The Electronics & Communication Engineering department shall impart quality technical education and entrepreneurship skills to develop creative individuals to face changing global scenario.

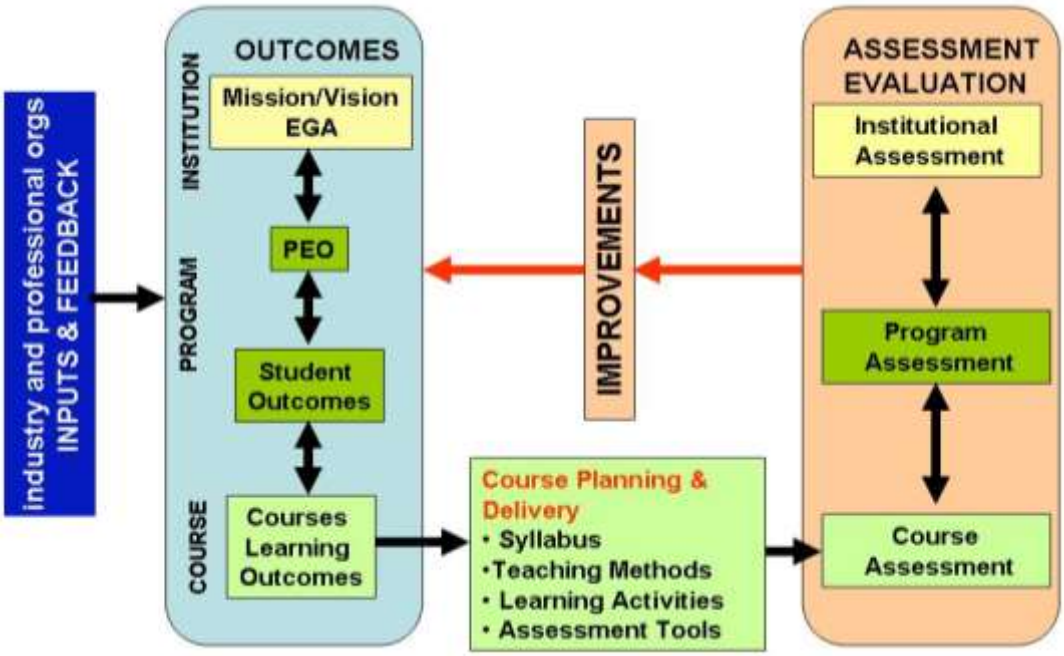
DEPARTMENT MISSION
To augment the national talent pool, with Electronics and Communication Engineers having all-encompassing technical knowledge, principled practices and nationalistic outlook.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)	
1.	The graduates will acquire core competence in basic science and Electronics and Communication Engineering fundamentals necessary to formulate, analyze, and solve engineering problems and to pursue advanced study or research.
2.	The graduates will engage in the activities that demonstrate desire for ongoing personal and professional growth and self-confidence to adapt to rapid and major changes.
3.	The graduates will maintain high professionalism and ethical standards, effective oral and written communication skills, work as part of teams on multidisciplinary projects under diverse professional environments, and relate engineering issues to the society, global economy and to emerging technologies.

PROGRAM OUTCOMES (POs)	
1.	**Engineering Knowledge:** Apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.
2.	**Problem Analysis:** Identify, formulate, research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
3.	**Design/ Development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet specified needs with appropriate consideration for public health and safety, 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 information to provide valid conclusions.
5.	**Modern Tool Usage:** Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
6.	**The Engineer and Society:** Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.
7.	**Environment and Sustainability:** Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.
8.	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of 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 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 lifelong learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)	
1.	Understanding and applying the mathematical and scientific concepts, for analysis and design of basic Electronics and Communication systems.
2.	Developing critical thinking abilities coupled with competence in use of computational tools for professional growth; complimented with communication skills and leadership attributes.
3.	Identifying societal needs and sensitizing individuals towards finding innovative solutions to contemporary issues with multidisciplinary outlook.

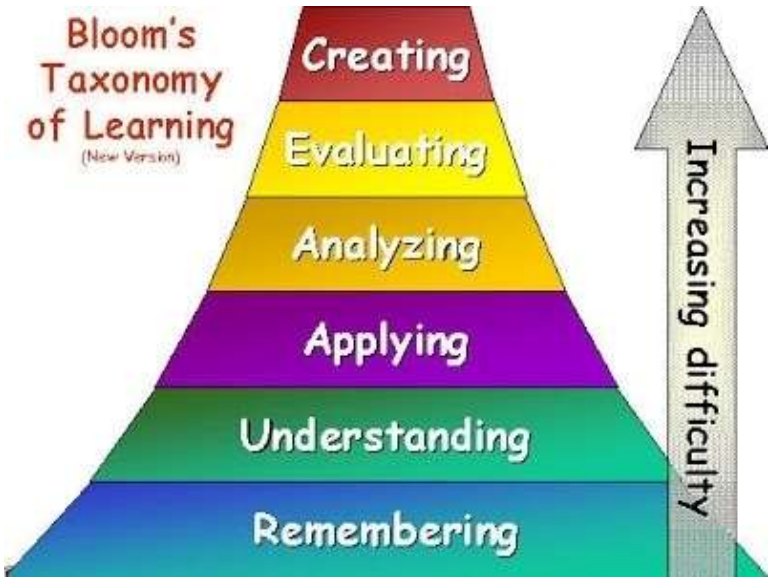
OUTCOME BASED EDUCATION (OBE)



BLOOM'STAXONOMYOFLEARNINGOBJECTIVES

Bloom's Taxonomy in its various forms represents the process of learning. It was developed in 1956 by Benjamin Bloom and modified during the 1990's by a new group of cognitive psychologists, led by Lorin Anderson (a former student of Bloom's) to make it relevant to the 21stcentury. The **revised taxonomy** given below emphasizes what a learner "Can Do".

Lower order thinking skills (LOTS)		
L1	Remembering	Retrieve relevant knowledge from memory.
L2	Understanding	Construct meaning from instructional material, including oral, written, and graphic communication.
L3	Applying	Carry out or use a procedure in a given situation–using learned knowledge.
Higher order thinking skills (HOTS)		
L4	Analyzing	Breakdown knowledge into its components and determine the relationships of the components to one another and then how they relate to an overall structure or task.
L5	Evaluating	Make judgments based on criteria and standards, using previously learned knowledge.
L6	Creating	Combining or reorganizing elements to form a coherent or functional whole or into a new pattern, structure or idea.



KLS Gogte Institute of Technology
1st Year B.E. (Common to all programs)
Scheme of Teaching and Examination 2021-22
(Effective from the academic year 2021-22)

Total credits for B.E. Program: 160

Abbreviations used:
BSC - Basic Science Course, **PCC-** Professional Core Course, **HSMC -** Humanity and Social Science & Management Courses, PEC- Professional Elective Course, **OEC –** Open Elective Course, **AEC –** Ability Enhancement Courses. **INT –** Internships, **UHV –**Universal Human Values, **MP -** Mini Project.
L –Lecture, **T –** Tutorial, **P-** Practical/Drawing, **S –** Self Study Component, **CIE –**Continuous Internal Evaluation, **SEE –**Semester End Examination

As per the guidelines of UGC CBCS the courses can be classified into:

Foundation Courses: The Foundation Courses are of two kinds:
These courses are the courses based upon the content that leads to Knowledge enhancement. These courses provide opportunities to improve technological knowledge before entering industry as well as preparing students for higher degrees in technological subjects. They are mandatory for all disciplines. These courses will have 4 credits per course.
The courses are: **Basic Science Courses (BSC), Engineering Science Courses (ESC)**.

Professional Core Courses (PCC): This is the course which is to be compulsorily studied by a student as a core requirement to complete the requirements of a program in a said discipline of study. These courses will have 4 credits per course.

Universal Human Value Courses (UHV): These are value-based courses aimed at man making education.
Humanities and Social Science including Management Studies Courses (HSMS). Humanity and Social Science Courses: The Humanities and Social Sciences are the studies of human behavior and interaction in social, cultural, environmental, economic, and political contexts. The Humanities and Social Sciences have a historical and contemporary focus, from personal to global contexts, and consider challenges for the future. Students will develop the ability to question, think critically, solve problems, communicate effectively, make decisions, and adapt to change. Thinking about and responding to issues requires an understanding of the key historical, geographical, political, economic, and societal factors involved, and how these different factors interrelate. Humanities and Social Science Courses Includes-Technical-English, Courses on Regional/State languages (Kannada), etc.

Elective Courses: This is course, which can be chosen from the pool of papers. It may be supportive to the discipline/ providing extended scope/enabling an exposure to some other discipline / domain / nurturing student proficiency skills. These courses will have 3 credits per course.
An elective may be **Discipline Centric Course (PEC)** or may be chosen from other discipline (**Open Elective Course- OEC**).

Ability Enhancement Courses (AEC): The Ability Enhancement (AE) Courses may be of two kinds: Ability Enhancement Compulsory Courses (AECC) and Skill Enhancement Courses (SEC).
"AECC" courses are the courses based upon the content that leads to Knowledge enhancement; Environmental Science, English. Biology for Engineers, Bioinformatics, Music and Vibration, Art and Architecture etc

"SEC" courses are value-based and/or skill-based and are aimed at providing hands-on-training, competencies, skills, etc.

Mandatory Non-Credit Courses (MNC): These courses are mandatory but do not have any credits and students must successfully complete these courses before the completion of degree.

Credit definition:

Offline Courses	Online Courses
• 1 hour Lecture **(L)** per week = 1 Credit • 2 hours Tutorial **(T)** per week = 1 Credit, • 2 hours Practical /Drawing **(P)** per week = 1 Credit	04 weeks =1 Credit 08 weeks = 2 Credit 12 weeks = 3 Credit
• Four-credit courses are to be designed for 50 hours of Teaching-Learning process. • Three credit courses are to be designed for 40 hours of Teaching-Learning process. • Two credit courses are to be designed for 25 hours of Teaching-Learning process. • One credit courses are to be designed for 15 hours of Teaching-Learning process.	

Semester wise distribution of credits for B.E program

Year	Semester	Credits	Total/Year	Cumulative Credits
1st	AE, CV, ME (I-P & II-C)	19+21	40	40
	CSE, EC, EE, ISE (I-C & II-P)	18+22		
2nd	III	20	40	80
	IV	20		
3rd	V	23	45	125
	VI	22		
4th	VII	17	35	160
	VIII	18		
Total			160	

Curriculum frame work:

Structure of Undergraduate Engineering program

S.No.	Category of courses	KLS GIT Breakup of credits
1	Humanities and Social Sciences including Management courses (English, Kannada, Indian Constitution, Environmental Sciences and Management)	8
2	Basic Science courses	22
3	Engineering Science courses including workshop, drawing	20
4	Professional Core Courses	49
5	Professional Elective courses relevant to chosen specialization/branch	9
6	Open subjects – Electives from other technical, emerging, arts commerce and	9
7	Mini, Project, Major Project work and Seminar	9
8	Summer Internship and Research /Industrial Internship	20
9	Ability Enhancement Courses, including Research Methodology, NCC/NSS/ Sports/Ex- Curricular, Online Certification Course	12
10	Universal Human Values	2
	TOTAL	**160**

L-T-P Model for Courses

	Contact Hours				Credits	
S.No.	**L-T-P**	**Lecture**	**Tutorial**	**Practical**	**L-T-P**	**Total**
1	3 - 0 - 0	3	0	0	3 - 0 - 0	3
2	3 - 2 - 0	3	2	0	3 - 1 - 0	4
3	3 - 0 - 2	3	0	2	3 - 0 - 1	4
4	2 - 0 - 2	2	0	2	2 - 0 - 1	3
5	1 - 0 - 4	1	0	4	1 - 0 - 2	3

Theory courses having the corresponding lab are converted to integrated type course. Also, the electives (if possible) can also be made integrated type.

Integrated courses (Professional Core/Electives): Integrated courses will have **Theory Syllabus with Practical Syllabus of the same course**. Continuous Internal Evaluation (CIE) will be conducted for the practical topics. In such a course there could be **No Semester End Examination (SEE) for the practical syllabus** of the course.

KLS Gogte Institute of Technology

B.E. in Electronics and Communication

3rd and 4th Semester B.E. Scheme of Teaching and Examination 2021-22

(Effective from the academic year 2021-22)

Total credits for B.E. Program: 160

As per the guidelines of UGC CBCS the courses can be classified into:

Abbreviations used:

BSC - Basic Science Course, **PCC-** Professional Core Course, **HSMC -** Humanity and Social Science & Management Courses, **PEC-** Professional Elective Course, **OEC –** Open Elective Course, **AEC –** Ability Enhancement Courses. **INT –** Internships, **UHV –**Universal Human Values, **MP -** Mini Project.
L –Lecture, **T –** Tutorial, **P-** Practical/Drawing, **S –** Self Study Component, **CIE –**Continuous Internal Evaluation, **SEE –**Semester End Examination

Foundation Courses: The Foundation Courses are of two kinds:
These courses are the courses based upon the content that leads to Knowledge enhancement. These courses provide opportunities to improve technological knowledge before entering industry as well as preparing students for higher degrees in technological subjects. They are mandatory for all disciplines. These courses will have 4 credits per course.
The courses are: **Basic Science Courses (BSC), Engineering Science Courses (ESC)**.

Professional Core Courses (PCC): This is the course which is to be compulsorily studied by a student as a core requirement to complete the requirements of a program in a said discipline of study. These courses will have 4 credits per course.

Universal Human Value Courses (UHV): These are value-based courses aimed at man making education.
Humanities and Social Science including Management Studies Courses (HSMS). Humanity and Social Science Courses: The Humanities and Social Sciences are the studies of human behavior and interaction in social, cultural, environmental, economic, and political contexts. The Humanities and Social Sciences have a historical and contemporary focus, from personal to global contexts, and consider challenges for the future. Students will develop the ability to question, think critically, solve problems, communicate effectively, make decisions, and adapt to change. Thinking about and responding to issues requires an understanding of the key historical, geographical, political, economic, and societal factors involved, and how these different factors interrelate. Humanities and Social Science Courses includes-Technical-English, Courses on Regional/State languages (Kannada), etc.

Elective Courses: This is course, which can be chosen from the pool of papers. It may be supportive to the discipline/ providing extended scope/enabling an exposure to some other discipline / domain / nurturing student proficiency skills. These courses will have 3 credits per course.
An elective may be **Discipline Centric Course (PEC)** or may be chosen from other discipline (**Open Elective Course- OEC**).
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"AECC" courses are the courses based upon the content that leads to Knowledge enhancement; Environmental Science, English. Biology for Engineers, Bioinformatics, Music and Vibration, Art and Architecture etc

"SEC" courses are value-based and/or skill-based and are aimed at providing hands-on-training, competencies, skills, etc.

Mandatory Non-Credit Courses (MNC): These courses are mandatory but do not have any credits and students must successfully complete these courses before the completion of degree.

Theory courses having the corresponding lab are converted to integrated type course. Also, the electives (if possible) can also be made integrated type.

Integrated courses (Professional Core/Electives): Integrated courses will have **Theory Syllabus with Practical Syllabus of the same course**. In such a course there could be **no Semester End Examination (SEE) for the practical syllabus** of the course, however, Continuous Internal Evaluation (CIE) will be conducted for the practical topics.

Credit definition:

Offline Courses	**Online Courses**
• 1-hour Lecture **(L)** per week = 1 Credit • 2 hours Tutorial **(T)** per week = 1 Credit, • 2 hours Practical /Drawing **(P)** per week = 1 Credit	04 weeks =1 Credit 08 weeks = 2 Credit 12 weeks = 3 Credit
• Four-credit courses are to be designed for 50 hours of Teaching-Learning process. • Three credit courses are to be designed for 40 hours of Teaching-Learning process. • Two credit courses are to be designed for 25 hours of Teaching-Learning process. • One credit courses are to be designed for 15 hours of Teaching-Learning process.	

Semester wise distribution of credits for B.E program

Year	**Semester**	**Credits**	**Total/Year**	**Cumulative Credits**
1st	**AE, CV, ME (I-P & II-C)**	19+21	**40**	**40**
	CSE, EC, EE, ISE (I-C & II-P)	18+22		
2nd	**III**	20	**40**	**80**
	IV	20		
3rd	**V**	23	**45**	**125**
	VI	22		
4th	**VII**	17	**35**	**160**
	VIII	18		
Total			**160**	

Curriculum frame work:

Structure of Undergraduate Engineering program

S.No.	Category of courses	VTU Breakup of credits	KLSGIT Breakup of credits
1	Humanities and Social Sciences including Management courses (English, Kannada, Indian Constitution, Environmental Sciences and Management)	10	8
2	Basic Science courses	23	22
3	Engineering Science courses including workshop, drawing	20	20
4	Professional Core Courses	46	49
5	Professional Elective courses relevant to chosen specialization/branch	9	9
6	Open subjects – Electives from other technical, emerging, arts commerce and	6	9
7	Mini, Project, Major Project work and Seminar	13	9
8	Summer Internship and Research /Industrial Internship	20	20
9	Ability Enhancement Courses, including Research Methodology, NCC/NSS/ Sports/Ex- Curricular, Online Certification Course	11	12
10	Universal Human Values	2	2
	TOTAL	**160**	**160**

L-T-P Model for Courses

	Contact Hours				Credits	
S.No.	**L-T-P**	**Lecture**	**Tutorial**	**Practical**	**L-T-P**	**Total**
1	3 - 0 - 0	3	0	0	3 - 0 - 0	3
2	3 - 2 - 0	3	2	0	3 - 1 - 0	4
3	3 - 0 - 2	3	0	2	3 - 0 - 1	4
4	2 - 0 - 2	2	0	2	2 - 0 - 1	3
5	1 - 0 - 4	1	0	4	1 - 0 - 2	3

New Scheme of Teaching (Including branch specific additional course)

B.E. (Common to all branches)

Scheme of Teaching and Examination 2021-22

		1st Semester	**For CSE, EC, EE and ISE – Chemistry Cycle**		Hours/week			Total contact hours/week	Credits	Examination		
S.No.	Course Type	Course Code	Course Title	Teaching Dept.	L	T	P			CIE	SEE	Total
1	BSC	21MAT11	Calculus and Linear Algebra	Mathematics	3	2	0	5	4	100	100	200
2	BSC	21CHE12	Applied Chemistry	Chemistry	3	0	0	3	3	100	100	200
3	ESC	21ELE13	Basics of Electrical and Electronics Engg.	E & E	3	0	0	3	3	100	100	200
4	ESC	21CCP14	Problem Solving using C	CSE & ISE	3	0	0	3	3	100	100	200
5	BSC	21CHL15	Chemistry Lab	Chemistry	0	0	2	2	1	50	50	100
6	ESC	21CPL16	C Programming Lab	CSE & ISE	0	0	2	2	1	50	50	100
7	ESC	21EEL17	Electrical and Electronics Engg. Lab	E & E	0	0	2	2	1	50	50	100
8	HSMS	21ENG18	Communicative English	English	1	0	0	1	1	50	50	100
9	AEC	21AEC191	Introduction to Innovation and Startup	Any Dept.	1	0	0	1	1	50	--	50
		21AEC192	Leadership and Public Speaking									
		21AEC193	Interpersonal Skills									
			TOTAL						**18**			

		2nd Semester	**For CSE, EC, EE and ISE – Physics Cycle**		Hours/week			Total contact hours/week	Credits	Examination		
S.No.	Course Type	Course Code	Course Title	Teaching Dept.	L	T	P			CIE	SEE	Total
1	BSC	21MAT21	Differential Equations and Laplace Transforms	Mathematics	3	2	0	5	4	100	100	200
2	BSC	21PHY22	Applied Physics	Physics	3	0	0	3	3	100	100	200
3	ESC	21CIV23	Engineering Mechanics	CV	3	0	0	3	3	100	100	200
4	ESC	21EME24	Basics of Mechanical Engg.	ME	3	0	0	3	3	100	100	200
5	ESC	21EGR25	Engineering Graphics	ME	1	0	4	5	3	100	100	200
6	BSC	21PHL26	Applied Physics Lab	Physics	0	0	2	2	1	50	50	100
7	AEC	21IIL27	Idea to Innovation Lab	All Engg. depts	0	0	2	2	1	100	--	100
8	HSMS	21ENG28	Professional Writing Skills in English	English	1	0	0	1	1	50	50	100
9	ESC	21ACS29	Object Oriented Programming Using C++	CSE	3	0	0	3	3	100	100	200
		21AEC29	Fundamentals of Electronics and Communication Engineering	E & C								
		21AEE29	Fundamentals of DC and AC Systems	E & E								
		21AIS29	Object Oriented Programming Using C++	ISE								
			TOTAL						**22**			

NOTE:

Summer Internship - I:

All the 1st year students admitted to B.E. program shall have to undergo a **mandatory summer internship of03 weeks** during the vacation of II semesters. Summer Internship shall include Inter / Intra Institutional activities. A Viva-voce examination shall be conducted during III semester and the prescribed credit shall be included in III semesters. The internship shall be considered as a head of passing and shall be considered for the award of degree. Those, who do not take up / complete the internship shall be declared fail and shall have to complete during subsequent University examination after satisfying the internship requirements. **SEE component will be the only seminar/Presentation and question answer session.** (The faculty coordinator or mentor has to monitor the students' internship progress and interact to guide them for the successful completion of the internship.

The course prescribed to lateral entry Diploma holders admitted to III semester of Engineering programs:

1. The **mandatory non – credit courses Additional Mathematics I and II (MATDIP)prescribed for III and IV semesters respectively**, to the lateral entry Diploma holders admitted to III semester of BE/B.Tech., programs, 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 requirements during subsequent semester/s to appear for CIE. These Courses shall not be considered for vertical progression, but completion of the courses shall be mandatory for the award of degree.
2. All the students admitted under the lateral entry category shall have to undergo a mandatory **SUMMER INTERNSHIP-Iof 03 weeks during the intervening vacation of III and IV semesters**. Summer Internship shall include Inter / Intra Institutional activities. A Viva-voce examination shall be conducted during the IV semester and the prescribed credit shall be included in the III semester after students clear this head. The internship shall be considered as a head of passing and shall be considered for the award of degree. Those, who do not take up / complete the internship shall be declared fail and shall have to complete during subsequent University examination after satisfying the internship requirements. (The faculty coordinator or mentor has to monitor the students' internship progress and interact to guide them for the successful completion of the internship.)

3rd Semester B.E.				Teaching Dept.	Hours/week			Total contact hours/ week	Credits	Examination		
S.No.	Course Type	Course Code	Course Title		L	T	P			CIE	SEE	Total
1	BSC	21MATEC31	Transforms and Probability Theory	Mathematics	3	0	0	3	3	100	100	200
2	IPCC	21EC32	Applied electronic circuits	E & C	3	0	2	5	4	100	100	200
3	IPCC	21EC33	Digital system design	E & C	3	0	2	5	4	100	100	200
4	IPCC	21EC34	Sensors, measurement and data acquisition systems	E & C	3	0	2	5	4	100	100	200
5	INT	21EC35	Summer Internship -I	E & C					2	50	50	100
6	HSMS	21EC36	Constitution of India		1	0	0	1	1	50	50	100
7	UHV	21EC37	Social Connect and Responsibility		1	0	0	1	1	50	50	100
8	AEC	21AECEC38x	AEC- III	E & C	1	0	0	1/2	1	50	50	100
					0	0	2					
9	BSC*	21DMATEC31	Bridge Course Mathematics-I	Mathematics	3	0	0	3	MNC	100	--	100
			TOTAL						**20**	**600+ 100***	**600**	**1200+ 100***

*Only for Diploma Lateral Entry Students

4th Semester B.E.				Teaching Dept.	Hours/week			Total contact hours/ week	Credits	Examination		
S.No.	Course Type	Course Code	Course Title		L	T	P			CIE	SEE	Total
1	BSC	21MATEC41	Advanced Linear Algebra, Vector Calculus and Statistics	Mathematics	3	0	0	3	3	100	100	200
2	IPCC	21EC42	Microcontrollers	E & C	3	0	2	5	4	100	100	200
3	IPCC	21EC43	Signals and Control Systems	E & C	3	0	2	5	4	100	100	200
4	IPCC	21EC44	Principles of Communication Systems	E & C	3	0	2	5	4	100	100	200
5	AEC	21EC45	Health and Wellness	E & C	2	0	0	2	2	50	50	100
6	HSMS	21EC46	Kannada	Kannada	0	1	0	1	1	50	50	100
7	UHV	21EC47	Universal Human Values and Professional Ethics		1	0	0	1	1	50	50	100
8	AEC	21AECEC48x	AEC- IV	E & C	1	0	0	1/2	1	50	50	100
					0	0	2					
9	BSC*	21DMATEC41	Bridge Course Mathematics-II	Mathematics	3	0	0	3	MNC	100	--	100
			TOTAL						**20**	**600+ 100***	**600**	**1200+ 100***

*Only for Diploma Lateral Entry Students

List of Ability Enhancement Courses (AEC)

Course Code	Course Title
21AECEC381/481	Software development concepts
21AECEC382/482	Fundamentals of microprocessor & microcontrollers
21AECEC383/483	MATLAB and Simulink
21AECEC384/484	Design thinking

Summer Internship-II: At the End of **fourth Semester four - weeks Summer Internship** Shall Be Carried Out – Based on Industrial/Govt./NGO/MSME/Rural Internship/Innovation/Entrepreneurship. It will be credited in fifth Semester. All the students admitted shall have to undergo mandatory internship of 04 weeks during the vacation of IV semesters. A Viva-Voce examination shall be conducted during V semester and the prescribed credit shall be included in V semester. Internship shall be considered as a head of passing and shall be considered for the award of degree. Those, who do not take up/complete the internship shall be declared fail and shall have to complete during subsequent University examination after satisfying the internship requirements. SEE component will be the only seminar/Presentation and question answer session. (The faculty coordinator or mentor has to monitor the students' internship progress and interact to guide them for the successful completion of the internship).

Kannada: Balake Kannada (Kannada for communication) is for non-Kannada speaking, reading, and writing students, and Samskrutika Kannada (Kannada for Administration) is for students who speak, read and write Kannada.

Professional Elective Courses [5th-7th sem]: Electives will be offered by the respective department.
Open Elective Courses [5th-7th sem]: All Open Electives are offered to students of all branches in general. However, a student shall choose an open Elective from the list in such a manner that he/she has not studied the same course in any form during the Programme. Students can select any one of the open electives offered by other Departments except those that are offered by the parent Department.
Selection of an open elective shall not be allowed if,

- The candidate has studied the same course during the previous semesters of the programme.
- The syllabus content of open electives is similar to that of the Departmental core courses or professional electives.
- A similar course, under any category, is prescribed in the higher semesters of the programme.
- Registration to electives shall be documented under the guidance of Programme Coordinator/ Advisor/Mentor.

Mini-project work(Single discipline/Interdisciplinary)[6th sem]: Based on the ability/abilities of the student/s and recommendations of the mentor, a single discipline or a multidisciplinary Mini-project can be assigned to an individual student or a group having not more than 4 students. (or Mini Project is a laboratory-oriented course which will provide a platform to students to enhance their practical knowledge and skills by the development of small systems/applications)
Research/Industrial Internship - At the End of the sixth / Seventh semester (in two cycles to accommodate all the students of the University) Research/Industrial Internship shall be carried out – Based on industrial/Govt./NGO/MSME/Rural Internship/Innovation/Entrepreneurship. All the students admitted shall have to undergo a mandatory internship of 24 weeks during the vacation of VI/VII semesters. A Viva-Voce examination shall be conducted during VII/VIII semester and the prescribed credit shall be included in VII/VIII semester. The internship shall be considered as a head of passing and shall be considered for the award of degree. Those, who do not take up/complete the internship shall be declared fail and shall have to complete during subsequent University examination after satisfying the internship requirements.
Research internship: Students have to take up research internships at Centers of Excellence (CoE) / Study Centers established in the same institute and /or out of the institute at reputed research organizations / Institutes. A research internship is intended to give you the flavour of current research going on a particular topic/s. The

internships serve this purpose. They help students get familiarized with the field, the skill needed the effort amount and kind of effort required for carrying out research in that field.

Certification (6- 8 weeks duration;shall have proctored examination): **It can be done any time between 5th – 8th sem and credited during the 8th semester.**

- NPTEL/SWAYAM/NASSCOM /Industry-Institute partnered certification (List of the courses will be notified by the departments).

Transforms and Probability Theory

Course Code	**21MATEC31**	**Course type**	**BSC**	**Credits L-T-P**	3 – 0– 0
Hours/week: L-T-P	3 – 0 – 0			**Total credits**	3
Total Contact Hours	L = 40 Hrs; T = 0 Hrs;P = 0 Hrs Total = 40Hrs			**CIE Marks**	100
Flipped Classes content	10 Hours			**SEE Marks**	100

Course learning objectives	
1.	Learn Fourier analysis of periodic and non-periodic systems.
2.	Get acquainted with discrete and continuous time functions and their Fourier Analysis.
3.	Study the frequency response for circuits using Laplace Transforms
4.	Learn probability distributions and their applications.

Pre-requisites: Basic Probability, Statistics, Basic Laplace transforms, convergence and divergence of series

Unit – I	**Contact Hours = 8 Hours**
Fourier Analysis of continuous time functions Classification of time functions – continuous, discrete, periodic and non-periodic functions. Fourier analysis of continuous time periodic functions using continuous time Fourier series (CTFS), properties of CTFS (proof not necessary), Numericals. Fourier analysis of continuous time non-periodic functions using continuous time Fourier transform (CTFT), properties of CTFT(proof not necessary), relationship between CTFS and CTFT, numericals pertaining to standard time functions (unit impulse, unit step, right sided and two-sided exponential functions, rectangular function, constant of magnitude, sinusoidal, complex exponential, signum function).	

Unit – II	**Contact Hours = 8 Hours**
Fourier Analysis of discrete time functions Fourier analysis of discrete time periodic functions using discrete time Fourier series (DTFS), properties of DTFS (proof not necessary), Numericals. Fourier analysis of discrete time non-periodic functions using discrete time Fourier transform (DTFT), properties of DTFT (proof not necessary), relationship between DTFS and DTFT, Numericals pertaining to standard time functions (unit impulse, unit step, right sided and two-sided exponential functions, rectangular function, constant of magnitude, sinusoidal, complex exponential, signum function).	

Unit – III	Contact Hours = 8 Hours
Laplace and Z transforms: Laplace transform as a generalization of CTFT, properties, numericals pertaining to standard continuous time functions, **Case study:** Mathematical modelling of continuous time system (RC and RL networks) using Laplace transform and its frequency response. Z transform as a generalization of DTFT, properties, numericals pertaining to standard discrete time functions, **Case study:** Mathematical modelling of discrete time system (moving average system, accumulator, finite difference) using Z transform and its frequency response.	

Unit – IV	Contact Hours = 8 Hours
Probability Theory: Axiomatic definition of probability, experiments, sample space, events, joint and conditional probability, Baye's theorem, Numericals. Definition of Random vector, continuous (Uniform, Exponential, Gaussian, Rayleigh PDFs) and discrete random vector (Bernoulli, Binomial and Poisson PMFs), CDF. Expected value of a random vector (CRV and DRV), Moments, Central moments. Joint random vector: joint PDF and CDF, marginal and conditional PDFs, covariance and correlation coefficients. Functions of random vector.	

Unit –V	Contact Hours = 8 Hours
Random Process: Definition and classification, mathematical tools for studying random processes – mean function, autocorrelation function, autocovariance function and cross correlation function, Numericals. Stationary and Ergodic random process. Properties of autocorrelation function (mention only).	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	2	2	2	2	2

Books	
	Text Books:
1.	Simon Haykin and Barry Van Veen, "Signals and Systems", 2nd edition, Wiley, 2003 and onwards.
2.	S. L. Miller, D. G. Childers, "Probability and Random Processes", Academic Press, 2010 and onwards.
3.	P. Z. Peebles, "Probability, Random Variables, and Random Signal Principles", McGraw Hill, 4th edition, 2017 and onwards.
	Reference Books:
1.	Erwin Kreyszig –Advanced Engineering Mathematics, John Wiley & Sons Inc., 9th Edition, 2006 and onwards
2.	B.V.Ramana –Engineering Mathematics, Tata Mcgraw Hill Publishing Company Limited 2004 and onwards
	E-resourses (NPTEL/SWAYAM.. Any Other)
1.	https://onlinecourses.nptel.ac.in/noc22_ee28/preview (**Random Processes)**
2.	https://nptel.ac.in/courses/117105085 (**Fourier Analysis of discrete time functions**)

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Online Quizzes (Surprise and Scheduled)
3.	Flipped Classes	3.	Open Book Tests (OBT)
4.	Online classes	4.	Course Seminar
		5.	Semester End Examination

Course Outcome (COs) At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)				
Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create		**Learning Level**	**PO(s)**	**PSO(s)**
1.	**Understand and Apply Fourier Analysis for periodic and non-periodic signals.**	Ap	1	1
2.	**Apply DTFS to deal with Fourier analysis of Discrete Signals**	Ap	1	1
3.	**Apply Laplace Transforms and Z transforms**	Ap	1	1
4.	**Understand Random variables and various associated terminology.**	Un	1	1
5.	**Understand Random processes and their properties.**	Un	1	1

Scheme of Continuous Internal Evaluation (CIE): Theory course

Components	Addition of two IA tests	Online Quiz	Addition of two OBAs/Math tools	Course Seminar	Total Marks
Marks	25+25= 50	4* 5 marks = 20	10+10 =20	10	100

OBA- Open Book Assignment
Minimum score to be eligible for SEE: 40 OUT OF 100

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass:** Score should be $\geq$ 35%, however overall score of CIE + SEE should be $\geq$ 40%.
3.	Question paper contains 3 parts - A,B & C, wherein students have to answer any 5 out of 7 questions in part A, 5 out of 10 questions choosing 1 question from each unit in part B & 1 out of 2 questions in part C.

CO-PO Mapping (Planned)													**CO-PSO Mapping (Planned)**		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
1	✓												✓		
2	✓												✓		
3	✓												✓		
4	✓												✓		
5	✓												✓		
Tick mark(✓)															

Third Semester

Bridge Course Mathematics-I

(Common to all Branches)

(A Bridge course for Lateral Entry students of III Sem. B. E.)

Course Code	21DMATEC31	**Course type**	**BSC (MNC for Diploma)**	**Credits L-T-P**	0 – 0 – 0
Hours/week: L - T- P	3– 0 – 0		**Total credits**		0
Total Contact Hours	L = 40 Hrs; T = 0 Hrs; P = 0 Hrs Total = 40 Hrs		**CIE Marks**		100
			SEE Marks		0

Course learning objectives	
1.	Get acquainted with different applications of Calculus.
2.	Understand the basic concepts of partial differentiation.
3.	Get familiar with Laplace transforms and various properties associated with it.
4.	Learn to find the inverse Laplace Transforms of all the functions discussed earlier.
5.	Get familiar with various topics in Linear Algebra.

Pre-requisites: Basic Trigonometry, Calculus ,Algebra

Unit – I: Calculus	**Contact Hours = 8 Hours**
Introduction to limits, continuity and differentiation: Polar Curves, angle between radius vector and tangent, angle between polar curves, Radius of curvature (Cartesian and polar form only).	

Unit – II: Partial Differentiation:	**Contact Hours = 8 Hours**
Definition and simple problems. Total Differentiation-Problems. Partial Differentiation of Composite functions – Problems. Maxima and minima of function of two variables. Lagrange's method of Undetermined multipliers. Jacobians.	

Unit-III: Laplace Transforms	**Contact Hours = 8 Hours**
Definition. Laplace Transforms of elementary functions. Properties. Laplace Transforms of $e^{at}f(t)$,$t^n f(t)$,$\int_0^t f(t)dt$, $\frac{f(t)}{t}$ (without proof), Periodic functions (with proof).	

Unit-IV: Inverse Laplace Transforms	**Contact Hours = 8 Hours**
Inverse Laplace Transforms-Problems, Convolution Theorem -Problems. Laplace transform of the derivative. Solution of Linear Differential Equation using Laplace Transforms, Applications- L-C-R series circuit.	

Unit – V: Linear Algebra-I	**Contact Hours = 8 Hours**
Rank of a matrix by elementary transformation, consistency of system of linear equations-Gauss Jordan method and Gauss-Seidal method. Eigen value and Eigen vectors – Rayleigh's Power method.	

Books	
	Text Books:
1.	B.S. Grewal – Higher Engineering Mathematics, Khanna Publishers, 42nd Edition, 2012.
2.	Erwin Kreyszig –Advanced Engineering Mathematics, John Wiley & Sons Inc., 9th Edition, 2006.
3.	B. V. Ramana- Higher Engineering Mathematics, Tata McGraw-Hill Education Private Limited, Tenth reprint 2010 and onwards.
	Reference Books:
1.	Peter V. O' Neil – Advanced Engineering Mathematics, Thomson Brooks/Cole, 7th Edition, 2011.
2	Glyn James – Advanced Modern Engineering Mathematics, Pearson Education, 4th Edition, 2010.

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Open Book Tests (OBT)
3.	Online Classes	3.	Course Seminar
		4.	Semester End Examination

Course Outcome (COs)

At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)

	Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create	**Learning Level**	**PO(s)**	**PSO(s)**
1.	**Review** basic concepts of Calculus.	Un	1	1
2.	**Understand** multivariable Calculus.	Un	1	1
3.	**Understand** Laplace Transforms and its properties.	Un	1	1
4.	**Understand** Inverse Laplace Transforms and its properties.	Un	1	1
5.	**Understand** basic Linear Algebra**.**	Un	1	1

Scheme of Continuous Internal Evaluation (CIE):

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass:** Score should be $\geq$ 35%, however overall score of CIE + SEE should be $\geq$ 40%.
3.	Question paper contains 3 parts - A,B & C, wherein students have to answer any 5 out of 7 questions in part A, 5 out of 10 questions choosing 1 question from each unit in part B & 1 out of 2 questions in part C.

CO-PO Mapping (Planned)													CO-PSO Mapping (Planned)		
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	✓												✓		
2	✓												✓		
3	✓												✓		
4	✓												✓		
5	✓												✓		
Tick mark(✓)															

APPLIED ELECTRONIC CIRCUITS

Course Code	**21EC32**	**Course type**	**IPCC**	**Credits L-T-P**	3 – 0 – 1
Hours/week: L - T- P	3 – 0 – 2			**Total credits**	4
Total Contact Hours	L = 40 Hrs; T = 0 Hrs; P = 20 Hrs Total = 60 Hrs			**CIE Marks**	100
Flipped Classes content	10 Hours			**SEE Marks**	100

Course learning objectives	
1.	Apply various network theorems, node voltage and mesh current methods to simplify and find solution to electrical circuits.
2.	Design and compare biasing circuits for transistor amplifiers & explain the transistor switching. Study the ac operation of the transistor at low frequencies via transistor modeling.
3.	Explain the construction, operation and characteristics of JFETs and MOSFETs, CMOS
4.	Design and compare various biasing techniques for FET amplifier.
5.	Study the operation of FETs via small signal modeling and further apply it to design FET amplifier networks.

Required Knowledge of: Circuit Theory and Basic Electronics

Unit – I	**Contact Hours = 8 Hours**
Basics of Network Analysis: Star-Delta Transformation, Power supplies in Series and parallel combination, Mesh analysis, Node Analysis, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem (only DC analysis), Two-Port Network: z-parameters, h-parameters, y-parameters. **Case study:** Resonant circuits as tuning circuits	

Unit – II	**Contact Hours = 8 Hours**
Transistor Biasing: Introduction to BJT, Fixed bias circuit, Emitter stabilized biased circuit, Voltage divider bias circuit, Design operations, Numericals, Transistor as a switch. **BJT AC Analysis:** BJT transistor modelling, Hybrid equivalent model, re transistor model (common emitter configuration only) **Case study:** AC analysis of transistor amplifier circuit using h parameter model.	

Unit – III	**Contact Hours = 8 Hours**
Field Effect Transistors: Introduction, Construction, basic operation and characteristics of: JFET, Depletion-type MOSFET and Enhancement-type MOSFET, Comparison of BJT and FET, CMOS Technology: working principle, characteristics and its applications. **Case study:** Implementation of CMOS inverter circuit.	

Unit – IV	**Contact Hours = 8 Hours**
FET Biasing: Introduction, Fixed biased circuit, Self-Bias circuit, Voltage divider biasing circuit for n-channel JFET, Feedback biasing arrangement and Voltage divider biasing arrangement for n-channel enhancement MOSFET. **Case study:** Design of FET fixed bias circuit and voltage divider bias circuit for given Q-pt.	

Unit – V	Contact Hours = 8 Hours
FET Amplifiers: Introduction, FET small signal model, AC analysis of common source JFET Fixed-Bias Amplifier circuit, Depletion-type MOSFET ac equivalent model, Enhancement type MOSFET ac equivalent model. **Case study:** AC analysis of JFET Source Follower (Common-Drain) Configuration.	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	2	2	2	2	2

List of Experiments

Unit No.	No. of Experiments	Topic(s) related to Experiment
1	1	Mesh analysis and node analysis for DC circuits
1	2	Verification of Thevenin's and Maximum Power Transfer Theorem
2	1	Transistor biasing using voltage divider bias
2	1	BJT RC coupled amplifier
5	1	FET amplifier

Unit No.	Self-Study Topics
1	Reciprocity theorem, Millman's theorem
2	Hybrid Equivalent model for Common collector configuration
3	Digital Controlled Analog switch using CMOS
4	Numerical on JFET based voltage divider bias circuit
5	AC analysis of E-MOSFET Voltage-Divider Configuration

Books	
	Text Books:
1.	ME Van Valkenburg, Network Analysis, Prentice Hall of India, 3rd Edition, 2000.
2.	D. Roy Choudhury, "Networks and Systems", New Age International, 1st edition, 1998.
3.	Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory", PHI/Pearson Education, 9th Edition and onwards.
4.	Jacob Millman & Christos C. Halkias, "Integrated Electronics", Tata-McGraw Hill, 2nd Edition, 2010 and onwards.
	Reference Books:
1.	A. S. Sedra & K. C. Smith, "Microelectronic Circuits", Oxford Univ. Press, 5th Edition, 1999 and onwards
2.	David A. Bell, "Electronic Devices and Circuits", PHI, 4th Edition, 2004 and onwards.
	E-resourses (NPTEL/SWAYAM... Any Other)- mention links
1.	
2.	

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Open Book Assignments (OBA)/ Lab Project
3.	Flipped Classes	3.	Lab Test
4.	Practice session/Demonstrations in Labs	4.	Semester End Examination
5.	Virtual Labs (if present)		

Course Outcome (COs) **Learning Levels:** **Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create**				
At the end of the course, the student will be able to		**Learning Level**	**PO(s)**	**PSO(s)**
1.	Apply the knowledge of DC circuits and simplify given electrical networks using various analysis methods.	Ap	1,2,3,5,12	1
2.	Understand the operation and biasing of BJTs and FETs, analyze and evaluate the performance of circuit parameters.	Un,Ap	1,2,3,5,12	1
3.	Design and analyze the BJT and FET amplifier circuits and study their frequency response.	Ap,An	1,2,3,5,9,12	1,2

Scheme of Continuous Internal Evaluation (CIE):

For integrated courses, a lab test also will be conducted at the end of the semester. The lab test **(COMPULSORY)** will be part of the CIE. **No SEE for Lab**.

THEORY (60 marks)			**LAB (40 marks)**		Total
IA test 1	IA test 2	Assignment (OBA/Lab Project/ Industry assignment)	Conduction	Lab test	
25 marks	25 marks	10 marks	15 marks	25 marks	100 marks

IA Test:

1. No objective part in IA question paper
2. All questions descriptive

Conduct of Lab:

1. Conducting the experiment and journal: 5 marks
2. Calculations, results, graph, conclusion and Outcome: 5 marks
3. Viva voce: 5 marks

Lab test: (Batchwise with 15 students/batch)

1. Test will be conducted at the end of the semester
2. Timetable, Batch details and examiners will be declared by Exam section
3. Conducting the experiment and writing report: 5 marks
4. Calculations, results, graph and conclusion: 10 marks
5. Viva voce: 10 marks

Eligibility for SEE:

1. 40% and above (24 marks and above) in theory component
2. 40% and above (16 marks and above) in lab component
3. **Lab test is COMPULSORY**
4. Not eligible in any one of the two components will make the student **Not Eligible** for SEE

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass:** Score should be $\geq$ 35%, however overall score of CIE + SEE should be $\geq$ 40%.
3.	Question paper contains 3 parts - A,B & C, wherein students have to answer any 5 out of 7 questions in part A, 5 out of 10 questions choosing 1 question from each unit in part B & 1 out of 2 questions in part C.

CO-PO Mapping (planned)													CO-PSO Mapping (planned)		
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**	**PSO3**
1	✓	✓	✓		✓				✓	✓		✓	✓		
2	✓	✓	✓		✓				✓	✓		✓	✓		
3	✓	✓	✓		✓				✓	✓		✓	✓	✓	

DIGITAL SYSTEM DESIGN

Course Code	**21EC33**	**Course type**	**IPCC**	**Credits L-T-P**	3 – 0 – 1
Hours/week: L - T- P	3 – 0 – 2			**Total credits**	4
Total Contact Hours	L = 40 Hrs; T = 0 Hrs; P = 20 Hrs Total = 60 Hrs			**CIE Marks**	100
Flipped Classes	10 Hours			**SEE Marks**	100

Course learning objectives	
1.	To gain knowledge in the design of combination circuits.
2.	To acquaint with the design of sequential circuits through the fundamentals of flip-flops.
3.	To understand and design sequential circuits.
4.	To model the digital circuits using Verilog HDL programming.
5	To gain knowledge of fundamentals of computer organization.

Required Knowledge of: Fundamentals of Electronics & Communication Engineering(21AEC29)

Unit – I	**Contact Hours = 8 Hours**
Design of Combinational Circuits -I: Design of arithmetic circuits, Comparator. Introduction to Verilog HDL Programming - data types, programming styles: data flow, behavioral, structural. Verilog HDL programming for arithmetic circuits, comparator	
Case Study: Designing logic circuits to control operations for industrial applications using MSI components and their implementation using Verilog HDL.	

Unit – II	**Contact Hours = 8 Hours**
Design of Combinational Circuits-II: Design using - Encoders, Decoders, Multiplexers. Introduction to PLDs. HDL programming using behavioral description, with basic coding structures (if- else, case, conditional statements etc.)	
Case Study: Designing logic circuits to control operations for industrial applications using MSI components and their implementation using Verilog HDL.	

Unit – III	**Contact Hours = 8 Hours**
Flip-Flops: Basic bi-stable element, Latches, set-up and hold timing, The gated latches, Master-Slave Flip-Flops, Edge triggered D-flip-flop, Characteristic Equations. Verilog HDL implementation of Flip-Flops.	
Case Study: Applications involving flip-flops	

Unit – IV	**Contact Hours = 8 Hours**
Design of Sequential Logic Circuits: Asynchronous counters. Design of Synchronous counters, Shift Register (SISO, PIPO, SIPO, PISO) and Universal shift register. Verilog HDL implementation of Counters and Shift Registers	
Case Study: Applications involving Counters and Registers	

Unit – V	Contact Hours = 8 Hours
Basics of Computer Organization: Microcomputer Organization (CPU, Memory, I/O Devices and Clock), Processor architecture (ALU, Register and Control Unit), Bus Architecture, Processor characteristics, RISC and CISC, Memory Hierarchy, Main Memory, Cache Memory, Instruction Formats, Addressing Modes.	
Case Study: Architecture of 8085 Processor.	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	**2**	**2**	**2**	**2**	**2**

List of Experiments

Unit No.	No. of Experiments	Topic(s) related to Experiment
1	**3**	**Hardware and Verilog Implementation of arithmetic circuits**
2	**2**	**Hardware and Verilog Implementation of encoder, decoder and multiplexer**
3	**2**	**Hardware and Verilog Implementation of flip-flops**
4	**2**	**Hardware and Verilog Implementation of shift register and counters**
5	**1**	**Verilog implementation of ALU**

Unit No.	Self-Study Topics
1	**Fast Adder**
2	**Demultiplexer**
3	**Conversion of flip-flop**
4	**Ring and Johnson counters**
5	**FSM**

Books	
	Text Books:
1.	Stephen Brown, “Fundamentals of Digital Logic with Verilog Design”, 3rd Edition, TMH New Delhi
2.	Morris Mano, “Computer System Architecture”, PHI, 2002, 3rd Edition and onwards
	Reference Books:
3.	Donald P Leach, Albert Paul Malvino, and Goutam Saha, “Digital Principles and Applications”, 7th Edition, TMH.
4.	Donald D. Givone, “Digital Principles and Design”, McGraw-Hill, 1st Edition, 2002.
5.	John M Yarbrough, “Digital Logic Application and Design”, Thomas Learning, 2001.
6.	Nazeih M Botros, “HDL Programming VHDL and VERILOG Charles River Media Inc..USA 2009
7.	Gaonkar, “8085 Architecture and Programming” PHI
	E-resourses (NPTEL/SWAYAM.. Any Other)- mention links
1.	NPTEL - https://onlinecourses.nptel.ac.in/noc21_ee75/preview

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Open Book Assignments (OBA)/ Lab Project
3.	Flipped Classes	3.	Lab Test
4.	Practice session/Demonstrations in Labs	4.	Semester End Examination

Course Outcome (COs)				
Learning Levels: **Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr -Create**				
At the end of the course, the student will be able to		**Learning Level**	**PO(s)**	**PSO(s)**
1.	Understand the fundamental principles of digital circuits and computer organization.	Un	1	1
2.	Apply the concepts of digital fundamentals to design optimal digital circuits and demonstrate their Verilog implementation.	Ap	1	1
3.	Experimentally demonstrate the design and verification of digital circuits using ICs and FPGA implementation.	Ap	1,2,3	1

Scheme of Continuous Internal Evaluation (CIE):

For integrated courses, a lab test also will be conducted at the end of the semester. The lab test **(COMPULSORY)** will be part of the CIE. **No SEE for Lab**.

THEORY (60 marks)			**LAB (40 marks)**		Total
IA test 1	IA test 2	Assignment (OBA/Lab Project/ Industry assignment)	Conduction	Lab test	
25 marks	25 marks	10 marks	15 marks	25 marks	100 marks

IA Test:
1. No objective part in IA question paper
2. All questions descriptive

Conduct of Lab:
1. Conducting the experiment and journal: 5 marks
2. Calculations, results, graph, conclusion and Outcome: 5 marks
3. Viva voce: 5 marks

Lab test: (Batchwise with 15 students/batch)
1. Test will be conducted at the end of the semester
2. Timetable, Batch details and examiners will be declared by Exam section
3. Conducting the experiment and writing report: 5 marks
4. Calculations, results, graph and conclusion: 10 marks
5. Viva voce: 10 marks

Eligibility for SEE:
1. 40% and above (24 marks and above) in theory component
2. 40% and above (16 marks and above) in lab component
3. **Lab test is COMPULSORY**
4. Not eligible in any one of the two components will make the student **Not Eligible** for SEE

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass:** Score should be $\geq$ 35%, however overall score of CIE + SEE should be $\geq$ 40%.
3.	Question paper contains 3 parts - A,B & C, wherein students have to answer any 5 out of 7 questions in part A, 5 out of 10 questions choosing 1 question from each unit in part B & 1 out of 2 questions in part C.

CO-PO Mapping (planned)													CO-PSO Mapping (planned)		
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**	**PSO3**
1	✓											✓	✓		
2	✓	✓	✓									✓	✓		
3	✓	✓	✓		✓				✓	✓		✓	✓		

SENSORS MEASUREMENT AND DATA ACQUISITION SYSTEMS

Course Code	**21EC34**	**Course Type**	**IPCC**	**Credits L-T-P**	3 - 0 - 1
Hours/week: L - T - P	3 - 0 - 2			**Total credits**	4
Total Contact Hours	L = 40 Hrs., P = 20 Hrs. Total = 60 Hrs.			**CIE Marks**	100
Flipped Classes	03 Hours			**SEE Marks**	100

Course Learning Objectives (CLO)	
1.	To illustrate the functioning of various sensors and transducers connected to real life system.
2.	To comprehend the fundamental concepts related to measurement system characteristics, errors, calibration, noise, reliability and choice of economics in measurement systems.
3.	To represent signals in a better manner in time domain and in frequency domain by using Operational Amplifier based waveshaping circuits.
4.	To develop basic knowledge about various types of filters and to understand design principles of filter-based frequency domain signal processing techniques.
5.	To realize the overall functioning of basic data acquisition system, data logging system, data transmission system and microcontroller and PC based advanced systems.

Pre-requisites: Basic Electrical and Electronics Engineering, Fundamentals of Electronics and Communication Engineering, Engineering Mathematics I.

Unit – I : Sensors and Transducers	**8 Hours**
Sensors and Transducers – Sensor in closed loop feedback control system, construction and principle of operation of transducers for measuring temperature, pressure (force or strain), displacement, linear and angular position, acceleration, torque, liquid level, flow, humidity (or moisture), hall effect, conductivity, pH, light intensity, performance parameter of sensors, transducer selection criteria.	
Case study – Hazardous areas of instrumentation – explosion, very high temperature, radiation etc.	

Unit – II : Basic Concepts Related to Measurement and Instrumentation Systems	**8 Hours**
A generalized measurement system, transducer classification, performance characteristics of sensors and measuring devices or systems, concept of system order, time domain response of first order systems, errors in measurement, calibration and standards, signals and noise in measurement systems.	
Case study – Reliability, choice and economics of measurement systems.	

Unit – III : Operational Amplifier Based Signal Conditioning	**8 Hours**
Op-Amp specifications from data sheet, inverting and non-inverting DC and AC amplifier, summing, scaling and averaging amplifier, instrumentation amplifier with transducer bridge, V to I converter with grounded load, I to V converter, voltage follower (buffer), integrator, differentiator, comparator, voltage to frequency converter (VFC).	
Case study – Pulse Width Modulation and motor speed control.	

Unit – IV : Filters and Frequency Domain Signal Processing	**8 Hours**
Filters as signal purifiers, passive filter design with discrete components, Necessity of active filters, Op-Amp based active filter design: low pass, high pass, band pass and band reject filters, all pass filter and its design consideration, introduction to digital filters and their applications.	
Case study – Digital filters in Radar systems and in Computer Tomography.	

Unit – V : Conversion Transmission and Representation of Sensed Data	**8 Hours**
Concepts of ADC/DAC, sample and hold and multiplexers, multichannel DAS, voltage (0-5 v) & current (4-20 mA) telemetry, TDM-FDM-CDM, digital transducer and data logger, microcontroller and PC based instrumentation systems.	
Case study – Radiation thermometer, nano instrumentation, biomedical instrumentation, electronic nose, pollution monitoring, robotic instrumentation.	

Books	
a.	**Text Books:**
1.	Arun K. Ghosh, 'Introduction to Measurements and Instrumentation.' PHI Learning Pvt. Ltd., 4th edition.
2.	D. Patranabis, 'Sensors and Transducers,' PHI Pvt. Ltd., 2nd edition.
3.	C. S. Rangan, G. R. Sharma, V. S. V. Mani, 'Instrumentation: Devices and Systems,' McGraw Hill Education, 2nd Edition.
4.	D. V. S. Murty, 'Transducers and Instrumentation,' PHI Learning Pvt. Ltd. 2nd Edition.
5.	John P. Bentley, 'Measurement Systems,' Pearson Education, 3rd Edition.
b.	**Reference Books:**
6.	Ramakant A. Gayakawad, 'Op-Amps and Linear Integrated Circuits,' PHI Pvt. Ltd., 4th Edition.
7.	H. S. Kalsi, 'Electronic Instrumentation,' The McGraw Hill Companies, 2nd Edition.
c.	**E-resources (NPTEL/ SWAYAM / Any Other) – Links mentioned below**
1.	https://nptel.ac.in/courses/108108147 : Sensors and Actuators by **Prof. Hardik J. Pandya, IISC**

Course Delivery methods		**Assessment Methods**	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Online Quizzes (Surprise and Scheduled)
3.	Flipped Classes	3.	Open Book Assignments (OBA)
4.	Online classes	4.	Course Seminar and Course Projects
5.	Lab Demonstrations	5.	Semester End Examination

Course Outcome (COs)

Learning Levels: Re (Remember) Un (Understand) Ap (Apply) An (Analysis) **Ev** (Evaluate) **Cr** (Create)

At the end of the course, the student will be able to		**Learning Levels**	**PO**	**PSO**
1.	*Choose specific* sensors for picking up physical data, related to real-life processes and *apply* proper signal conditioning technique in time and frequency domain for better signal representation.	**Un, Ap**	1, 2, 3, 5, 12	1
2.	*Develop* detailed understanding about measuring system properties like error, calibration standards, noise, reliability, and choice and economics of measurement systems etc.	**Un, Ap**	1, 2, 3, 4	1
3.	*Survey* different signal conversion, signal transmission, data representation and data storage techniques toward development of modern-day data acquisition system.	**Un, Ap**	1, 2, 3, 12	1, 3

Flipped Classroom Details

Unit No.	I	II	III	IV	V
03 Sessions are Planned for Flipped Classroom (FC)	NA	NA	NA	NA	**Case Study Topics of Module 5 will be assigned as FC topics**

List of Experiments

Unit No.	Expt. No.	Experiments
1	1	RC first order system performance estimation in time domain with step input
2	2	Sensitivity characteristic determination of temperature transducer (RTD)
2	3	Measurement of strain by using load cell
3	4	Adding, summing and scaling amplifiers with inverting and non-inverting Operational Amplifier configurations
3	5	Op-Amp based voltage to current and current to voltage converters
3	6	RC Integrator and differentiator circuit performance analysis [both active and passive circuits by using Multisim based software tool]
4	7	Active practical RC low pass and high pass filter design and performance comparison with discrete filters
4	8	Design of band pass filter and band reject (Notch) filter by using Op-Amps [by Multisim based software tool]
All	9 & 10	Project development on real life application by using sensors, time and frequency domain signal conditioners, Arduino Uno, signal representation element (group activity).

Scheme of Continuous Internal Evaluation (CIE):
For integrated courses, a lab test also will be conducted at the end of the semester. The lab test **(COMPULSORY)** will be part of the CIE. **No SEE for Lab**.

THEORY (60 marks)			**LAB (40 marks)**		Total
IA test 1	IA test 2	Assignment (OBA/Lab Project/ Industry assignment)	Conduction	Lab test	
25 marks	25 marks	10 marks	15 marks	25 marks	100 marks

IA Test:
1. No objective part in IA question paper
2. All questions descriptive

Conduct of Lab:
1. Conducting the experiment and journal: 5 marks
2. Calculations, results, graph, conclusion and Outcome: 5 marks
3. Viva voce: 5 marks

Lab test: (Batchwise with 15 students/batch)
1. Test will be conducted at the end of the semester
2. Timetable, Batch details and examiners will be declared by Exam section
3. Conducting the experiment and writing report: 5 marks
4. Calculations, results, graph and conclusion: 10 marks
5. Viva voce: 10 marks

Eligibility for SEE:
1. 40% and above (24 marks and above) in theory component
2. 40% and above (16 marks and above) in lab component
3. **Lab test is COMPULSORY**
4. Not eligible in any one of the two components will make the student **Not Eligible** for SEE

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass:** Score should be $\geq$ 35%, however overall score of CIE + SEE should be $\geq$ 40%.
3.	Question paper contains 3 parts - A,B & C, wherein students have to answer any 5 out of 7 questions in part A, 5 out of 10 questions choosing 1 question from each unit in part B & 1 out of 2 questions in part C.

CO-PO Mapping (Planned)													CO-PSO Mapping (Planned)		
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
1	✓	✓	✓		✓							✓	✓		
2	✓	✓	✓	✓									✓		
3	✓	✓	✓									✓	✓		✓
Tick mark the CO, PO and PSO mapping															

Course Code: 21EC35	Summer Internship – I	Total credits	2
Course type: PC(INT)	CIE Marks: 50 marks	SEE Marks	NIL

Internships prescribed for B.E./B. Tech. programs starting from the academic year 2021 - 22			
Sl. No	**Particular**	**Duration of Internship**	**Schedule**
1.	**Internship – I:** Referred to as Inter/Intra Institutional Internship **Prescribed Credits: 02**	03 Weeks	**(i)** During the intervening vacation of II and III semesters for students admitted to the I semester.
			(ii) During the intervening vacation of III and IV semesters for lateral entry Diploma students admitted to III semester.

1. **Electronics Workshop**

Today's era is known for Electronics gadgets and the consumer products are increasing day by day. This course will help students to get familiar with basic electronic principles and acquire basic electronic equipment maintenance skills.

- This course aims to impart the basics and applications of electronic equipments in a hands-on mode.
- The course deals with electronic circuit design, circuit connection, fault identification and rectification.
- Students will be able to setup and carry out assembly of electronic circuits using Printed Circuit Boards (PCB).

A PCB allows large number of electronic components to be connected to each other easily and reliably. Understanding how to prepare the necessary equipment and components, and then assemble a PCB, is important skill for anyone wanting to become involved in manufacturing an enormous range of products. In this workshop, students will prepare the necessary information, components and equipment required to assemble PCBs. Students will carry out the soldering and assembly processes required making a PCB, and checking the quality of their work. This workshop will also develop students' ability to work in a team using written instructions, drawing and diagrams to carry out practical tasks. These skills are highly valued by employers and this workshop will help prepare you for progression to employment as a manufacturing operative in industry. Industrial field and manufacturing system include and rely on electrical systems but few people understand how these systems function or how they should be tested and serviced safely. In this workshop, students will gain the skills necessary to carry out routine servicing and maintenance activities on electrical components and systems. Students will learn how components come together to make simple electronics systems function and operate. Students will explore the ways in which systems can be tested and serviced safely.

2. **Arduino Programming**

Today's era is known for coding and developing a low-cost solution. This course will help students to get familiar with learning the c coding for arduino programming and interfacing with the peripherals and also to acquire the knowledge on developing the mini projects. This course aims to impart the development of low-cost solutions to real time problems and develop applications in a hands-on mode.

- The course deals with fundamentals of coding, IDE platform and interfacing.
- Students will be able to setup and carry out mini projects and develop low-cost solutions.

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino uses a prototype platform (open-source) based on an easy-to-use hardware and software. It consists of a circuit board, which can be programed (referred to as a microcontroller) and a ready-made software called Arduino IDE (Integrated Development Environment), which is used to write and upload the computer code to the physical board.

The key features are −

- Arduino boards are able to read analog or digital input signals from different sensors and turn it into an output such as activating a motor, turning LED on/off, connect to the cloud and many other actions.
- You can control your board functions by sending a set of instructions to the microcontroller on the board via Arduino IDE (referred to as uploading software).
- Unlike most previous programmable circuit boards, Arduino does not need an extra piece of hardware (called a programmer) in order to load a new code onto the board. You can simply use a USB cable.
- Additionally, the Arduino IDE uses a simplified version of C++, making it easier to learn to program.
- Finally, Arduino provides a standard form factor that breaks the functions of the micro-controller into a more accessible package.

3. Basics of Electric Vehicles and Renewable Energy Systems (EVRES)

Electric Vehicles and Renewable Energy Systems are two main environmentally friendly technologies for this twenty first century. All the famous automobile companies worldwide are steadily shifting their research and products from IC Engine based vehicles toward electric and hybrid vehicles as the overall storage of gasoline-based fuels are reducing very fast worldwide and in very near future it is going to be exhausted. At the same time, over dependence on fossil fuels (coal and gasolene) for energy generation is also disadvantages from financial and environmental point of view. Hence, almost every country is steadily increasing the capacity of renewable energy generation.

This internship is planned to make EC students aware of the basic fundamentals in these two inter-related fields and develop their skills in simulation-based design and study of electric vehicles and renewable energy generation system. In the first-year innovation lab, you have learnt about platform-based learning. We shall build on those lines to know how does MATLAB and Simulink help to understand the electrical engineering design concepts better. We shall see Arduino programming in Simulink, applications like DC motor control, AC-DC rectifier design, inverter design, battery charger design etc. by using Simulink. We shall also see different types of software-based motor control techniques (DC, AC, BLDC motor controls using Simulink). Many types of sensor integration, signal processing units, solar panel mounting and direction control, wind energy generation and metering unit design, MPPT basics will also be discussed during this internship. Design of solar powered electric vehicles, design of solar powered water pumping system, and other research ideas in renewable energy system will also be discussed toward the end of this internship. Students shall get to execute hardware/software-based projects on these topics or on related fundamentals.

Documents to be submitted by Students for Internship Evaluation

a. **Student's Diary**
b. **Internship Report**

c. Assessment Rubrics for Intra and Inter Institute Activities

Intra and Inter Institute Activities and Assessment Rubrics **[Ref: AICTE Internship Policy.pdf page 9 and allied]** **Scheduled during the intervening period of II and III semesters (Period 03 weeks)** **Prescribed credits: 02**				
Sl. No. **Sub Activity Head**	**Performance/ Appraisal**	**Assessment Rubrics (Allotted marks decide the letter grade)**	**Proposed Document as Evidence**	**Evaluated by**
Internship – 1 Inter/ Intra Institutional Workshop/ Training.	Excellent	80 to 100	(i) Student's Diary and (ii) Internship Report along with the certificate issued from relevant authorized Authority	(i) Institute Faculty together with External Expert if any. (ii) Training and Placement Officer. (iii) Physical Education Officer or the concerned in charge Officer of the Activity
	Good	79 to 60		
	Satisfactory	59 to 40		
Note: The total CIE marks shall be the sum of marks allotted to successfully completed activities by the student.				

Course Outcome (COs)

At the end of the course, the student will be able to		**Learning Level**	**PO(s)**	**PSO**
1.	Articulate and apply principles learned in the classroom to a specific area of internship with hands-on experience.	Apply	1,5,	1,2,3
2.	Present thoughts and ideas clearly and effectively in written and oral forms as required for particular workplace settings.	Understand	8,9,10	1,2,3
3.	Gain self-understanding, self-confidence, develop interpersonal skills, develop effective work habits, including time management, punctuality, and personal accountability.	Apply	10	3

CONSTITUTION OF INDIA

Course Code	**21EC36**	**Course type**	**HSMS**	**Credits L-T-P**	1 – 0 - 0
Hours/week: L - T- P	1 – 0 – 0			**Total credits**	1
Total Contact Hours	L = 15 Hrs; T = 0 Hrs; P = 0 Hrs Total = 15 Hrs			**CIE Marks**	50
Flipped Classes content	5 Hours			**SEE Marks**	50 (2 Hours)

Course learning objectives	
1.	To enable the student to understand the importance of the constitution
2.	To understand the structure of executive, legislature, and judiciary and fundamental rights and duties
3.	To understand the central and state relation: administrative
4.	To understand the autonomous nature of constitutional bodies like Supreme Court and high court and election commission of India

Pre-requisites: NIL

Unit – I	**Contact Hours = 3 Hours**
Introduction to Indian Constitution: Constitution meaning of the term, Indian Constitution – Sources and constitutional history, Features – Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.	

Unit – II	**Contact Hours = 3 Hours**
Union Government and its Administration Structure of the Indian Union: Federalism, Centre - State relationship, President: Role, power and position, Lok Sabha, Rajya Sabha, Prime Minister and Council of ministers, Cabinet and Central Secretariat, The Supreme Court and High Court: Powers and Functions.	

Unit – III	**Contact Hours = 3 Hours**
State Government and its Administration: Governor – Role and Position Chief Minister and Council of ministers, State Cabinet, State Legislature State Secretariat: Organization, Structure and Functions.	

Unit – IV	**Contact Hours = 3 Hours**
Local Administration – District's Administration Head – Role and Importance, Municipalities – Mayor and role of Elected Representative – CEO of Municipal Corporation Panchayati Raj: Functions, Panchayati Raj Institution: Zila Panchayat, Elected officials and their roles, CEO Zila Panchayat: Block level Organizational Hierarchy – (Different departments), Village level – Role of Elected and Appointed officials – Importance of grass root democracy.	

Unit – V	**Contact Hours = 3 Hours**
Election Commission: Election Commission- Role of Chief Election Commissioner and Election Commissionerate State Election Commission, Functions of Commissions for the welfare of SC/ST/OBC and women.	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	1	1	1	1	1

Books	
	Text Books:
1.	Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt. Ltd. New Delhi
2.	Subash Kashyap, Indian Constitution, National Book Trust
3.	H. M. Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
	E-resourses (NPTEL/SWAYAM.. Any Other)- mention links
1.	Prof. Sudhir Krishnaswamy, NOC: Constitutional Studies, https://nptel.ac.in/courses/129106003
2.	By Prof. Sairam Bhat, Prof. M. K. Ramesh , Constitution of India and Environmental Governance: Administrative and Adjudicatory Process, https://onlinecourses.nptel.ac.in/noc20_lw02/preview

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Online Quizzes (Scheduled)
3.	Flipped Classes	3.	Assignments
		4.	Semester End Examination

Course Outcome (COs)

At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)

Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create		**Learning Level**	**PO(s)**	**PSO(s)**
1.	Discuss the significance of Indian Constitution and the structure of Central and State Government	Un	6,9,10,12	3
2.	Exercise the fundamental rights in proper sense and identify responsibilities in national building.	Ap	6,9,10,12	3

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Addition of two Assignments	Total Marks
Marks	15+15 = 30	10+10 =20	50
Writing the IA test is Compulsory **Minimum marks required to be eligible for SEE: 20 out of 50**			

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 50 marks of 2 hours duration.
2.	**Minimum marks required in SEE to pass: 20 out of 50**
3.	Question paper contains questions from each unit each carrying 10 marks. Students have to answer one full question from each unit.

CO-PO Mapping (Planned)													CO-PSO Mapping (Planned)		
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**	**PSO3**
1						✓			✓	✓		✓			✓
2						✓			✓	✓		✓			✓
Tick mark the CO, PO and PSO mapping															

SOCIAL CONNECT AND RESPONSIBILITIES

Course Code	**21EC37**	**Course type**	**UHV**	**Credits L-T-P**	1 – 0 – 0
Hours/week: L - T- P	1 – 0 – 0			**Total credits**	1
Total Contact Hours	15 Hours of engagement			**CIE Marks**	50
Flipped Classes content	--			**SEE Marks**	50

Course learning objectives	
1.	Bridging the gap between theory and practice through community engagement
2.	Interaction with the community for identification and solution to real life problems faced by the community
3.	Catalyzing acquisition of values and responsibilities for public service to make better citizens

Required Knowledge of: Interpersonal skills, Communication skills

Activities to be planned and conducted by the Department Associations are:

1. **Linking learning with the community through Knowledge Sharing**: In this the students can apply their knowledge and skills to improve the lives of the people. The knowledge available with the students can be shared to the school students of the local community. It can be in the form of engaging the classes, developing projects which can used by the students and teachers, training sessions on MS word, Excel, PPT for students and teachers etc.
2. **Creating Awareness about health and hygiene:** The students can arrange talks on Importance of cleanliness, health, and hygiene by taking help of Doctors, Public Health Organizations, NGOs etc.
3. **Including the Practitioners as teachers:** Arrange the invited talks by experts in agriculture for the farmers in the local community to create awareness about Organic farming, new methods of agriculture such as hydroponics, vertical farming etc.
4. **Environmental Sustainability:** Students can take initiatives to educate the local community regarding protecting our environment through tree plantations, preserving water bodies etc.
5. **Social Innovations for Rural development**

Course Outcome (COs)

Learning Levels:

Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create

At the end of the course, the student will be able to		**Learning Level**	**PO(s)**	**PSO(s)**
1.	Gain knowledge about the culture and societal realities	Un	6,7,8,9,10,12	2,3
2.	Develop sense of responsibility and bond with the local community	Un	6,7,8,9,10,12	2,3
3.	Make significant contributions to the local community and the Society at large	Ap	6,7,8,9,10,12	2,3
4	Identify opportunities for contribution to the Socio-economic development	Ev	6,7,8,9,10,12	2,3

Scheme of Continuous Internal Evaluation (CIE):

• Students must maintain the diary of the activities conducted. • The activities can be conducted in groups/batches. • Faculty members can design the evaluation system.	50 marks

Scheme of Semester End Examination (SEE):			
• Students must prepare the report of the learnings and the outcomes. • Presentations can be conducted for the SEE. • Department can form a team of two faculty members as evaluators. NGOs, Officials from Govt./ Semi-Govt. organizations could be included in the evaluation process.	Report	Presentation	Total
	20	30	50

CO-PO-PSO mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1						✓	✓	✓	✓	✓		✓		✓	✓
2						✓	✓	✓	✓	✓		✓		✓	✓
3						✓	✓	✓	✓	✓		✓		✓	✓
4						✓	✓	✓	✓	✓		✓		✓	✓

Advanced Linear Algebra, Vector Calculus and Statistics

Course Code	**21MATEC41**	**Course type**	**BSC**	**Credits L-T-P**	3 – 0 – 0
Hours/week: L - T- P	3 – 0 – 0			**Total credits**	3
Total Contact Hours	L = 40 Hrs; T = 0 Hrs; P = 0 Hrs Total = 40 Hrs			**CIE Marks**	100
Flipped Classes content	10 Hours			**SEE Marks**	100

Course learning objectives	
1.	To understand the concepts eigenvalues, eigenvectors, vector space, Linear transformation.
2.	To get acquainted with the orthogonal, orthonormal vectors, Gram Schmidt 's process, singular value decomposition and quadratic forms.
3.	To Understand various operations involving scalar and vector fields.
4.	To get familiar with different types of vectors integral.

Pre-requisites: Basic Linear Algebra, vector algebra and vector calculus, basic statistics

Unit – I	**Contact Hours = 8 Hours**
Vector Spaces, sub spaces, null spaces, column spaces, linear transformation. Linearly independent sets and bases, coordinate systems, dimension of a vector space, Rank, change of bases. **Case study:** Fourier transform as linear transformation and change of basis. **Case study:** Vectors in Hilbert Spaces.	

Unit – II	**Contact Hours = 8 Hours**
Orthogonality and Orthonormality: Inner product, length and orthogonality of vectors, orthogonal set of vectors, orthogonal projection, Gram Schmidt's Process. Quadratic forms, Singular value decomposition (SVD). **Case study:** Principal Component Analysis (PCA)	

Unit – III	**Contact Hours = 8 Hours**
Applications of Vector Calculus Applications of vector differentiation: Gradient, Divergence and Curl. Applications of vector integration: Green's Theorem, Stoke's Theorem and Gauss divergence theorem.	

Unit – IV	**Contact Hours = 8 Hours**
Correlation and Regression: Karl Pearson coefficient of correlation, Regression: Lines of regression Problems. Multiple correlation and regression. Partial correlation and regression.	

Unit – V	**Contact Hours = 8 Hours**
Sampling distribution: Sampling distribution, Sampling distribution of means, Test of significance for small and large samples. 't' and 'chi square' distributions, F- distribution. Practical examples.	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions					

Books	
	Text Books:
1.	David C. Lay, Linear Algebra and Its Applications, Pearson Publications, 2016 onwards.
2.	Seymour Lipschutz, Dennis Spellman and Murray R. Spiegel, Schaum's Outline for Vector Analysis, McGraw Hill Publication, 2009 and onwards.
	Reference Books:
1.	B. S. Grewal – Higher Engineering Mathematics, Khanna Publishers, 42nd Edition, 2012and onwards
2.	Erwin Kreyszig –Advanced Engineering Mathematics, John Wiley & Sons Inc., 9th Edition,2006 and onwards.
	E-resourses (NPTEL/SWAYAM.. Any Other)
1.	https://nptel.ac.in/courses/111105122 (**Applications of Vector Calculus**)
2.	https://nptel.ac.in/courses/111105042 (**Correlation and Regression)**

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Online Quizzes (Surprise and Scheduled)
3.	Flipped Classes	3.	Open Book Tests (OBT)
4.	Online classes	4.	Course Seminar
		5.	Semester End Examination

Course Outcome (COs)

At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)

	Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create	**Learning Level**	**PO(s)**	**PSO(s)**
1.	**Understand the various concepts connected with vector spaces.**	Ap	1	1
2.	**Understand the orthogonality of vectors and related concepts.**	Un	1	1
3.	**Use the various terminologies connected with vector/scalar functions and their applications.**	Ap	1	1
4.	**Understand the relationships between numerical data.**	Un	1	1
5.	**To get acquainted with sampling concepts.**	Un	1	1

Scheme of Continuous Internal Evaluation (CIE): Theory course

Components	Addition of two IA tests	Online Quiz	Addition of two OBAs\Math tools	Course Seminar	Total Marks
Marks	25+25 = 50	4* 5 marks = 20	10+10 =20	10	100

OBA- Open Book Assignment
Minimum score to be eligible for SEE: 40 OUT OF 100

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass:** Score should be $\geq$ 35%, however overall score of CIE + SEE should be $\geq$ 40%.
3.	Question paper contains 3 parts - A,B & C, wherein students have to answer any 5 out of 7 questions in part A, 5 out of 10 questions choosing 1 question from each unit in part B & 1 out of 2 questions in part C.

CO-PO Mapping (Planned)													CO-PSO Mapping (Planned)		
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**	**PSO3**
1	✓												✓		
2	✓												✓		
3	✓												✓		
4	✓												✓		
5	✓												✓		
Tick mark(✓)															

Fourth Semester

Bridge Course Mathematics-II

(Common to all Branches)

(A Bridge course for Lateral Entry students of IV Sem. B. E.)

Course Code	21DMATEC41	**Course type**	**BSC (MNC for Diploma)**	**Credits L-T-P**	0 – 0 – 0
Hours/week: L - T- P	3– 0 – 0			**Total credits**	0
Total Contact Hours	L = 40 Hrs; T = 0 Hrs; P = 0 Hrs Total = 40 Hrs			**CIE Marks**	100
				SEE Marks	0

Course learning objectives	
1.	Learn differential equations of first and second order and their applications to second order.
2.	Get familiar with concepts of beta, gamma functions and multiple integrals.
3.	Learn advanced concepts of Linear Algebra
4.	Learn and use various concepts in vector differentiation
5.	Learn and use various concepts in vector integration.

Pre-requisites : Basic Trigonometry, Calculus,Algebra.

Unit – I:Differential Equations:	**Contact Hours = 8 Hours**
Bernoulli and Exact (excluding reducible). Orthogonal trajectory. Linear differential equations of higher order **w**ith constant coefficients. Problems on second order only. Applications to- vibration of a spring, Electric circuits and bending of beams.	

Unit-II: Multiple Integrals	**Contact Hours =8 Hours**
Introduction to integration Beta, Gamma functions. Double integral, Change of order, change of variables. Application to area, Triple integral (based on limits given). Application to find volume.	

Unit –III: Linear Algebra II	**Contact Hours = 8 Hours**
Diagonalization of a square matrix, Orthogonal matrix Quadratic form and reduction to Canonical forms by Orthogonal Transformation. Linear Transformation. Regular transformation: Identity, stretching along an axis, reflection with respect to axis, Rotation Shear, projection. (planar illustration).	

Unit-IV: Vector Differentiation	**Contact Hours = 8 Hours**
Scalar and Vector point function, Gradient, Divergence, Curl, Solenoidal and Irrotational vector fields, scalar potential and its applications (Directional Derivative, Angle between surfaces). Vector identities- $div(\phi A),\ curl(\phi A), curl(grad\phi),\ div(curlA)$.	

Unit –V: Vector Integration	**Contact Hours =8 Hours**
Line Integral, Surface Integral, Volume Integral, Green's Theorem, Stoke's Theorem, Gauss Divergence Theorem (all theorems statement only) and problems.	

Books	
	Text Books:
1.	B.S. Grewal – Higher Engineering Mathematics, Khanna Publishers, 42nd Edition, 2012.
2.	Erwin Kreyszig –Advanced Engineering Mathematics, John Wiley & Sons Inc., 9th Edition, 2006.
3.	B. V. Ramana- Higher Engineering Mathematics, Tata McGraw-Hill Education Private Limited, Tenth reprint 2010 and onwards.
	Reference Books:
1.	Peter V. O' Neil – Advanced Engineering Mathematics, Thomson Brooks/Cole, 7th Edition, 2011.
2.	Glyn James – Advanced Modern Engineering Mathematics, Pearson Education, 4th Edition,2010.

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Open Book Tests (OBT)
3.	Online Classes	3.	Course Seminar
		4.	Semester End Examination

Course Outcome (COs) At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)				
Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create		**Learning Level**	**PO(s)**	**PSO(s)**
1.	**Apply** Differential equations to solve physical phenomena.	**Ap**	1	1
2.	**Understand** the concept of Beta, Gamma functions and Multiple Integrals.	**Re**	1	1
3.	**Understand** the concept of diagonalization of matrices, Transformations and relevant concepts.	**Un**	1	1
4.	**Use** the various terminologies connected with vector/scalar functions	**Ap**	1	1
5.	**Understand** the applications of vector Integration.	**Un, Ap**	1	1

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA	Online Quiz	Addition of two OBAs/Math tools	Course Seminar	Total Marks
Marks	25+25 = 50	4*5 marks=20	10+10 =20	10	100
	OBA - Open Book Assignment **Minimum score to be eligible for SEE: 40 OUT OF 100**				

CO-PO Mapping (Planned)													**CO-PSO Mapping(Planned)**		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
1	✓												✓		
2	✓												✓		
3	✓												✓		
4	✓												✓		

5	✓												✓		
Tick mark(✓)															

MICROCONTROLLERS

Course Code	**21EC42**	**Course type**	**IPCC**	**Credits L-T-P**	3 – 0 – 1
Hours/week: L - T- P	3 – 0 – 2			**Total credits**	4
Total Contact Hours	L = 40 Hrs; T = 0 Hrs; P = 20 Hrs Total = 60 Hrs			**CIE Marks**	100
Flipped Classes content	10 Hours			**SEE Marks**	100

Course learning objectives	
1.	To understand need and application of Microcontroller particularly ARM Processors in embedded system design.
2.	To study the architecture of ARM Processor and program using assembly language.
3.	To understand architecture and features of typical ARM Microcontroller.
4.	To learn interfacing of real-world input and output devices to ARM.

Required Knowledge of: Basic C programming, Digital Design using HDL and basics of Computer organization.

Unit – I	**Contact Hours = 8 Hours**
ARM Embedded Systems: Microprocessor vs. Microcontrollers**,** ARM Design philosophy, Embedded System Hardware, Embedded System Software. **ARM Processor Fundamentals:** Architecture of ARM7TDMI, ARM programmer's model, Program Status Register, Pipeline, Introduction to Exceptions, Interrupts, and the Vector Table. **Case Studies:** Survey of various microcontrollers, their specifications, use cases and applications	

Unit – II	**Contact Hours = 8 Hours**
ARM Programming: **Introduction to the ARM assembly programming:** Structure of assembly module, Directives, Data processing instructions, Data transfer instructions, Control flow instructions, Writing basic assembly language programs. **Architectural support for high level languages:** Abstraction in software design, Assembly code to C conversion and C to Assembly code. **Case Studies:** Analysis of assembly vs C programming for code optimization for the given application.	

Unit – III	**Contact Hours = 8 Hours**
ARM7 Family Microcontroller Architectural overview: Introduction, Features, Block Diagram, On-chip flash memory system, On-chip Static RAM (SRAM), Memory Mapping, LPC2148 Pin out. Pin connect Block, General Purpose Input Output (GPIO). **Case Studies:** Communication of microcontrollers to the external world through GPIO's using sensors, actuators and display devices.	

Unit – IV	**Contact Hours = 8 Hours**
ARM7 Family Microcontroller Peripherals -I: Phase Locked Loops (PLL), Timers, PWM. Embedded 'C' Programming examples. **Exception and Interrupts:** External Interrupt and Vector Interrupt Controller (VIC). Embedded 'C' Programming examples. **Case Studies:** Traffic light monitoring system	

Unit – V	Contact Hours = 8 Hours
ARM7 Family Microcontroller Peripherals -II: Universal Asynchronous Receiver Transmitter (UART), ADC, and DAC. Embedded 'C' Programming examples. **Case Studies:** Irrigation monitoring system for processing and controlling	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	2	2	2	2	2

List of Experiments

Unit No.	No. of Experiments	Topic(s) related to Experiment
2	**2**	Assembly language programs and simulated on the Keil uvision simulator
3	**2**	Embedded C program for GPIOs, simulated and verified using the ARM development kits.
4	**3**	Embedded C program for Timers, PWM and External Interrupts simulated and verified using the ARM development kits.
5	**3**	Embedded C program for UART, ADC and DAC simulated and verified using the ARM development kits.

Unit No.	Self-Study Topics
3	GLCD Interface
4	Watchdog Timer
5	I2C, SPI and other communication protocols.

Books	
	Text Books:
1.	Andrew Sloss, Dominic Symes, Chris Wright, "ARM System Developer's Guide – Designing and Optimizing System Software", ELSEVIER
2.	Steve Furber, "ARM System- on-Chip Architecture" LPE, Second Edition
3.	UM10139 LPC214x User manual
	Reference Books:
1.	William Hohl, "ARM Assembly Language fundamentals and Techniques" CRC press, 2009
2.	Insider's guide to Philips ARM7 based microcontrollers. hitex.co.uk
	E-resourses (NPTEL/SWAYAM.. Any Other)- mention links
1.	NPTEL course - Embedded System - https://nptel.ac.in/courses/108102045/5, 6 and 7
2.	NPTEL course - ARM Based Development - https://nptel.ac.in/courses/117106111

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Open Book Assignments (OBA)/ Lab Project
3.	Flipped Classes	3.	Lab Test
4.	Practice session/Demonstrations in Labs	4.	Semester End Examination
5.	Virtual Labs (if present)		

Course Outcome (COs) Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create				
At the end of the course, the student will be able to		Learning Level	PO(s)	PSO(s)
1.	**Identify** a suitable ARM microprocessor based on the features and architecture for the development of an embedded application.	Un	1,2,3,7,12	1
2.	**Develop** the assembly/C program for the given problem/application, and compare the code optimization through the case studies.	Ap	1,2,3,7,12	1
3.	**Understand** the on-chip peripherals of a microcontroller and **demonstrate** their interfacing for a given application using ARM7 development boards and Keil simulator..	Ap	1,2,3,7,12	1

Scheme of Continuous Internal Evaluation (CIE):

For integrated courses, a lab test also will be conducted at the end of the semester. The lab test (**COMPULSORY)** will be part of the CIE. **No SEE for Lab**.

THEORY (60 marks)			LAB (40 marks)		Total
IA test 1	IA test 2	Assignment (OBA/Lab Project/ Industry assignment)	Conduction	Lab test	
25 marks	25 marks	10 marks	15 marks	25 marks	100 marks

IA Test:

1. No objective part in IA question paper
2. All questions descriptive

Conduct of Lab:

1. Conducting the experiment and journal: 5 marks
2. Calculations, results, graph, conclusion and Outcome: 5 marks
3. Viva voce: 5 marks

Lab test: (Batchwise with 15 students/batch)

1. Test will be conducted at the end of the semester
2. Timetable, Batch details and examiners will be declared by Exam section
3. Conducting the experiment and writing report: 5 marks
4. Calculations, results, graph and conclusion: 10 marks
5. Viva voce: 10 marks

Eligibility for SEE:

1. 40% and above (24 marks and above) in theory component
2. 40% and above (16 marks and above) in lab component
3. **Lab test is COMPULSORY**
4. Not eligible in any one of the two components will make the student **Not Eligible** for SEE

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass:** Score should be $\geq$ 35%, however overall score of CIE + SEE should be $\geq$ 40%.
3.	Question paper contains 3 parts - A,B & C, wherein students have to answer any 5 out of 7 questions in part A, 5 out of 10 questions choosing 1 question from each unit in part B & 1 out of 2 questions in part C.

CO-PO Mapping (planned)													CO-PSO Mapping (planned)		
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**	**PSO3**
1	✓	✓	✓				✓					✓	✓		
2	✓	✓	✓		✓		✓		✓	✓		✓	✓		
3	✓	✓	✓		✓		✓		✓	✓		✓	✓		

SIGNALS AND CONTROL SYSTEMS

Course Code	21EC43	Course Type	IPCC	Credits L-T-P	3 - 0 - 1
Hours/week: L - T - P	3 - 0 - 2			Total credits	4
Total Contact Hours	L = 40 Hrs., P = 20 Hrs. : Total = 60 Hrs.			CIE Marks	100
Flipped Classes	Not planned			SEE Marks	100

Course Learning Objectives (CLO)	
1.	To understand basic mathematical operations performed on the continuous and discrete time signals and comprehend the basis of classification of different types of systems.
2.	To develop continuous and discrete time system mathematical models and evaluate their responses with standard signal inputs.
3.	To realize the necessity of transfer function-based system modeling and determine system transfer functions of LTI systems by block reduction technique and signal flow graph methods.
4.	To analyze for absolute and relative system stability in time domain and frequency domain.
5.	To apply the fundamental knowledge of Fourier analysis, correlation and spectral density for analyzing the quality of signals.

Pre-requisites: Engineering Mathematics I and II, Basic Electrical and Electronics Engineering, Fundamentals of Electronics and Communication Engineering.

Unit – I : Basics of Signals and Systems	**8 Hours**
Signal classification, concept of continuous and discrete signals, basic mathematical operations on continuous and discrete signals, concept of orthogonal signal and its necessity, **System classification**, determination of Impulse response of LTI system and its importance, Step response and Ramp response of LTI systems, continuous & discrete convolution.	
Case study: Finding unit impulse response and step response of basic electronic systems.	

Unit – II : Development of LTI System Model	**8 Hours**
Properties of transfer function, finding transfer function from system differential equation & difference equation, determination of ZIR ZSR and overall system response, realization of DF-I DF-II cascade and parallel systems, transfer function determination from state variable models, concept of state transition matrix and its properties, determination of state transition matrix.	
Case Study: Development of state variable system solution.	

Unit – III : Transfer Function Based System Modeling	**8 Hours**
Advantages and limitations of transfer function based modeling over state variable modeling, transfer function determination of RLC and MBK systems, FV and FI analogy, block reduction technique, Mason's gain formula and signal flow graph based system modeling, concept of steady state error.	
Case Study: Mathematical modeling of automobile and control system related to automobile.	

Unit – IV : System Stability Analysis in Time and Frequency Domain	**8 Hours**
System pole position and related stability analysis, concepts of absolute, relative and asymptotic stability, Routh Hurwitz stability criterion, Root Locus plot development and related stability analysis, Bode plot based system stability analysis in frequency domain, gain margin and phase margin in Bode plot.	
Case Study: Interrelation between Root Locus Plot and Bode Plot	

Unit – V : Fourier Analysis and Correlation	**8 Hours**
Development of single-sided and double-sided amplitude and phase spectra from Fourier Series, Parseval's theorem, Gibb's phenomenon, conditions for existence of Fourier Transform, Fourier Transform of typical signals, auto-correlation & cross correlation, properties of ESD & PSD, numerical.	
Case Study: Fourier Series based signal analysis and synthesis by using MATLAB.	

Unit No.	**Expt. No.**	**List of Laboratory Experiments**
1	1	Generation of standard test signals and performing basic operations like delay, advance, folding, time scaling, and amplitude scaling on these signals
1	2	Computation of system output using continuous & discrete convolution techniques
2	3	Natural & Step response analysis of first order RL and RC systems with initial conditions
2	4	Step response analysis: 2^{nd} order systems (RLC & MBK) with various damping conditions
3	5	System transfer function development by using block reduction technique and stability analysis – Simulink based experiment
3	6	Computation of error coefficients and determination of system steady state error for Type 0, I, and II systems with Step, Ramp and Parabolic inputs
4	7	Determination of time domain system response and corresponding stability analysis from Laplace domain pole position of closed loop system transfer function
4	8	Root locus plot-based system stability analysis
4	9	Bode plot-based system stability analysis
5	10	Fourier Series based signal analysis and synthesis and generation of Fourier Spectra

Unit No.	**Self-Study Topics**
1	Expressing a given signal into even signal and odd parts
2	Comparison of DF I, DF II, cascade and parallel system realization
3	Transfer function development of rotary mechanical systems with MBK components
4	System bandwidth determination from Bode plot-based system analysis
5	Application of correlation, ESD, PSD in determining signal quality

a.	**Text Books: [List of Books and Online Material to be referred for this course]**
1.	B. P. Lathi and Roger Green, "Linear Systems and Signals," Oxford - International Edition, November 2017, ISBN: 9780190200213.
2.	Simon Haykin and Barry Van Veen, "Signals and Systems", John Wiley & Sons, 2001, Reprint 2002 and onwards.
3.	Control Systems, "Principles and Design," M Gopal, McGraw Hill Edu; 2nd Edition.
4.	Richard C. Dorf and Robert H. Bishop, "Modern Control Systems," Pearson International Edition, 11^{th} Edition.
b.	**Reference Books:**
5.	Alan V. Oppenheim, Alan S. Willsky and A Hamid Nawab, "Signals and Systems" Pearson Education Asia / PHI, 2nd edition, 1997, Indian Reprint 2002.
6.	H. P Hsu, R. Ranjan, "Signals and Systems", Schaum's outline series, TMH, 2006
c.	**E-resources (NPTEL / SWAYAM / any other) – Links mentioned**
1.	https://nptel.ac.in/courses/117101055 : Signals and System Notes by **Prof. Vikarm Gadre, IITB**
2.	https://onlinecourses.nptel.ac.in/noc21_ee28/preview Signals and System Lectures and Notes by **Prof. Kushal K. Shah, IISER, Bhopal**
3.	https://onlinecourses.nptel.ac.in/noc20_ee90/preview Control Systems lecture videos and notes by **Prof. C. S. Shankar Ram, IIT Madras**

Course Delivery Methods		Assessment Methods	
1.	Chalk and Talk	1.	IA test for theory course
2.	PPT and Videos	2.	Open Book Assignments (OBA)
3.	Lab Demonstrations	3.	Course projects / Course seminars
4.	NPTEL courses / lectures / notes	4.	Lab IA test
5.	Virtual Labs (for selected experiments)	5.	Semester End Examination (SEE)

Course Outcome (COs) **Learning Levels: Re** (Remember) **Un** (Understand) **Ap** (Apply) **An** (Analysis) **Ev** (Evaluate) **Cr** (Create)				
At the end of the course, the student will be able to		**Learning Levels**	**PO**	**PSO**
1.	distinctly *classify* different types of continuous and discrete time signals and systems as per their properties.	**Un, Ap**	1, 2, 3, 5	1, 2
2.	*develop* transfer function of LTI systems by various methods and *identify* the type of system stability based on system responses.	**Un, Ap**	1, 2, 4, 5	1
3.	draw *inference* about quality of different types of signals with the help of mathematical functions like correlation, ESD and PSD.	**Un, An**	1, 2, 3, 12	1, 3

Scheme of Continuous Internal Evaluation (CIE):
For integrated courses, a lab test also will be conducted at the end of the semester. The lab test **(COMPULSORY)** will be part of the CIE. **No SEE for Lab**.

THEORY (60 marks)			**LAB (40 marks)**		Total
IA test 1	IA test 2	Assignment (OBA/Lab Project/ Industry assignment)	Conduction	Lab test	
25 marks	25 marks	10 marks	15 marks	25 marks	100 marks
IA Test: 1. No objective part in IA question paper 2. All questions descriptive					
Conduct of Lab: 1. Conducting the experiment and journal: 5 marks 2. Calculations, results, graph, conclusion and Outcome: 5 marks 3. Viva voce: 5 marks					
Lab test: (Batchwise with 15 students/batch) 1. Test will be conducted at the end of the semester 2. Timetable, Batch details and examiners will be declared by Exam section 3. Conducting the experiment and writing report: 5 marks 4. Calculations, results, graph and conclusion: 10 marks 5. Viva voce: 10 marks					
Eligibility for SEE: 1. 40% and above (24 marks and above) in theory component 2. 40% and above (16 marks and above) in lab component 3. **Lab test is COMPULSORY** 4. Not eligible in any one of the two components will make the student **Not Eligible** for SEE					

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass:** Score should be $\geq$ 35%, however overall score of CIE + SEE should be $\geq$ 40%.
3.	Question paper contains 3 parts - A,B & C, wherein students have to answer any 5 out of 7 questions in part A, 5 out of 10 questions choosing 1 question from each unit in part B & 1 out of 2

	questions in part C.

CO-PO Mapping(Planned)													CO-PSO Mapping(Planned)		
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**	**PSO3**
1	✓	✓	✓	--	✓	--	--	--	--	--	--	--	✓	✓	--
2	✓	✓	--	✓	✓	--	--	--	--	--	--	--	✓	--	--
3	✓	✓	✓	--	--	--	--	--	--	--	--	✓	✓	--	✓

PRINCIPLES OF COMMUNICATION SYSTEMS

Course Code	**21EC44**	**Course type**	**IPCC**	**Credits L-T-P**	3 – 0 – 1
Hours/week: L - T- P	3 – 0 – 2			**Total credits**	4
Total Contact Hours	L = 40 Hrs; T = 0 Hrs; P = 20 Hrs Total = 60 Hrs			**CIE Marks**	100
Flipped Classes content	10 Hours			**SEE Marks**	100

Course learning objectives	
1.	To understand basics Continuous wave modulation techniques
2.	To understand sampling process and entropy applications
3.	To analyze waveform coding and encoding algorithm
4.	To analyze line codes and digital modulation techniques
5.	To understand error control coding techniques

Required Knowledge of: Fundamentals of Electronics and Communication Engineering

Unit – I	**Contact Hours = 8 Hours**
Review of Random Process, Review of Continuous wave modulation, Angle Modulation: Frequency Modulation: Narrow and Wideband FM, FM Bandwidth, Generation and Detection of FM waves, Numericals, FM stereo multiplexing, Spread Spectrum Modulation	
Case study: Frequency Modulation for 5G networks	

Unit – II	**Contact Hours = 8 Hours**
Sampling Theory: Low pass sampling and Reconstruction, Natural and Flat top sampling, Signal distortion in sampling, Numericals. **Measurement of Information**: Average information content (entropy) of symbols in long independent sequences, Information rate, Properties of entropy.	
Case Study: Radar signal recognition algorithm based on entropy theory	

Unit – III	**Contact Hours = 8 Hours**
WAVEFORM CODING: Pulse Code Modulation, Quantization noise and SNR, Robust Quantization, DPCM, Delta Modulation, Adaptive Delta Modulation **SOURCE ENCODING:** Properties of codes, Shannon's encoding algorithm, Shannon-Fano, and Huffman's coding algorithm	

Unit – IV	**Contact Hours = 8 Hours**
Baseband Transmission: Gram Schmidt orthogonalization, Properties of Line codes, Power Spectral Density of Uni-polar, Polar, Bipolar and Manchester RZ and NRZ, ISI in band limited channels, Zero-ISI condition- the Nyquist criterion, Solution for zero ISI, Raised cosine filters, Corelative Coding. **Digital Modulation Schemes:** Geometric Representation of signals, Generation, Detection, Bit error rate of Coherent Binary PSK, Binary FSK. Introduction to MSK, QPSK and QAM.	

Unit – V	Contact Hours = 8 Hours
Linear Block codes: Matrix Description of LBC, Encoding, Decoding and Syndrome circuits, Error calculation. **Binary Cyclic Codes:** Properties, Encoding using (n-k) shift registers, Syndrome calculation. **Convolutional Encoding**: Convolutional encoder representation in time and transform domain	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	Phase locked loop, Pre-emphasis and deemphasis	Sample and Hold, Properties of entropy	Encoding algorithms	ISI and corelative coding, MSK and QAM	Syndrome calculation

List of Experiments

Unit No.	No. of Experiments	Topic(s) related to Experiment
1	1	Spectrum Analysis of Continuous wave (SW)
2	4	Sampling Process (SW) Pulse Amplitude Modulation (HW) Pulse Position Modulation Pulse Width Modulation (HW)
3	2	Delta Modulation (HW) Adaptive Delta Modulation (HW)
4	2	PSD of line codes (SW) Digital Modulation Techniques (SW)
5	2	Spread Spectrum Modulation (HW) Generation of PN Sequence (SW)

Unit No.	Self-Study Topics
1	Superheterodyne receiver, FM Radio, FDM
2	Joint Entropy, Mutual Information, Communication Channels
3	Robust Quantization
4	Raised Cosine Filters
5	Transform domain of convolutional codes

Books	
	Text Books:
1.	Simon Haykin, “Digital Communications”, John Wiley, 2005 and onwards.
2.	Shu Lin, Daniel J. Costello, “Error Control Coding”, PHI, 2nd Edition, and onwards
3.	George Kennedy, Bernard Davis, SRM Prasanna “Electronics Communication Systems”,5th edition, McGraw Hill Education (India) Pvt. Ltd
	Reference Books:
1.	B. Sklar, “Digital Communication Fundamentals and Applications”, 2nd Edition, Pearson Education, 2009 and onwards.
2.	B. P. Lathi, “Modern Digital and Analog Communication Systems” 3rd Edition, Oxford University Press 2007 and onwards.
	E-resourses (NPTEL/SWAYAM/ Any Other)- mention links
1.	https://nptel.ac.in/courses/117101051/
2.	https://nptel.ac.in/courses/108102096/

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Open Book Assignments (OBA)/ Lab Project
3.	Flipped Classes	3.	Lab Test
4.	Practice session/Demonstrations in Labs	4.	Semester End Examination
5.	Virtual Labs (if present)		

Course Outcome (COs)

Learning Levels:

Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create

At the end of the course, the student will be able to		Learning Level	PO(s)	PSO(s)
1.	**Distinguish** between analog and digital communication system and **analyze** effect of noise in communication systems	Un	1,2,3,4,5,8,9,12	1
2.	**Analyze** suitable digital coding of Analog waveforms and **design** noiseless communication system	Ap	1,2,3,4,5,8,9,12	2
3.	**Understand** suitable encoding technique for communication systems and **Develop** an efficient modulation technique	An	1,2,3,4,5,8,9,12	1

Scheme of Continuous Internal Evaluation (CIE):

For integrated courses, a lab test also will be conducted at the end of the semester. The lab test **(COMPULSORY)** will be part of the CIE. **No SEE for Lab**.

THEORY (60 marks)			LAB (40 marks)		Total
IA test 1	IA test 2	Assignment (OBA/Lab Project/ Industry assignment)	Conduction	Lab test	
25 marks	25 marks	10 marks	15 marks	25 marks	100 marks

IA Test:

1. No objective part in IA question paper
2. All questions descriptive

Conduct of Lab:

1. Conducting the experiment and journal: 5 marks
2. Calculations, results, graph, conclusion and Outcome: 5 marks
3. Viva voce: 5 marks

Lab test: (Batchwise with 15 students/batch)

1. Test will be conducted at the end of the semester
2. Timetable, Batch details and examiners will be declared by Exam section
3. Conducting the experiment and writing report: 5 marks
4. Calculations, results, graph and conclusion: 10 marks
5. Viva voce: 10 marks

Eligibility for SEE:

1. 40% and above (24 marks and above) in theory component
2. 40% and above (16 marks and above) in lab component
3. **Lab test is COMPULSORY**
4. Not eligible in any one of the two components will make the student **Not Eligible** for SEE

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass:** Score should be $\geq$ 35%, however overall score of CIE + SEE should be $\geq$ 40%.
3.	Question paper contains 3 parts - A,B & C, wherein students have to answer any 5 out of 7 questions in part A, 5 out of 10 questions choosing 1 question from each unit in part B & 1 out of 2 questions in part C.

CO-PO Mapping (planned)													CO-PSO Mapping (planned)		
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**	**PSO3**
1	✓	✓	✓	✓	✓			✓	✓			✓	✓		
2	✓	✓	✓	✓	✓			✓	✓			✓		✓	
3	✓	✓	✓	✓	✓			✓	✓			✓	✓		

HEALTH AND WELLNESS

Course Code	**21EC45**	**Course type**	**AEC**	**Credits L-T-P**	2 – 0 – 0
Hours/week: L - T- P	2 – 0 – 0			**Total credits**	2
Total Contact Hours	L = 25 Hrs; T = 0 Hrs; P = 0 Hrs Total = 25 Hrs			**CIE Marks**	50
Flipped Classes content				**SEE Marks**	50

Course learning objectives	
1.	To understand and practice yoga and postures.
2.	To know about health and wellness & its balance for positive mindset.
3.	To build the healthy lifestyles for good health for their better future.
4.	To create a healthy and caring relationships to meet the requirements of good/social/positive life.
5.	To learn about avoiding risks and harmful habits inside and outside the campus.
6.	To prevent and fight against harmful diseases for good health through positive mindset.

Unit – I Foundations of Yoga	**Contact Hours = 5 Hours**
Introduction to Yoga, Yogasanas (The yogic postures) Sitting postures- Vajrasana, Swastikasana, Ardhapadmasana, Standing postures-Tadasana, Vrikshasana, Utkatasana Supine postures- Niralamba Bhujangasana, Ardhashalabhasana, Makarasana, Shavasana. Guidelines for Pranayama , Surya Namaskar and meditation. Activity- Yoga session for students	

Unit – II Good Health & It's balance for positive mindset	**Contact Hours = 4 Hours**
Health -Importance of Health, Influencing factors of Health, Health beliefs, Advantages of good health, Health & Behavior, Health & Society, Health & family, Health & Personality, Psychological disorders-Methods to improve good psychological health, Changing health habits for good health.	

Unit – III Building of healthy lifestyles for better future	**Contact Hours = 4 Hours**
Developing healthy diet for good health, Food & health, Nutritional guidelines for good health, Obesity & overweight disorders and its management, Eating disorders, Fitness components for health, Wellness and physical function, How to avoid exercise injuries.	

Unit – IV Creation of Healthy and caring relationships	**Contact Hours = 4 Hours**
Building communication skills, Friends and friendship - Education, the value of relationship and communication skills, Relationships for Better or worsening of life, understanding of basic instincts of life (more than a biology), Changing health behaviours through social engineering.	

Unit – V Avoiding risks and harmful habits	**Contact Hours = 4 Hours**
Characteristics of health compromising behaviors, Recognizing and avoiding of addictions, How addiction develops, Types of addictions, influencing factors of addictions, Differences between addictive people and non-addictive people & their behaviors. Effects of addictions Such as..., how to recovery from addictions.	

Unit – VI Preventing & fighting against diseases for good health	Contact Hours = 4 Hours
How to protect from different types of infections, How to reduce risks for good health, Reducing risks & coping with chronic conditions, Management of chronic illness for Quality of life, Health & Wellness of youth: a challenge for upcoming future, Measuring of health & wealth status.	

Books	
	Text Books:
1.	"Scientific Foundations of Health" – Study Material Prepared by Dr. L Thimmesha, Published in VTU - University Website.
2.	"Yoga: A Healthy Way of Living" by NCERT (National Council of Educational Research and Training)
3.	"Scientific Foundations of Health", (ISBN-978-81-955465-6-5) published by Infinite Learning Solutions, Bangalore – 2022.
4.	Health Psychology - A Textbook, FOURTH EDITION by Jane Ogden McGraw Hill Education (India) Private Limited - Open University Press.
	Reference Books:
1.	Health Psychology (Second edition) by Charles Abraham, Mark Conner, Fiona Jones and Daryl O'Connor – Published by Routledge 711 Third Avenue, New York, NY 10017.
2.	HEALTH PSYCHOLOGY (Ninth Edition) by SHELLEY E. TAYLOR - University of California, Los Angeles, McGraw Hill Education (India) Private Limited - Open University Press.

Course delivery methods		Assessment methods	
1.	✓ Chalk and Talk	1.	✓ IA tests
2.	✓ PPT and Videos	2.	Online Quizzes (Surprise and Scheduled)
3.	✓ Yoga session	3.	Open Book Tests (OBT)
4.	Flipped Classes	4.	✓ Course Survey/ activity
5.	Online classes	5.	✓ Semester End Examination

Course Outcome (COs)

At the end of the course, the student will be able to(Highlight the **action verb** representing the learning level.)

	Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr – Create	**Learning Level**	**PO(s)**	**PSO(s)**
1.	Apply Yogic practices for improving Health and wellness.	Ap	6,12	
2.	Develop the healthy lifestyles and build caring relationships for good health and better social life.	Un	6,12	
3.	Understand about risks and harmful habits inside and outside the campus for their bright future.	Un	6,12	

4.	Prevent and fight against harmful diseases for good health through positive mindset.	Un	6,12	

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Course Survey/ Activity	Total Marks
Marks	20+20 = 40	10	50
Minimum score to be eligible for SEE: 20 OUT OF 50			

Course activity includes conducting survey or activities related to general health awareness, community health issues, industrial health issues etc in groups. Students have to conduct the above listed activities, gather data, give possible solutions/outcomes and present it in the form of a report for evaluation.

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 50 marks of 2 hours duration.
2.	Score should be $\geq$ 35% ,however overall score of CIE + SEE should be $\geq$ 40%
3.	Question paper will be of MCQ type with questions from all units.

CO-PO Mapping (Planned)													**CO-PSO Mapping (Planned)**		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
1						✓						✓			
2						✓						✓			
3						✓						✓			
4						✓						✓			
Tick mark the CO, PO and PSO mapping															

SOFTWARE DEVELOPMENT CONCEPTS

Course Code: 21AECEC381/481	**Ability Enhancement Course (AEC)**	**Credits L-T-P**	1 – 0 – 0
Hours/week: L - T- P	1 – 0 – 0	**Total credits**	1
Total Contact Hours	L = 15 Hrs; T = 0 Hrs; P = 0 Hrs Total = 15 Hrs	**CIE Marks**	50
Flipped Classes content		**SEE Marks**	-

Course learning objectives	
1.	To understand fundamental concepts of system software
2.	To understand multifunction programs using advanced concepts of C programming
3.	To provide an understanding of basic concepts of Object-Oriented paradigm
Pre-requisites: Any programming experience	

Unit – I	**Contact Hours = 5 Hours**
Basic concepts of System software: Assembler, Compiler, Preprocessor directives, Unicode, Creation and execution of a program (Compilation process- Preprocessing, Compiling, Assembling, Linking, Loading), BIOS and DOS services for accessing hardware of a PC, Operating system	

Unit – II	**Contact Hours = 5 Hours**
Pointers: Understanding the computer's memory, Introduction to Pointers, Declaring pointer variables, Function pointers **Structures and Unions:** Introduction, Nested structures, Arrays of structures, Structures and functions, Unions **Files:** Introduction to files, using files in C, read data from files, writing data to files, Detecting the end of file, Error handling during file operations. **Writing and executing programs using above concepts**	

Unit – III	**Contact Hours = 5 Hours**
Fundamentals of Object-Oriented Paradigm (Technology): System development Life cycle, Traditional software development process, building high quality software, Object Oriented Software development, Object oriented Analysis and Design, Tools used in OO Analysis and Design, Introduction to Unified Modeling Language	

Flipped Classroom Details

Unit No.	**I**	**II**	**III**
No. for Flipped Classroom Sessions	**1**	**1**	**1**

Books	
	Text Books:
1.	Reema Theraja, "Programming in C", Oxford University Press
2.	Venugopal and Rajkumar, "Microprocessor X86 Programming", BPB publication
3.	Reema Theraja, "Object Oriented Programming with C++" , Oxford University Press
	Reference Books:
1.	A.K.Ray and K.M. Bhuchandi, "Advanced Microprocessors and Peripherals", Tata McGraw-Hill Publishing Company Limited
2.	Behrouz A. Forouzan and Richard F. Gilbert, "A structured Programming Approach"
3.	Grady Booch,"Object-oriented analysis & design with applications", Pearson Education Asia, Second Edition
	E-resourses (NPTEL/SWAYAM, Any Other)- mention links
1.	
2.	

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Online Quizzes (Surprise and Scheduled)
3.	Flipped Classes	3.	Open Book Tests (OBT)
4.	Online classes	4.	Course Seminar
		5.	Semester End Examination

Course Outcome (COs)

At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)

	Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create	**Learning Level**	**PO(s)**	**PSO(s)**
1.	**Understand** the basic concepts of System software	L2	1,3,12	2
2.	**Understand** the Object-Oriented Technology	L2	1,3,11,12	2
3.	**Implement** multifunction programs using advanced concepts of C	L3	1,3,5,9,12	1

Scheme of Continuous Internal Evaluation (CIE): Theory course (non-Integrated)

Components	Addition of CIE components	Total Marks
IA Test (15+15)	**30**	**50**
Course Activity	**20**	

Scheme of Semester End Examination (SEE):	
1.	Project Presentation 40 Project Demonstration 60
2.	**Minimum marks required in SEE to pass: 40 out of 100**

CO-PO Mapping (Planned)													CO-PSO Mapping (Planned)		
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	✓		✓									✓		✓	
2	✓		✓								✓	✓		✓	
3	✓		✓		✓				✓			✓	✓		

FUNDAMENTALS OF MICROPROCESSOR & MICROCONTROLLERS

Course Code: **21AECEC382/482**	**Ability Enhancement Course (AEC)**	**Credits L-T-P**	1 – 0 – 0
Hours/week: L - T- P	1 – 0 – 0	**Total credits**	1
Total Contact Hours	L = 15 Hrs; T = 0 Hrs; P = 0 Hrs Total = 15 Hrs	**CIE Marks**	50
Flipped Classes content		**SEE Marks**	50

Course learning objectives	
1.	To understand the basics of microcontrollers architectures and its functionalities.
2.	To develop an in-depth understanding of the operation of microcontrollers, machine language programming & interfacing techniques.
3.	To design and develop microcontroller-based systems for real time applications using low level language like ALP.

Pre-requisites: NIL

Unit – I	**Contact Hours = 5 Hours**
Microprocessor Based Systems: Digital Computer, Microprocessor, Microcomputer, Microcontroller, Van Neumann and Harvard Architecture, CISC and RISC Processors.History of microprocessor and microcontrollers, Difference between microprocessors and microcontrollers.	

Unit – II	**Contact Hours = 5 Hours**
8051 Microcontroller architecture: Overview of 8051 Microcontroller, Architecture, I/O Ports, Instruction set of 8051. **External Memory Interfacing**: Memory address decoding, interfacing 8051 with ROM/EPROM and Data ROM.	

Unit – III	**Contact Hours = 5 Hours**
8051 Timers– Operation and Assembly language programming to generate a pulse using Mode-1 and a square wave using Mode-2 on a port pin. **8051 Serial Communication**- Basics of Serial Data Communication, RS-232 standard, 9 pin RS232 signals, Simple Serial Port programming in Assembly and C . **8051 REAL TIME CONTROL:**Interfacing simple switch and LED to I/O ports to switch on/off LED with respect to switch status.	

Flipped Classroom Details

Unit No.	**I**	**II**	**III**
No. for Flipped Classroom Sessions	**1**	**1**	**1**

Books	
	Text Books:
1.	The 8051 Microcontroller and Embedded Systems Using Assembly and C, 2/e by Muhammad Ali Mazidi, Janice Gillispie Mazidi and Rolin McKinlay (Second Edition , Pearson Education)
2.	The 8051 Microcontroller & Embedded Systems using Assembly and C By K. J. Ayala, D. V. Gadre (Cengage Learning , India Edition)
3.	"Microcontrollers: Architecture, Programming, Interfacing and System Design", Raj Kamal, Pearson Education, 2005.
	E-resourses (NPTEL/SWAYAM, Any Other)- mention links
1.	NOC:Microprocessors And Microcontrollers, IIT Kharagpur , Prof. Santanu Chattopadhyay, NPTEL
2.	Microcontrollers and Applications, IIT Kanpur , Dr. S.P. Das, NPTEL

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Online Quizzes (Surprise and Scheduled)
3.	Flipped Classes	3.	Open Book Tests (OBT)
4.	Online classes	4.	Course Project
5.	Virtual labs	5.	Semester End Examination

Course Outcome (COs)

At the end of the course, the student will be able to(Highlight the **action verb** representing the learning level.)

Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create		**Learning Level**	**PO(s)**	**PSO(s)**
1.	**Understand** a basic concept of digital fundamentals to Microcontrollers.	Un	1,3,6,7,9,12	1
2.	**Apply** theconcepts of s/w & h/w structure of the Microcontrollers and interface peripherals.	Ap	1,3,6,7,9,10,12	1
3.	**Understand** and **apply** the data transfer information through serial & parallel ports through real time example.	Ap	1,3,6,7,9,10,12	1

Scheme of Continuous Internal Evaluation (CIE): Theory course (Non- Integrated)

Components	Addition of CIE components	Total Marks
Pre-Test (Written Test)	**10**	**50**
Case Studies	**20**	
Post-Test (Two Quiz)	**20**	

Scheme of Semester End Examination (SEE): Theory course (Non- Integrated)

Components	TotalMarks
Project **Understanding project objectives 20** **Background knowledge of Project 20** **Soft Skills - Communication Skills 20** **Viva-Voce 20** **Project Report 20**	**100**

CO-PO Mapping (Planned)													CO-PSO Mapping (Planned)		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
1	✓		✓			✓	✓		✓			✓	✓		
2	✓		✓			✓	✓		✓	✓		✓	✓		
3	✓		✓			✓	✓		✓	✓		✓	✓		

MATLAB AND SIMULINK

Course Code: 21AECEC383/483	**Ability Enhancement Course (AEC)**	**Credits L-T-P**	0 – 0 – 2
Hours/week: L - T- P	0 – 0 – 2	**Total credits**	1
Total Contact Hours	L = 0 Hrs; T = 0 Hrs; P = 15Hrs Total = 15 Hrs	**CIE Marks**	50
Flipped Classes content		**SEE Marks**	50

Course learning objectives	
1.	To introduce students the use of a high-level programming language, MATLAB.
2.	To gain knowledge about MATLAB Simulink to solve Electronics Engineering, Electrical engineering and mechanical engineering problems.
3.	To provide an opportunity to students to develop inter-disciplinary skills and bridge the skill gaps to make students industry ready.

Pre-requisites: NIL

Unit – I	**Contact Hours = 5 Hours**
Basics of MATLAB and MATLAB Compiler: The MATLAB user interface, working with MATLAB data types, creating matrices and arrays, Operators and control statements, using scripts and functions, Data import and export, Using the graphical features, Programming with simple examples **Discussion of Toolboxes with Applications**: DSP System Toolbox, Communications System Toolbox, LTE System Toolbox, Computer Vision System Toolbox	

Unit – II	**Contact Hours = 5 Hours**
Engineering fundamentals using MATLAB & Simulink: Electrical engineering concepts using SimPowerSystems, Mechanical engineering concepts using Simscape, SimHydraulics and SimMechanics (Mechanics, Fluid Dynamics and Thermal), Control System Design and Analysis **MATLAB/SIMULINK used for Real Life Applications**: Modelling and Simulation of the Vehicle Suspension System, DC Servo Motor & Tank Level Control, Implement PID controller for your systems.	

Unit – III	**Contact Hours = 5 Hours**
Simulink and Hardware Interfacing: Arduino Toolbox Installation for Simulink, Setup and Blink LED, Communicate with the target board (Arduino) using external mode by changing the brightness of an LED with PWM, RC Circuit / First Order System. **Enabling Project-Based Learning with MATLAB, Simulink, and Low-Cost Hardware**	

Flipped Classroom Details

Unit No.	**I**	**II**	**III**
No. for Flipped Classroom Sessions	**1**	**1**	**1**

Books	
	Text Books:
1.	Agam Kumar Tyagi, "**MATLAB and Simulink for Engineers**", OXFORD Higher Education.
2.	Dr. Shailendra Jain, "**Modeling& Simulation using MATLAB – Simulink**", Wiley – India.

	Reference Books:
1.	Steven T. Karris, "**Introduction to Simulink with Engineering Applications**", Orchard Publications.
2.	MATLAB Manuals and Handbooks

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	Demonstration of solutions to problem sets
2.	PPT and Videos	2.	Quiz
3.	Flipped Classes	3.	Semester End Examination

Course Outcome (COs) At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)				
Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create		**Learning Level**	**PO(s)**	**PSO(s)**
1.	**Understand the** importance of MATLAB in handling lots of data.	L2	1,3,6,7,9,10,12	1,2
2.	**Analyze** a complex task and break it up into smaller, simpler tasks	L4	2,3,7,9,10,11,12	1,2,3
3.	**Apply** the knowledge gained to develop new and creative solutions to real life problems	L3	1,3,6,7,9,10,11,12	1,2,3

Scheme of Continuous Internal Evaluation (CIE): Theory course (Non- Integrated)

1. Open ended problem sets will be given to students after sessions completion of each unit. The students will demonstrate the solutions during regular lab.
2. Quizzes will be conducted periodically.

Components	Addition of CIE components	Total Marks
Demonstration of solutions to Open ended problems	**30**	**50**
Quiz	**20**	

Scheme of Semester End Examination (SEE):

1. Project demonstration and Presentation to be evaluated for 50 marks

CO-PO Mapping (Planned)													CO-PSO Mapping (Planned)		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
1	✓		✓			✓	✓		✓	✓		✓	✓	✓	
2		✓	✓				✓		✓	✓	✓	✓	✓	✓	✓
3	✓		✓			✓	✓		✓	✓	✓	✓	✓	✓	✓

DESIGN THINKING

Course Code: **21AECEC384/484**	**Ability Enhancement Course (AEC) on** **Design Thinking**	**Credits L-T-P**	1 – 0 – 0
Hours/week: L - T- P	1 – 0 – 0	**Total credits**	1
Total Contact Hours	L = 15 Hrs; T = 0 Hrs; P = 0 Hrs Total = 15 Hrs	**CIE Marks**	50
Flipped Classes content		**SEE Marks**	50

Course learning objectives	
1.	To introduce students to the design process as a tool for innovation.
2.	To familiarize the students with the tools for developing design ideas through appropriate design processes and build skillset of students for business opportunities.
3.	To provide opportunity for students to develop teamwork and leadership skills for an idea to prototype/product process.

Pre-requisites: NIL

Unit – I: *Intro to Design Thinking and Product Design*	**Contact Hours : 5 Hours**
Introduction to Design Thinking, Introduction to Design Research Strategies, Introduction to Synthesis, Introduction to Ideation and Prototyping Strategies, User Testing.	

Unit – II: Design through *Team Work*	**Contact Hours: 5 Hours**
Team work discussion, Associations and mapping, Research - tools for observation and immersion, Journey mapping and ideation. Tools: FIGMA	

Unit – III: Prototype/product/System Design	**Contact Hours = 5 Hours**
Business Model Canvas and Design Research, Visualizing ideas, Communicating ideas and effective storytelling, Final demonstration of product/process Presentations.	

Flipped Classroom Details

Unit No.	**I**	**II**	**III**
No. for Flipped Classroom Sessions	**1**	**1**	**1**

Books	
	Reference Books:
1. 2. 3.	James Garratt, Design and Technology. Wucius Wong, Principles of Design. Eskild Tjalve, A Short Course in Industrial Design.
	E-resourses (NPTEL/SWAYAM, Any Other)- mention links
1.	Google material design : https://material.io/design
2.	https://www.udemy.com/course/design-thinking-masterclass/

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	Problem Identification
2.	PPT and Videos	2.	Idea Presentation
3.	Flipped Classes	3.	Team Work
4.	Online classes	4.	Usage of tools
5.	Group Discussions	5.	Demonstration

Course Outcome (COs) At the end of the course, the student will be able to(Highlight the **action verb** representing the learning level.)				
Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create		**Learning Level**	**PO(s)**	**PSO(s)**
1.	**Un- Understanding** of the Design Process and how it can be applied in a variety of business settings	L2	2,8	2,3
2.	**Ap- Learn** to research and understand the unique needs of a company around specific challenges	L2	8,9,10,12	2,3
3.	**Ap-** Learn to **develop** and test innovative ideas through a rapid iteration cycle	L3	2,8,9,10,11,12	2,3

Scheme of Continuous Internal Evaluation (CIE): Theory course (Non- Integrated)

Components	Addition of CIE components	Total Marks
Theme Based activity (report writing, presentation)	**30**	**50**
Poster presentation	**20**	

Scheme of Semester End Examination (SEE):		
Components	**Addition of SEE components**	**Total Marks**
Prototype/Idea Design presentation	**30**	**50**
Viva	**20**	

CO-PO Mapping (Planned)													CO-PSO Mapping (Planned)		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
1		✓	✓	✓	✓	✓	✓		✓	✓		✓		✓	✓
2			✓	✓	✓	✓	✓		✓	✓	✓	✓		✓	✓
3		✓	✓	✓	✓	✓	✓		✓	✓	✓	✓		✓	✓

ಬಳಕೆ ಕನ್ನಡ - baLake Kannada (Kannada for Usage)

Balake Kannada (Kannada for communication) is for non-Kannada speaking, reading, and writing students

Course Code	21EC46	Course type	HSMS	Credits L-T-P	0–1 - 0
Hours/week: L-T-P	0 – 2 – 0			Total credits	1
Total Contact Hours	L = 20 Hrs; T = 0 Hrs;P = 0 Hrs Total = 20 Hrs			CIE Marks	50
Flipped Classes content	---			SEE Marks	50 (2 Hours)

ಬಳಕೆ ಕನ್ನಡ ಪಠ್ಯದ ಕಲಿಕೆಯ ಉದ್ದೇಶಗಳು (Course Learning Objectives):

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

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

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

1. ಬಳಕೆ ಕನ್ನಡವನ್ನು ತರಗತಿಯಲ್ಲಿ ಶಿಕ್ಷಕರು ಬೋಧಿಸಲು ವಿಟಿಯು ಸೂಚಿಸಿರುವ ಪಠ್ಯಪುಸ್ತಕವನ್ನು ಉಪಯೋಗಿಸಬೇಕು.
2. ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ತಯಾರಿಸಲು ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಉತ್ತೇಜಿಸುವುದು ಮತ್ತು ತರಗತಿಯಲ್ಲಿ ಅವುಗಳನ್ನು ಚರ್ಚಿಸಲು ಅವಕಾಶ ಮಾಡಿಕೊಡುವುದು.
3. ಪ್ರತಿ ವಿದ್ಯಾರ್ಥಿ ಪುಸ್ತಕವನ್ನು ತರಗತಿಯಲ್ಲಿ ಬಳಸುವಂತೆ ನೋಡಿಕೊಳ್ಳುವುದು ಮತ್ತು ಪ್ರತಿ ಪಾಠ ಮತ್ತು ಪ್ರವಚನಗಳ ಮೂಲ ಅಂಶಗಳಿಗೆ ಸಂಬಂಧಪಟ್ಟಂತೆ ಪೂರಕ ಚಟುವಟಿಕೆಗಳಿಗೆ ತೊಡಗಿಸತಕ್ಕದ್ದು.

Unit- I	**Contact Hours = 4 Hours**

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

Unit - II	**Contact Hours = 4 Hours**

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

Unit - III	Contact Hours = 4 Hours

ಚತುರ್ಥಿ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯದ ಬಳಕೆ ಮತ್ತು ಸಂಖ್ಯಾವಾಚಕಗಳು – Dative Cases, and Numerals

ಸಂಖ್ಯಾಗುಣವಾಚಕಗಳು ಮತ್ತು ಬಹುವಚನ ನಾಮರೂಪಗಳು – Ordinal numerals and Plural markers

ನ್ಯೂನ / ನಿಷೇಧಾರ್ಥಕ ಕ್ರಿಯಾಪದಗಳು ಮತ್ತು ವರ್ಣ ಗುಣವಾಚಕಗಳು

Defective / Negative Verbs and Colour Adjectives

Unit - IV	Contact Hours = 4 Hours

ಅಪ್ಪಣೆ / ಒಪ್ಪಿಗೆ, ನಿರ್ದೇಶನ, ಪ್ರೋತ್ಸಾಹ ಮತು ಒತ್ತಾಯ ಆರ್ಥರೂಪ ಪದಗಳು ಮತ್ತು ವಾಕ್ಯಗಳು

Permission, Commands, encouraging and Urging words (Imperative words and sentences)

ಸಾಮಾನ್ಯ ಸಂಭಾಷಣೆಗಳಲ್ಲಿ ದ್ವಿತೀಯ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯಗಳು ಮತ್ತು ಸಂಭವನೀಯ ಪ್ರಕಾರಗಳು

Accusative Cases and Potential Forms used in General Communication

"ಇರು ಮತ್ತು ಇರಲ್ಲ" ಸಹಾಯಕ ಕ್ರಿಯಾಪದಗಳು, ಸಂಭಾವ್ಯಸೂಚಕ ಮತ್ತು ನಿಷೇಧಾರ್ಥಕ ಕ್ರಿಯಾ ಪದಗಳು - Helping Verbs "iru and iralla", Corresponding Future and Negation Verbs

ಹೋಲಿಕೆ (ತರತಮ) , ಸಂಬಂಧ ಸೂಚಕ ಮತ್ತು ವಸ್ತು ಸೂಚಕ ಪ್ರತ್ಯಯಗಳು ಮತ್ತು

ನಿಷೇಧಾರ್ಥಕ ಪದಗಳ ಬಳಕೆ- Comparitive, Relationship, Identification and Negation Words

Unit - V	Contact Hours = 4 Hours

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

ಪಠ್ಯಪುಸ್ತಕ	
1.	ಬಳಕೆ ಕನ್ನಡ ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ ಪ್ರಸಾರಾಂಗ, ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಬೆಳಗಾವಿ.

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Assignments
		3.	Semester End Examination

Course Outcome (COs)

At the end of the course, the student will be able to (Highlight the **action verb** representing the learning level.)

Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create		**Learning Level**	**PO(s)**	**PSO(s)**
1.	Communicate (converse) in Kannada language in their daily life with kannada speakers.	L3	10	
2.	Read and write Kannada language as per requirement.	L3	10	

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Addition of two Assignments	Total Marks
Maximum Marks	15+15= 30	10+10 =20	50
1. Writing the IA tests is compulsory 2. **Minimum marks required to be eligible for SEE: 20 out of 50**			

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 50 marks of 2 hours duration.
2.	**Minimum marks required in SEE to pass: 20 out of 50**
3.	Question paper will have choices.

CO-PO Mapping (Planned)													**CO-PSO Mapping(Planned)**		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
1										✓					
2										✓					
Tick mark the CO, PO and PSO mapping															

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ

Samskrutika Kannada (Kannada for Administration) is for students who speak, read and write Kannada.

Course Code	21EC46	Course type	HSMS	Credits L-T-P	0–1 - 0
Hours/week: L-T-P	0 – 2 – 0			Total credits	1
Total Contact Hours	L = 20 Hrs; T = 0 Hrs;P = 0 Hrs Total = 20 Hrs			CIE Marks	50
Flipped Classes content	---			SEE Marks	50 (2 Hours)

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಪಠ್ಯದ ಕಲಿಕೆಯ ಉದ್ದೇಶಗಳು:

1. ವೃತ್ತಿಪರ ಪದವಿ ವಿದ್ಯಾರ್ಥಿಗಳಾಗಿರುವುದರಿಂದ ಕನ್ನಡ ಭಾಷೆ, ಸಾಹಿತ್ಯ ಮತ್ತು ಕನ್ನಡದ ಸಂಸ್ಕೃತಿಯ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು.
2. ಕನ್ನಡ ಸಾಹಿತ್ಯದ ಪ್ರಧಾನ ಭಾಗವಾದ ಆಧುನಿಕ ಪೂರ್ವ ಮತ್ತು ಆಧುನಿಕ ಕಾವ್ಯಗಳನ್ನು ಸಾಂಕೇತಿಕವಾಗಿ ಪರಿಚಯಿಸಿ ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಸಾಹಿತ್ಯ ಮತ್ತು ಸಂಸ್ಕೃತಿಯ ಬಗ್ಗೆ ಅರಿವು ಹಾಗೂ ಆಸಕ್ತಿಯನ್ನು ಮೂಡಿಸುವುದು.
3. ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯವನ್ನು ಹಾಗೂ ಅವರುಗಳ ಸಾಧಿಸಿದ ವಿಷಯಗಳನ್ನು ಪರಿಚಯಿಸುವುದು.
4. ಕನ್ನಡ ಶಬ್ದಸಂಪತ್ತಿನ ಪರಿಚಯ ಮತ್ತು ಕನ್ನಡ ಭಾಷೆಯ ಬಳಕೆ ಹಾಗೂ ಕನ್ನಡದಲ್ಲಿ ಪತ್ರ ವ್ಯವಹಾರವನ್ನು ತಿಳಿಸಿಕೊಡುವುದು.

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

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

1. ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡವನ್ನು ಬೋಧಿಸಲು ತರಗತಿಯಲ್ಲಿ ಶಿಕ್ಷಕರು ಪ್ರಸ್ತುತ ಪುಸ್ತಕ ಆಧಾರಿಸಿ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನವನ್ನು ಅನುಸರಿಸುವುದು. ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ತಯಾರಿಸಲು ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಪ್ರೇರೇಪಿಸುವುದು ಮತ್ತು ತರಗತಿಯಲ್ಲಿ ಅವುಗಳನ್ನು ಚರ್ಚಿಸಲು ಅವಕಾಶ ಮಾಡಿಕೊಡುವುದು.
2. ಇತ್ತೀಚಿನ ತಂತ್ರಜ್ಞಾನದ ಅನುಕೂಲಗಳನ್ನು ಬಳಸಿಕೊಳ್ಳುವುದು - ಅಂದರೆ ಕವಿ-ಕಾವ್ಯ ಪರಿಚಯದಲ್ಲಿ ಕವಿಗಳ ಚಿತ್ರಣ ಮತ್ತು ಲೇಖನಗಳು ಮತ್ತು ಕಥೆ ಕಾವ್ಯಗಳ ಮೂಲ ಅಂಶಗಳಿಗೆ ಸಂಬಂಧಪಟ್ಟ ಧ್ವನಿ ಚಿತ್ರಗಳು, ಸಂಭಾಷಣೆಗಳು, ಈಗಾಗಲೇ ಇತರ ವಿಮರ್ಶಕರು ಬರೆದಿರುವ ವಿಮರ್ಶಾತ್ಮಕ ವಿಷಯಗಳನ್ನು ಟಿಪಿಟಿ, ಡಿಜಿಟಲ್ ಮಾಧ್ಯಮಗಳ ಮುಖಾಂತರ ವಿಶ್ಲೇಷಿಸುವುದು.
3. ನವೀನ ಮಾದರಿಯ ಸಾಹಿತ್ಯ ಬೋಧನೆಗೆ ಸಂಬಂಧಪಟ್ಟ ವಿಧಾನಗಳನ್ನು ಶಿಕ್ಷಕರು ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಅನುಕೂಲವಾಗುವ ರೀತಿಯಲ್ಲಿ ಅಳವಡಿಸಿಕೊಳ್ಳಬಹುದು.

ಘಟಕ -1 ಲೇಖನಗಳು	Contact Hours = 4 Hours

1. ಕರ್ನಾಟಕ ಸಂಸ್ಕೃತಿ - ಹಂಪ ನಾಗರಾಜಯ್ಯ
2. ಕರ್ನಾಟಕದ ಏಕೀಕರಣ : ಒಂದು ಅಪೂರ್ವ ಚರಿತ್ರೆ - ಜಿ. ವೆಂಕಟಸುಬ್ಬಯ್ಯ
3. ಆಡಳಿತ ಭಾಷೆಯಾಗಿ ಕನ್ನಡ - ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ ಮತ್ತು ಪ್ರೋ. ವಿ. ಕೇಶವಮೂರ್ತಿ

ಘಟಕ -2 ಆಧುನಿಕ ಪೂರ್ವದ ಕಾವ್ಯ ಭಾಗ	Contact Hours = 4 Hours

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

ಘಟಕ -3 ಆಧುನಿಕ ಕಾವ್ಯಭಾಗ	Contact Hours = 4 Hours
1. ಡಿವಿಜಿ ರವರ ಮಂಕುತಿಮ್ಮನ ಕಗ್ಗದಿಂದ ಅಯ್ದ ಕೆಲವು ಭಾಗಗಳು 2. ಕುರುಡು ಕಾಂಚಾಣ : ದಾ.ರಾ. ಬೇಂದ್ರೆ 3. ಹೊಸಬಾಳಿನ ಗೀತೆ : ಕುವೆಂಪು	

ಘಟಕ -4 ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯ	Contact Hours = 4 Hours
1. ಡಾ. ಸರ್. ಎಂ. ವಿಶ್ವೇಶ್ವರಯ್ಯ : ವ್ಯಕ್ತಿ ಮತ್ತು ಐತಿಹ್ಯ - ಎ ಎನ್ ಮೂರ್ತಿರಾವ್ 2. ಕರಕುಶಲ ಕಲೆಗಳು ಮತ್ತು ಪರಂಪರೆಯ ವಿಜ್ಞಾನ : ಕರೀಗೌಡ ಬೀಚನಹಳ್ಳಿ	

ಘಟಕ -5 ಕಥೆ ಮತ್ತು ಪ್ರವಾಸ ಕಥನ	Contact Hours = 4 Hours
1. ಯುಗಾದಿ : ವಸುಧೇಂದ್ರ 2. ಮೆಗಾನೆ ಎಂಬ ಗಿರಿಜನ ಪರ್ವತ : ಹಿ.ಚಿ. ಬೋರಲಿಂಗಯ್ಯ	

ಪಠ್ಯಪುಸ್ತಕ	
1.	ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಡಾ. ಹಿ.ಚಿ.ಬೋರಲಿಂಗಯ್ಯ ಮತ್ತು ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ, ಪ್ರಸಾರಾಂಗ, ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಬೆಳಗಾವಿ.

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

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Assignments
		3.	Semester End Examination

Course Outcome (COs)

At the end of the course, the student will be able to(Highlight the **action verb** representing the learning level.)

	Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create	**Learning Level**	**PO(s)**	**PSO(s)**
1	ಕನ್ನಡ ಸಾಹಿತ್ಯದ ಆಧುನಿಕ ಪೂರ್ವ ಮತ್ತು ಆಧುನಿಕ ಕಾವ್ಯಗಳು ಮತ್ತು ಸಂಸ್ಕೃತಿಯ ಬಗ್ಗೆ ಆಸಕ್ತಿಯು ಮೂಡುತ್ತದೆ. Discuss and Explain the history and culture of Karnataka	L3	10	

2	Discuss the contributions made to Kannada literature	L3	10	

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Addition of two Assignments	Total Marks
Maximum Marks	15+15= 30	10+10 =20	50
1. Writing the IA tests is compulsory 2. **Minimum marks required to be eligible for SEE: 20 out of 50**			

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 50 marks of 2 hours duration.
2.	**Minimum marks required in SEE to pass: 20 out of 50**
3.	Question paper will have choices.

CO-PO Mapping (Planned)													**CO-PSO Mapping(Planned)**		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
1										✓					
2										✓					
Tick mark the CO, PO and PSO mapping															

UNIVERSAL HUMAN VALUES AND PROFESSIONAL ETHICS

Course Code	21EC47	**Course type**	**UHV**	**Credits L-T-P**	1 – 0- 0
Hours/week: L-T-P	1 – 0 – 0			**Total credits**	1
Total Contact Hours	L = 20 Hrs; T = 0 Hrs;P = 0 Hrs Total = 20 Hrs			**CIE Marks**	50
Flipped Classes content	--			**SEE Marks**	50

Course learning objectives	
1.	To provide understanding of basic human values
2.	To implement the human values in Engineering profession.

Knowledge required: English Language, Social Studies

Unit – I Human Values	**6 Hours**
Objectives, Morals, Values, Ethics, Integrity, Work ethics, Service learning, Virtues, Respect for others, living peacefully, Caring, Sharing, Honesty, Courage, Valuing time, Cooperation, Commitment, Empathy, Self-confidence, Challenges in the work place, Spirituality.	

Unit – II Professional Ethics	**8 Hours**
Engineering Ethics: Overview, senses of engineering ethics, variety of moral issues, types of enquiries, moral dilemma, moral autonomy, moral development (theories), consensus and controversy, profession, models of professional roles, responsibility. Theories about right action (ethical theories), self-control, self-interest, customs, religion, self-respect, case studies (Choice of the Theory), engineering as experimentation, engineers as responsible experimenters.	

Unit – III Professional Ethics	**6 Hours**
Codes of ethics, Environmental ethics, Computer ethics, Engineers as managers, Ethics and code of business conduct in MNC	

Illustrative case studies (3 cases related to Human value and 3 cases related Professional Ethics)

	Books
1.	Nagarazan R.S., Professional Ethics and Human Values, New Age International Publishers Pvt.Ltd. 2006

Course Outcome (COs)		
At the end of the course, the student will be able to**:**		Bloom's Level
1.	Identify and practice the human values	L2
2.	Understand and implement ethics in Engineering profession.	L1, L3

Program Outcome of this course (POs)		**PO No.**
1.	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.	6
2.	Apply ethical principles and commit to professional ethics and responsibilities and	8

	norms of the engineering practice.	

Course delivery methods		Assessment methods	
1.	Lecture	1.	I. A. test
2.	Presentation	2.	SEE
3.	Expert talks		

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests
Maximum Marks: 50	25+25= 50
Minimum score to be eligible for SEE: 20 OUT OF 50	

Scheme of Semester End Examination (SEE):	
1.	SEE question paper for 50 marks having descriptive type questions will be conducted for two hours duration.
2.	**Minimum marks required in SEE to pass: 20 out of 50**
3.	Choice in each unit.

CO-PO Mapping (Planned)													**CO-PSO Mapping(Planned)**		
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**	**PSO3**
1						✓									
2								✓							
Tick mark the CO, PO and PSO mapping															