RAMAIAH
Institute of Technology

CURRICULUM

Outcome Based Education
(Academic Year 2022 – 2023)

ELECTRONICS AND

TELECOMMUNICATION ENGINEERING

III & IV SEMESTER B.E.

RAMAIAH INSTITUTE OF TECHNOLOGY
(Autonomous Institute, Affiliated to VTU)
Bangalore – 560054.

About the Institute

Dr. M. S. Ramaiah a philanthropist, founded 'Gokula Education Foundation' in 1962 with an objective of serving the society. M S Ramaiah Institute of Technology (MSRIT) was established under the aegis of this foundation in the same year, creating a landmark in technical education in India. MSRIT offers 17 UG programs and 15 PG programs. All these programs are approved by AICTE. All eligible UG and PG programs are accredited by National Board of Accreditation (NBA). The institute is accredited with **'A⁺' grade by NAAC in March 2021** for 5 years. University Grants Commission (UGC) & Visvesvaraya Technological University (VTU) have conferred Autonomous Status to MSRIT for both UG and PG Programs since 2007. The institute is also been conferred autonomous status for Ph.D program since 2021. The institute is a participant to the Technical Education Quality Improvement Program (TEQIP), an initiative of the Government of India. The institute has 380 competent faculty out of which 65% are doctorates. Some of the distinguished features of MSRIT are: State of the art laboratories, individual computing facility for all faculty members, all research departments active with sponsored funded projects and more than 300 scholars pursuing Ph.D. To promote research culture, the institute has established Centre of Excellence for Imaging Technologies, Centre for Advanced Materials Technology, Centre for Antennas and Radio Frequency systems (CARFS), Center for Cyber Physical Systems, Schneider Centre of Excellence & Centre for Bio and Energy Materials Innovation. **M S Ramaiah Institute of Technology has obtained "Scimago Institutions Rankings" All India Rank 107 & world ranking 600 for the year 2022.**

The Entrepreneurship Development Cell (EDC) and Section 8 company "Ramaiah Evolute" have been set up on campus to incubate startups. **M S Ramaiah Institute of Technology is recognized by Atal Ranking of Institutions on Innovation Achievements (ARIIA), MoE, Govt. of India.** MSRIT has a strong Placement and Training department with a committed team, a good Mentoring/Proctorial system, a fully equipped Sports department, large air-conditioned library with good collection of book volumes and subscription to International and National Journals. The Digital Library subscribes to online e-journals from Elsevier Science Direct, IEEE, Taylor & Francis, Springer Link, etc. MSRIT is a member of DELNET, CMTI and VTU E-Library Consortium. MSRIT has a modern auditorium and several hi-tech conference halls with video conferencing facilities. The institute has excellent hostel facilities for boys and girls. MSRIT Alumni have distinguished themselves by occupying high positions in India and abroad and are in touch with the institute through an active Alumni Association.

As per the National Institutional Ranking Framework (NIRF), MoE, Government of India, M S Ramaiah Institute of Technology has achieved 67th rank among 1249 top Engineering Institutions & 17th Rank for School of Architecture in India for the year 2022 and is 1st amongst the Engineering Colleges affiliated to VTU, Karnataka.

About the department

The Department of Electronics &Telecommunication Engineering (Formerly known as Department of Telecommunication Engineering) was established in 1996 to address the increasing demand for professionals with expertise in communication and networking technology in India. The Department has state of the art laboratories, equipment's, resources and committed faculty having best of the academic and industry recognition. The Department started a **M.Tech program in Digital Communication in the year 2004**. The Department also started a **Research Centre** in the year 2012 and currently has 12 Research Scholars carrying out their Research. Department has collaborations with some of the leading industries like **Ansys, Rohde & Schwarz, JV Micronics, Nokia, Huawei Technologies, Intel, Samsung,** and with leading national and international universities like **Bradley University, IIT-M**, enabling the department to focus on R&D, and thus providing new avenues for PG/UG students for placement and higher studies. Both UG and PG Programs are accredited by the **National Board of Accreditation**. There are **5 Funded Research projects** (Industry and Government) ongoing in the department involving students to carry out innovative projects. Many professional activities are organized regularly to the students under various professional societies like IEEE Sensor Council, IEEE Communication Society, IEEE Antenna and Propagation Society, IEEE MTTs and IETE Bangalore.

The department of ETE has established the Centre of Excellence – **Centre for Antennas and Radio Frequency Systems (CARFS)** Jointly with ECE department on 24th March 2021 to engage in advanced Research leading to innovation in the areas of Antennas & RF Systems. The CARFS has the State of the art Facilities to collaborate with Researchers in other Institutions across the Country and World in various projects.

VISION OF THE INSTITUTE

To be an Institution of International Eminence, renowned for imparting quality technical education, cutting edge research and innovation to meet global socio-economic needs

MISSION OF THE INSTITUTE

RIT shall meet the global socio-economic needs through

- Imparting quality technical education by nurturing a conducive learning environment through continuous improvement and customization
- Establishing research clusters in emerging areas in collaboration with globally reputed organizations
- Establishing innovative skills development, techno-entrepreneurial activities and consultancy for socio-economic needs

QUALITY POLICY

We at Ramaiah Institute of Technology strive to deliver comprehensive, continually enhanced, global quality technical and management education through an established Quality Management System complemented by the synergistic interaction of the stake holders concerned

VISION OF THE DEPARTMENT

To provide an ambience for the students to excel in studies, research and innovation, focusing on meeting global socio-economic needs from a Telecommunication Engineering perspective

MISSION OF THE DEPARTMENT

- Providing high quality technical education to create world class Telecommunication engineers.
- Creating an ambience for skill development, research and entrepreneurial activities to meet socio-economic needs

PROGRAM EDUCATIONAL OBJECTIVES (PEOs):

PEO1: Graduates will excel in professional careers in Industry, Academia and Research to meet Socio-Economic needs.

PEO2: Graduates will analyze problems specific to Telecommunication Engineering and multidisciplinary domains providing technically feasible solutions.

PE03: Graduates will exhibit professional communication skills, teamwork, leadership qualities, ethical behavior and lifelong learning.

PROGRAM OUTCOMES (POs):

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: 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.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs):

PSO1: Identify, analyze, formulate, design and demonstrate applications relevant to Telecommunication engineering using electronic devices.

PSO2: Use current technology and modern tools to address solutions for telecommunication products by taking into account safety, healthy environmental requirements.

PSO3: Apply project management tools to solve Telecommunication systems by exhibiting teamwork and lifelong learning.

SCHEME OF TEACHING III SEMESTER

Sl. No.	Subject Code	Subject	Teaching Department	Category	Credits				Total contact hours /week
					L	T	P	Total	
1	ET31	Transform Techniques and Linear Programming	Mathematics	BSC	2	1	0	3	4
2	ET32	Data Structures Using C	ETE	IPCC	2	0	1	3	4
3	ET33	Analog Circuit Design	ETE	PCC	2	1	0	3	4
4	ET34	Digital Circuit Design	ETE	PCC	3	0	0	3	3
5	ET35	Network Analysis	ETE	PCC	3	0	0	3	3
6	ETL36	Analog Circuit Design Lab	ETE	PCC	0	0	1	1	2
7	ETL37	Digital Circuit Design Lab	ETE	PCC	0	0	1	1	2
8	UHV38	Universal Human Values	ETE	UHV	2	0	0	2	2
9	HS392	Constitution of India & Professional Ethics	Humanities	HSMC	1	0	0	1	1
10	AEC310	Ability Enhancement Course- III	Respective department	AEC	1	0	0	1	1
				Total	**16**	**2**	**3**	**21**	**26**
11	PE83	Physical Education	Respective department	NCMC	All students have to register compulsorily for any one of the courses with the concerned coordinator (Yoga Teacher/ Physical Education Director/ NSS Coordinator) in the beginning of the III semester. Attending the registered course from III to VIII semesters. Qualifying is mandatory for the award of the degree.				
	YO83	Yoga	Respective department						
	NS83	NSS	Respective department						
12	AM31	Additional Mathematics - I *	Mathematics	NCMC	0	0	0	0	3

NOTE: Branches: CSE, AI & ML, AI & DS, CSE(CS), CSE (AI & ML), ISE, ECE: Kannada (Kali / Manasu) in III Semester
Constitution of India & Professional Ethics in IV Sem
Branches: EEE, MLE, ETE, EIE, ME, CV, IEM, CH, BT: Constitution of India & Professional Ethics in III Semester
Kannada (Kali / Manasu) in IV Semester

Nomenclature: BSC: Basic Science Course, **IPCC:** Integrated Professional Core Course, **PCC:** Professional Core Course,
HSMC: Humanity and Social Science & Management Courses, **AEC**–Ability Enhancement Courses, **UHV:** Universal Human Value
Course, **NCMC**: Non-credit Mandatory Course

L –Lecture, T – Tutorial, P- Practical/ Drawing

Integrated Professional Core Course (IPCC): Refers to Professional Theory Core Course Integrated with practical of the same course. Credit for IPCC is 03 and its Teaching–Learning hours (L: T: P) can be considered as (2: 0: 1). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated only by CIE (no SEE). However, questions from the practical part of IPCC can be included in the SEE question paper.

HS39/ HS49 Kannada Manasu is for students who speak, read and write Kannada and
HS39/ HS49 Kannada Kali is for non-Kannada speaking, reading, and writing students.

The Non Credit Mandatory Course, Physical Education (Sport and Athletics)/Yoga/National Service Scheme (NSS):

1. Student shall select any one of the NCMC's namely, Physical Education (Sport and Athletics)/Yoga/ NSS prescribed for VIII semesters and shall attend the course from the III semesters and up to end of VIII semesters to complete all the formalities of the course and appear for the SEE. Marks scored in SEE shall be included in the VIII semester grade card.
2. The above mentioned NCMC's shall not be considered for vertical progression as well as for the calculation of SGPA/CGPA but completion of the courses shall be mandatory for the award of degree.
3. SEE marks will be allotted by the concerned course teacher based on attendance and performance in the practice sessions/field in the ratio of 50:50. Maximum CIE marks are 50. SEE should be awarded by the course teacher every semester (III to VIII) for 50 marks and marks scored by the student are scaled down to 50 in the VIII semester.
4. The students who take a course on Physical Education and Yoga, he/she has to take up the semester end practical examination prescribed for 100 marks. The students who opt for NSS course have to submit report and attend viva-voce examination. The marks of the report shall be 50 marks and for the presentation/viva-voce 50 marks. SEE scale down to 50 marks.
5. In case, any student fails to secure the minimum 40% of the prescribed marks, he/she shall be deemed to have secured **'F'** grade.

* Lateral Entry Students:
The Non-Credit Mandatory Course, Additional Mathematics I is prescribed for III Semester Lateral Entry Diploma students admitted to III Semester of BE Program. The student shall register for this course along with other III semester courses. The students shall attend classes for the course during the semester and complete all formalities of attendance and CIE. In case, any student fails to secure the minimum 40% of the prescribed CIE marks, he/she shall be deemed to have secured **'F'** grade. In such a case, the student has to fulfill the requirements during subsequent semester/s to appear for CIE. Incase student fails to register for the said course/ falls short of attendance, he/she will repeat the course whenever it is offered next. Additional Mathematics I shall have CIE component only and no SEE component. This Course shall not be considered for vertical progression, but completion of the course shall be mandatory for the award of the degree.

Inter/Intra Institutional Internship: All the students admitted under lateral entry category shall have to undergo a mandatory summer Internship-I of 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 IV semester and the prescribed credit shall be included in IV semester after students clearing this head. The internship shall be considered as a head of passing and shall be considered for vertical progression and for the award of degree. Those, who do not take up / complete the internship shall be declared fail and shall have to complete during subsequent examination after satisfying the internship requirements during subsequent semesters.

Lateral Entry Students:
AICTE Activity Points to be earned by students admitted to BE program (For more details refer to Chapter 6, AICTE, Activity Point Program, Model Internship Guidelines):
Every regular student, who is admitted to the 4-year degree program, is required to earn 100 activity points in addition to the total credits earned for the program. Students entering 4 years degree program through lateral entry are required to earn 75 activity points in addition to the total credits earned for the program. The activity points earned by the student shall be reflected on the students VIII semester grade card. The activities to earn the points can be spread over the duration of the course. However, minimum prescribed duration should be fulfilled. Activity points (non-credit) have no effect on SGPA/CGPA and shall not be considered for vertical progression. Incase student fail to earn the prescribed activity points; VIII semester grade card shall be issued only after earning the required activity Points. Students shall be eligible for the award of degree only after the release of the VIII semester grade card.

SCHEME OF TEACHING IV SEMESTER

Sl. No.	Subject Code	Subject	Teaching Department	Category	Credits				Total contact hours /week
					L	T	P	Total	
1	ET41	Numerical Methods and Probability Models	Mathematics	BSC	2	1	0	3	4
2	ET42	Systems Modelling and Control	ETE	IPCC	2	0	1	3	4
3	ET43	Microcontroller	ETE	PCC	3	0	0	3	3
4	ET44	Engineering Electromagnetics	ETE	PCC	3	0	0	3	3
5	ET45	Signal Processing	ETE	PCC	2	1	0	3	4
6	ETL46	Microcontroller Lab	ETE	PCC	0	0	1	1	2
7	ETL47	Signal Processing Lab	ETE	PCC	0	0	1	1	2
8	ETL48	OOPS using Python Lab	ETE	PCC	0	0	1	1	2
9	HS491	Kannada (Kali/Manasu)	Humanities	HSMC	1	0	0	1	1
10	AEC410	Ability Enhancement Course - IV	Respective department	AEC	1	0	0	1	1
11	INT411	Inter/ Intra Institutional Internship	Respective department	INT	0	0	2	2	-
		Total			14	2	6	22	26
12	AM41	Additional Mathematics II *	Mathematics	NCMC	0	0	0	0	-

NOTE: Branches: CSE, AI & ML, AI & DS, CSE(CS), CSE (AI & ML), ISE, ECE: Kannada (Kali / Manasu) in III Semester
Constitution of India & Professional Ethics in IV Sem
Branches: EEE, MLE, ETE, EIE, ME, CV, IEM, CH, BT: Constitution of India & Professional Ethics in III Semester
Kannada (Kali / Manasu) in IV Semester
Nomenclature: BSC: Basic Science Course, **IPCC:** Integrated Professional Core Course, **PCC:** Professional Core Course, **INT** –Internship, **HSMC:** Humanity and Social Science & Management Courses, **AEC**–Ability Enhancement Courses, **NCMC**: Non-credit Mandatory Course
L –Lecture, T – Tutorial, P- Practical/ Drawing

Integrated Professional Core Course (IPCC): Refers to Professional Theory Core Course Integrated with practical of the same course. Credit for IPCC is 03 and its Teaching–Learning hours (L : T : P) can be considered as (2 : 0 : 1). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated only by CIE (no SEE). However, questions from the practical part of IPCC can be included in the SEE question paper.
HS39/ HS49 Kannada Manasu is for students who speak, read and write Kannada and   **HS39/ HS49 Kannada Kali** is for non-Kannada speaking, reading, and writing students.
Innovation/ Societal/ Entrepreneurship based Internship: At the End of fourth Semester four - weeks summer internship shall be carried out at industry, State and Central Govt./NGO/MSME, Innovation center's or incubation centers. The internship can be Rural Internship. All the students shall have to undergo mandatory internship of 04 weeks during the intervening period of IV & V semesters. A Viva-Voce examination (CIE) shall be conducted during V semester and the prescribed credit shall be included in VI 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 examination after satisfying the internship requirements. The in-charge faculty has to monitor the student's internship progress and interact to guide them for the successful completion of the internship.   Innovation/ Societal/ Entrepreneurship based Internship shall have only CIE no SEE component.
* Lateral Entry Students: **The Non-Credit Mandatory Course, Additional Mathematics II** is prescribed for IV Semester Lateral Entry Diploma students admitted to III Semester of BE Program. The student shall register for this course along with other IV semester courses. The students shall attend classes for the course during the semester and complete all formalities of attendance and CIE. In case, any student 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. Incase student fails to register for the said course/ falls short of attendance, he/she will repeat the course whenever it is offered next. Additional Mathematics II shall have CIE component only and no SEE component. This Course shall not be considered for vertical progression, but completion of the course shall be mandatory for the award of the degree.

AICTE Activity Points to be earned by students admitted to BE program (For more details refer to Chapter 6, AICTE, Activity Point Program, Model Internship Guidelines):

Every regular student, who is admitted to the 4-year degree program, is required to earn 100 activity points in addition to the total credits earned for the program. Students entering 4 years' degree program through lateral entry are required to earn 75 activity points in addition to the total credits earned for the program. The activity points earned by the student shall be reflected on the students VIII semester grade card. The activities to earn the points can be spread over the duration of the course. However, minimum prescribed duration should be fulfilled. Activity points (non-credit) have no effect on SGPA/CGPA and shall not be considered for vertical progression. Incase student fail to earn the prescribed activity points; VIII semester grade card shall be issued only after earning the required activity Points. Students shall be eligible for the award of degree only after the release of the VIII semester grade card.

TRANSFORM TECHNIQUES AND LINEAR PROGRAMMING

Course Code: ET31	Credits: 2:1:0
Pre – requisites: Nil	Contact Hours: 28L+28T
Course Coordinator: Dr. Monica Anand & Dr. M. Girinath Reddy	

Course Content

Unit I

Laplace Transform: Definition, Transform of standard functions, Properties of Laplace transforms, Existence conditions, Transforms of derivatives, Integrals, Multiplication by t^n, Division by t, Evaluation of integrals by Laplace transforms and Transform of Periodic function.

- Pedagogy / Course delivery tools: Chalk and talk
- Links: https://nptel.ac.in/courses/111/105/111105134/
- Impartus recording: https://a.impartus.com/ilc/#/course/59742/295

Unit II

Applications of Laplace Transform: Unit–step function, Unit–impulse function, Inverse transforms, Convolution Theorem, Solution of linear differential equations and Simultaneous linear differential equations using Laplace transforms. Engineering applications.

- Pedagogy / Course delivery tools: Chalk and talk
- Links: https://nptel.ac.in/courses/111/105/111105134/
- Impartus recording: https://a.impartus.com/ilc/#/course/59742/295

Unit III

Fourier Series: Periodic functions, Dirichlet's conditions, Fourier series of periodic functions of period 2π and arbitrary period, Half range Fourier series, Practical harmonic analysis.

- Pedagogy / Course delivery tools: Chalk and talk
- Links: https://nptel.ac.in/courses/111/105/111105134/
- Impartus recording: https://a.impartus.com/ilc/#/course/619570/1030

Unit IV

Fourier Transforms: Derivation of Fourier Series to Fourier Transforms, Infinite Fourier transform, Infinite Fourier sine and cosine transforms, Properties, Inverse

transforms, Convolution theorem (without proof) and its significance, Parseval's identity (statements only), Fourier transform of derivatives and integrals, Solution of ODE's using Fourier transforms, Limitations of Fourier Transform and need of Wavelet Transform.

- Pedagogy / Course delivery tools: Chalk and talk
- Links: https://nptel.ac.in/courses/111/105/111105134/
- Impartus recording: https://a.impartus.com/ilc/#/course/171952/703

Unit V

Linear Programming: Introduction to Linear Programming Problem (LPP), Formulation of the problem, Graphical method, General, Canonical and standard forms of LPP, Simplex method, Big-M method, Two-phase simplex method and Duality in linear programming.

- Pedagogy / Course delivery tools: Chalk and talk
- Links: https://nptel.ac.in/courses/111104027

Text Books:

1. Erwin Kreyszig –Advanced Engineering Mathematics – Wiley publication – 10th edition-2015.
2. B. S. Grewal –Higher Engineering Mathematics – Khanna Publishers – 44th edition – 2017.

References:

1. Glyn James – Advanced Modern Engineering Mathematics – Pearson Education – 4th edition – 2010.
2. Dennis G. Zill, Michael R. Cullen - Advanced Engineering Mathematics, Jones and Barlett Publishers Inc. – 3rd edition – 2009.
3. Kanti Swarup, P.K. Gupta and Man Mohan -Operations Research-Sultan Chand & Sons Publishers–2014.

Course Outcomes (COs):

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

1. Determine Laplace transform of standard functions. (PO-1, PO-2, PSO-1)
2. Solve initial and boundary value problems using Laplace transforms. (PO-1, PO-2, PSO-1)
3. Construct the Fourier series expansion of a function/tabulated data. (PO-1, PO-2, PSO-1)

4. Evaluate Fourier transforms of functions and use it to solve ODE's. (PO-1, PO-2, PSO-1)
5. Formulate and solve a simple linear programming problem. (PO-1, PO-2, PSO-1)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment Tool	**Marks**	**Course outcomes addressed**
Internal test-I	30	CO1, CO2, CO3
Internal test-II	30	CO3, CO4, CO5
Average of the two internal tests shall be taken for 30 marks.		
Other components		
Quiz	10	CO1, CO2, CO3
Assignment	10	CO3, CO4, CO5
Semester End Examination (SEE)	100	CO1, CO2, CO3, CO4, CO5

DATA STRUCTURES USING C	
Course Code: ET32	**Credits:** 2:0:1
Pre – requisites: Computing Fundamentals and C programming (CS14)	**Contact Hours:** 28L+28P
Course Coordinator: Dr. Arvind Kumar G	

Unit I

Introduction to structures, pointers and functions in C

Linked List: Dynamic memory allocation & de allocation functions, Introduction to Linked List, Types of linked list, Basic operations (Insert, Delete, Traverse, Search, and Display)

- Pedagogy / Course delivery tools: PPT, Chalk and talk
- Links: https://www.programiz.com/dsa/linked-list
- Impartus recording: https://a.impartus.com/ilc/#/course/132060/636

Unit II

Stacks & Queues: Basic stack operations, Stack Applications-Conversion & Evaluation of expressions, other applications on stack.

Queues: Introduction to queues: Basic operations, Different types of queues.

- Pedagogy / Course delivery tools: PPT, Chalk and talk
- Links: https://www.andrew.cmu.edu/course/15-121/lectures/Stacks%20and%20Queues/Stacks%20
- Impartus recording: https://a.impartus.com/ilc/#/course/132060/636

Unit III

Trees: Introduction to trees: Basic tree concepts, Binary tree properties, Binary tree traversal, Algorithms & programs on Binary search tree (BST).

- Pedagogy / Course delivery tools: PPT, Chalk and talk
- Links: https://data-flair.training/blogs/binary-tree-in-c/#:~:text=In%20programming%20terminology%2C%20a%20tree %20tree.
- Impartus recording: https://a.impartus.com/ilc/#/course/132060/636

Unit IV

Sorting: Types of sorting: Insertion sort, Shell sort, Quick sort, Bubble sort.

Searching: Binary search & sequential search. Hashed list searches: Basic concepts, Hashing Methods.

- Pedagogy / Course delivery tools: PPT, Chalk and talk

- Links: https://www.edureka.co/blog/sorting-algorithms-in-c/
- Impartus recording: https://a.impartus.com/ilc/#/course/132060/636

Unit V

Graphs: Introduction & Basic concepts, Graph operations, Graph traversal-Depth first & Breadth first traversal. Graph storage structure: Adjacency matrix & Adjacency list. Graph

- Pedagogy / Course delivery tools: PPT, Chalk and talk
- Links: https://www.cs.yale.edu/homes/aspnes/pinewiki/ C(2f)Graphs.html
- Impartus recording: https://a.impartus.com/ilc/#/course/132060/636

List of Experiments:

Session Numbers	Topics
1.	• Program to insert, delete and display Singly linked list by attaching or detaching nodes at the beginning of the list.
2.	• Program to insert, delete and display doubly linked list by attaching or detaching nodes at the beginning of the list.
3.	• Program to insert, delete and display Singly linked list by attaching or detaching nodes at the end of the list
4.	• Program to insert, delete and display Doubly linked list by attaching or detaching nodes at the end of the list
5.	• Program to insert, delete and display Circularly linked list by adding and deleting at the beginning • Program to insert, delete and display Circularly linked list by adding and deleting at the end.
6.	• Program to insert, delete and display Circularly linked list by adding at the end and deleting at the beginning • Program to make a copy of a given singly linked list
7.	• Program to create and reverse a Singly linked list and display the same • Program to search a given element in a given Singly linked list
8.	• Implementation of a stack using singly linked list • Program to convert a given decimal number to hexadecimal
9.	• Program to decide whether a switch is routable or not using a stack. • Program to convert infix to postfix

10.	• Implementation of a Queue using singly linked list • Program to implement Maximum /Minimum Priority Queue
11.	• Programs for in order, preorder and post order traversal of trees • Program to insert ,delete ,traverse and search in a binary search tree
12.	• Program to search a data base using linear search • Program to search a data base using binary search
13.	• Program to sort a data base using Bubble sort • Program to sort a data base using Merge sort
14.	• Program to implement breadth first traversal for a given graph. • Program to implement depth first traversal for a given graph

Text Books:

1. Yedidyah Langsam & Moshe J. Augenstein Aaron M. Tanenbaum, "Data Structures using C O Pearson Publication, 2008.
2. Richard Gilberg and Behrouz Forouzan, "Data Structures: A Pseudo code approach with   C", 2nd edition, Thomson publishing, 2007.
3. E. Balagurusamy, "Data Structures using C", Tata McGraw Hill, 2017.

Reference Books:

1. Reema Theraja, "Data Structures using C", Oxford publications,2014
2. Sahni Horowitz, "Fundamentals of Data Structures", University Press , Second edition,2008
3. E. Balagurusamy, "Programming in ANSI C", Tata McGraw Hill, 2017.

Web Links and Video Lectures (e-Resources)

1. NPTEL online course "Programming and Data Structures", http://nptel.ac.in/courses/106105085/
2. NPTEL online course "Introduction to programming in C", https://onlinecourses.nptel.ac.in/noc17_cs43/preview

Course Outcomes (COs):

1. Understand the basic concepts of Data structures and C programming (PO-1, PO-12, PSO-1)
2. Differentiate between Linear and Non-Linear data bases and their associated concepts (PO-1, PO-12, PSO-1)

3. Design linear and Nonlinear databases suitable to a given application (PO1, PO-2, PO-3, PO-6, PO-8, PO-9, PO-10, PO-11, PO-12, PSO-1, PSO-2, PSO-3)
4. Design and implement different functionalities to be performed on databases (PO1, PO-2, PO-3, PO-6, PO-8, PO-9, PO-10, PO-11, PO-12, PSO-1, PSO-2, PSO-3)
5. Evaluate the application for which the database is designed (PO1, PO-2, PO-3, PO-6, PO-8, PO-9, PO-10, PO-11, PO-12, PSO-1, PSO-2, PSO-3)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment Tool	**Marks**	**Course outcomes addressed**
Internal Test-I	30	CO1, CO2, CO3
Internal test-II	30	CO1, CO4, CO5
Average of the two internal tests will be taken for 30 marks.		
Other components		
MINI PROJECT	20	CO1, CO2, CO3, CO4, CO5
Semester End Examination (SEE)	100	CO1, CO2, CO3, CO4, CO5

ANALOG CIRCUIT DESIGN

Course Code: ET33	**Credits:** 2:1:0
Pre – requisites: Basic Electronics (EC13)	**Contact Hours:** 28L+28T
Course Coordinator: Dr. Satish Tunga	

Course Content

Unit I

Field – Effect Transistors: Introduction and Characteristics of JFETs, Transfer Characteristics. FET Biasing, JFET Small Signal Model, JFET AC equivalent Circuit, Low Frequency analysis of common source, common drain and common gate amplifier.

MOSFET: Device Structure and Physical Operation, V-I Characteristics, MOSFET Circuits at DC, Biasing in MOS amplifier Circuits, Small Signal Operation and Models, MOSFET as an amplifier and as a switch, Analysis of common source, common drain and common gate amplifier.s

- Pedagogy / Course delivery tools: Chalk and talk
- Links: https://nptel.ac.in/courses/108102095
- Impartus recording: http://a.impartus.com/ilc/#/course/107458/533

Unit II

Power Amplifiers: Class A large signal amplifiers, second harmonic distortion, high order harmonics generation, Transformer coupled audio power amplifier, Class B push pull amplifiers.

Feedback Amplifiers: Concept of feedback, Transfer gain with feedback, General characteristics of negative feedback amplifiers, Input and Output impedance.

- Pedagogy / Course delivery tools: Chalk and talk
- Links: https://nptel.ac.in/courses/108102095
- Impartus recording: http://a.impartus.com/ilc/#/course/107458/533

Unit III

Introduction to Operational Amplifiers and Characteristics: Introduction to Operational Amplifiers and Characteristics: Introduction, Block diagram, characteristics and equivalent circuits of an ideal op-amp. The Practical op-amp Introduction, Input offset voltage, offset current, thermal drift, common mode rejection ratio, Slew rate and its Effect, PSRR and gain – bandwidth product, Summing amplifier, Integrators and differentiators, Instrumentation amplifier, Log/ Antilog amplifier, Triangular/rectangular wave generator, phase-shift, oscillators. Relevant Problems

- Pedagogy / Course delivery tools: Chalk and talk
- Links: https://www.youtube.com/playlist?list=PLuv3GM6-gsE3npYPJJDnEF3pdiHZT6Kj3
- Impartus recording: http://a.impartus.com/ilc/#/course/107458/533

Unit IV

Comparators and Converters: Comparator, Zero Crossing Detector, Monostable and Astable Multivibrator, Schmitt Trigger, Voltage limiters, Clipper and clampers, Absolute value output circuit, Peak detector, Sample and hold Circuit, Precision rectifiers, Voltage-to-current converter, Current-to-voltage converter. Relevant Problems.

Active Filters: First & Second order high pass & low pass Butterworth filters, higher order filters Band pass filters, Band reject filters & all pass filters.

- Pedagogy / Course delivery tools: Chalk and talk
- Links: https://www.youtube.com/playlist?list=PLuv3GM6-gsE3npYPJJDnEF3pdiHZT6Kj3
- Impartus recording: http://a.impartus.com/ilc/#/course/107458/533

Unit V

A/D & D/Converters: Basics, R–2R D/A Converter, successive approximation ADC, dual slope ADC, Timer: Internal architecture of 555 timer, Mono stable, Astable multivibrators, and applications, PLL, regulator, Fixed and Adjustable Voltage Regulators.

- Pedagogy / Course delivery tools: Chalk and talk
- Links: http://www.youtube.com/playlist?list =PLbRMhDVUMngcoKrA4sH-zvbNVSE6IpEio
- Impartus recording: http://a.impartus.com/ilc/#/course/107458/533

Text Books:

1. Robert L. Boylestad and Louis Nashelsky, "Electronics devices and Circuit theory", Pearson, 11th Edition, July 2015.
2. A S. Sedra, K. C. Smith, "Microelectronic Circuits", Oxford University Press, 8th edition Nov 2019.
3. Ramakant A Gayakwad, "Op-Amps and Linear Integrated Circuits", Pearson, 4th edition, May 2015.

Reference Books:

1. I. J. Nagrath, "Electronics: Analog and Digital", PHI, 2013
2. David A. Bell, "Operational Amplifiers and Linear ICs" Oxford University Press, 3rd Edition July 2021.
3. Choudhury Roy D and Shail B. Jain, "Linear Integrated Circuits", Wiley Eastern, Oct 2018.

Web Links and Video Lectures (e-Resources):

- https://www.youtube.com/watch?v=2I_8YNVgbEw&t=43s
- https://www.youtube.com/watch?v=7Nqj2XstBkw
- https://www.youtube.com/watch?v=Ok-1kMqUnPk&list=PLO4mxQzfcml_56XSGcA8ULOv7qEtZd0Hy&index=27   , https://www.youtube.com/watch?v=8GLpBE5n5Cw&list=PLc7Gz02Znph-c2-ssFpRrzYwbzplXfXUT&index=88,
- https://www.youtube.com/watch?v=WzdmaSUCQGM&list=PLyYrySVqmyVPzvVlPW-TTzHhNWg1J_0LU&index=42
- https://www.youtube.com/watch?v=Bw6ahZ8znNU
- http://www.youtube.com/playlist?list=PLbRMhDVUMngcoKrA4sH-zvbNVSE6IpEio
- http://www.youtube.com/playlist?list=PLbRMhDVUMngcoKrA4sH-zvbNVSE6IpEio
- https://www.youtube.com/watch?v=ljlDriLo_7U&list=PLc7Gz02Znph-c2-ssFpRrzYwbzplXfXUT&index=81

Course Outcomes (COs):

1. Recall structures of JFET, MOSFETs, and functional block diagrams Linear IC's, PLL and IC Regulators. (PO-1, PO-2, PO-12) (PSO-1, PSO-3)
2. Understand the operational principles, characteristics and models of JFET, MOSFET, Linear IC's, PLL and IC Regulators. (PO-1, PO-2, PO-3, PO-12) (PSO-1, PSO-3)
3. Apply the fundamental circuit concepts and use the device models to analyse the various amplifier circuits using BJT, JFET and MOSFETs. (PO-1, PO-2, PO-3, PO-6, PO-12) (PSO-1, PSO-2, PSO-3)
4. Analyse the performance of various circuits using Linear IC's PLL and IC Regulators. (PO-1, PO-2, PO-3, PO-6, PO-12) (PSO-1, PO-2, PO-3)
5. Acquire competency to design analog circuits present in complicated electronic systems. (PO-1, PO-2, PO-3, PO-6, PO-12) (PSO-1, PO-2, PO-3)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment Tool	**Marks**	**Course outcomes addressed**
Internal Test-I	30	CO1, CO2, CO3
Internal test-II	30	CO1, CO4, CO5
Average of the two internal tests will be taken for 30 marks.		
Other components		
Surprise Test	10	CO1, CO2, CO3, CO4, CO5
Assignment	10	CO1, CO2, CO3, CO4, CO5
Semester End Examination (SEE)	100	CO1, CO2, CO3, CO4, CO5

DIGITAL CIRCUIT DESIGN	
Course Code: ET34	**Credits:** 3:0:0
Pre – requisites: Basic Electronics (EC13)	**Contact Hours:** 42L
Course Coordinator: Dr. Ramya H R	

Unit I

Principle of combinational logic: Definition of combinational logic, Canonical forms, Generation of switching equations from truth tables, Karnaugh maps-3, 4 and 5 variables, incompletely specified functions (Don't Care terms), Simplifying Maxterm equations, Map entered variables. BCD to excess-3 Code Conversion and vice-versa, Binary to gray Code Conversion and vice-versa, Quine Mc-cluskey Minimization Technique

Analysis and Design of Combinational logic: General approach, Decoders, Encoders, Digital multiplexers- Using multiplexers as Boolean function generators. Adders and subtractors - Cascading full adders, carry Look ahead carry, Binary comparators.

- Pedagogy / Course delivery tools: Chalk and talk
- Links: https://nptel.ac.in/courses/ 117106011
- Impartus recording: https://a.impartus.com/ilc/#/course/81459/295

Unit II

Sequential Circuits: Basic Bi-stable Element, Latches, SR Latch, Application of SR Latch, A Switch De-bouncer, The R S Latch, the gated SR Latch, the gated D Latch, The Master-Slave Flip-Flops (Pulse-Triggered Flip-Flops): The Master-Slave SR Flip-Flops, The Master-Slave JK Flip- Flop, Edge Triggered Flip-Flop: The Positive Edge-Triggered D Flip-Flop, Negative-Edge Triggered D Flip-Flop. Characteristic Equations, Registers, Unidirectional & Universal shift register, Counters - Binary Ripple Counters, Synchronous Binary counters, Counters based on Shift Registers, Design of a Synchronous counters using clocked JK Flip-Flops D, T, or SR Flip-Flops, Design of Mealy and Moore sequential networks.

- Pedagogy / Course delivery tools: Chalk and talk
- Links: https://nptel.ac.in/courses/ 117106011
- Impartus recording: https://a.impartus.com/ilc/#/course/81459/295

Unit III

Overview of Digital Design with Verilog HDL: Evolution of computer aided digital design- Emergence of HDLs-Typical design flow-importance of HDLs-Popularity of

Verilog HDL-Design Methodologies-modules-instances-components of simulation-example-basic concepts, Modules and ports: Modules-Ports-Rules-Hierarchical Names.
Gate Level modeling and Data flow modeling: Gate Types-Gate Delays-Delay Examples-Continuous Assignment-Delays-Expressions, Operators, Operands-Operator Types-Examples. Modeling of adder, subtractor, multiplier, comparator using full adder.

- Pedagogy / Course delivery tools: Chalk and talk
- Links: https://nptel.ac.in/courses/ 117106011
- Impartus recording: https://a.impartus.com/ilc/#/course/81459/295

Unit IV

Behavioural modeling: Structured Procedures-Procedural assignments- Timing controls-conditional statement- Multi way Branching-Loops-Sequential and parallel blocks, Generate Blocks-Examples. Behavioural modeling of flip-flops and counters.
Tasks and Functions: Difference between Tasks and Functions-Tasks-Functions-Automatic Functions- Constant Function-Signed Functions.

- Pedagogy / Course delivery tools: Chalk and talk
- Links: https://nptel.ac.in/courses/ 117106011
- Impartus recording: https://a.impartus.com/ilc/#/course/81459/295

Unit V

Logic Synthesis with Verilog HDL: Logic Synthesis-Verilog HDL Synthesis-Interpretation of Verilog Constructs-Synthesis Design flow-examples-verification of the gate level netlist, modeling tips for logic synthesis.
Memory and PLDs: ROM, RAM, Simple PLDs**,** PROM, PLA, PAL, Complex PLDs, CPLD Architecture, FPGA Architecture, Composition of Memory.

- Pedagogy / Course delivery tools: Chalk and talk
- Links: https://nptel.ac.in/courses/ 117106011
- Impartus recording: https://a.impartus.com/ilc/#/course/81459/295

Text Books:

1. John M Yarbrough, "Digital Logic Applications and Design", Thomson Learning, 2009.
2. Donald D Givone, "Digital Principles and Design", Tata McGraw Hill Edition, 2007.
3. Samir Palnitkar, "VERILOG HDL-A Guide to digital design and synthesis", 2nd edition, Pearson education.2003.
4. Wayne Wolf, "FPGA based system design", Pearson Education, 2005.

Reference Books:

1. R D Sudhaker Samuel, "Logic Design – A simplified approach", Sanguine Technical Publishers, 2011
2. Stephen Brown and Zvonko Vranesic, "Fundamentals of Digital logic with VERILOG design", TMH, 2013

Course Outcomes (COs):

1. Ability to simplify & design combinational logic circuits with minimum number of gates. (PO-1, PO-2, PO-3, PO-12, PSO-1, PSO-3)
2. Ability to design a sequential network with minimum number of gates. (PO-1, PO-2, PO-3, PO-12, PSO-1, PSO-3)
3. Ability to understand the basics of Verilog HDL to design digital circuits. (PO-1, PO-2, PO-12, PSO-1, PSO-3)
4. Ability to apply Verilog HDL to design and evaluate combinational and sequential circuits using different abstraction levels. (PO-1, PO-2, PO-3, PO-5, PO-8, PO-12, PSO-1, PSO-2, PSO-3)
5. Design and synthesize digital circuits on an FPGA processor using EDA tools (PO-1, PO-2, PO-3, PO-5, PO-8, PO-12, PSO-1, PSO-2, PSO-3)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment Tool	**Marks**	**Course outcomes addressed**
Internal Test-I	30	CO1, CO2, CO3
Internal test-II	30	CO1, CO4, CO5
Average of the two internal tests will be taken for 30 marks.		
Other components		
Assignment	10	CO1, CO2, CO3, CO4, CO5
Surprise Test	10	CO1, CO2, CO3, CO4
Semester End Examination (SEE)	100	CO1, CO2, CO3, CO4, CO5

NETWORK ANALYSIS	
Course Code: ET35	**Credits:** 3:0:0
Pre – requisites: Basic Electronics (EC13)	**Contact Hours:** 42L
Course Coordinator: Dr. Viswanath Talasila	

Unit I
Basic Concepts
Practical and Ideal sources, Source transformations, Mesh and Nodal analysis
- Pedagogy / Course delivery tools: Blackboard teaching
- Links: https://onlinecourses.nptel.ac.in/noc21_ee14/preview
- Impartus Recording: https://a.impartus.com/ilc/#/course/59763/295

Unit II
Circuit Analysis Techniques
Superposition theorem, Thevenin's theorem, Maximum power transfer theorem
- Pedagogy / Course delivery tools: Blackboard teaching
- Links: https://onlinecourses.nptel.ac.in/noc21_ee14/preview
- Impartus Recording: https://a.impartus.com/ilc/#/course/59763/295

Unit III
Transient Behaviour, Initial conditions of linear electric circuits
Analysis of networks (RL, RC and RLC combinations), solving circuits with initial conditions
- Pedagogy / Course delivery tools: Blackboard teaching
- Links: https://onlinecourses.nptel.ac.in/noc21_ee14/preview
- Impartus Recording: https://a.impartus.com/ilc/#/course/59763/295

Unit 4
Laplace Transforms for Electric Circuit Analysis
Introduction to Laplace Transforms, Basic theorems used for circuit analysis, Circuit representations in the Laplace domain
- Pedagogy / Course delivery tools: Blackboard teaching
- Links: https://onlinecourses.nptel.ac.in/noc21_ee14/preview
- Impartus Recording: https://a.impartus.com/ilc/#/course/59763/295

<div align="center">

Unit V

</div>

Modelling electric circuits using Transfer Functions

Waveform synthesis using Laplace Transform techniques, Introduction to Transfer Functions, Transfer function models of electric circuits

- Pedagogy / Course delivery tools: Blackboard teaching
- Links: https://onlinecourses.nptel.ac.in/noc21_ee14/preview
- Impartus Recording: https://a.impartus.com/ilc/#/course/59763/295

Text Books:

1. William H. Hayt, Jack Kemmerly and Steven M. Durbin, "Engineering Circuit Analysis", Kemmerly and Durbin, 8th Edition, McGraw Hill Education, 2013
2. David K Cheng, "Analysis of Linear Systems", Narosa Publishing House, 11th reprint, 2002

Reference Books:

1. "Network Analysis", ME Van Valkenburg, PHI/Pearson, 3rd Edition, 2002
2. "Circuits", Bruce Carlson, Thomson Learning, 2002

Web Links and Video Lectures (e-Resources):

- https://onlinecourses.nptel.ac.in/noc21_ee14/preview

Course Outcomes (COs):

1. Develop the ability to represent and solve electric circuits using concepts from linear matrix algebra (PO-1, PO-2, PO-3, PO-4, PO-6, PSO-1, PSO-2)
2. Use differential equations to model and analyse linear electric circuits. (PO-1, PO-2, PO-3, PO-4, PO-6, PO-12, PSO-1, PSO-2, PSO-3)
3. Compute transient and steady state behaviour of linear circuits with initial conditions (PO-1, PO-2, PO-3, PO-4, PO-6, PSO-1, PSO-2)
4. Use circuit theorems and transform techniques to simplify the analysis and design of linear circuits (PO-1, PO-2, PO-3, PO-4, PO-6, PO-12, PSO-1, PSO-2, PSO-3)
5. Model linear electric circuits in the frequency domain using Laplace transform techniques (PO-1, PO-2, PO-3, PO-4, PO-6, PO-12, PSO-1, PSO-2, PSO-3)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment Tool	**Marks**	**Course outcomes addressed**
Internal Test-I	30	CO1, CO2, CO3
Internal test-II	30	CO1, CO2, CO3, CO4, CO5
Average of the two internal tests will be taken for 30 marks.		
Other components		
Assignment	10	CO1, CO2
Assignment	10	CO1, CO2, CO3, CO4, CO5
Semester End Examination (SEE)	100	CO1, CO2, CO3, CO4, CO5

ANALOG CIRCUIT DESIGN LAB

Course Code: ETL36	Credits: 0:0:1
Pre – requisites: Basic Electronics (EC13)	Contact Hours: 28P
Course Coordinator: Kusuma S M	

List of Experiments:

Hardware experiments

1. Design and Testing of diode clipping circuits
2. Design and Testing of diode clamping circuits.
3. Design and testing of regulators
4. Design and testing of RC coupled single stage amplifier
5. Design and testing of Colpitts/crystal oscillator
6. Design and testing of Complementary Symmetry Class B push pull amplifier.
7. Design and testing of Inverting amplifier using Opamp IC741
8. Design and testing of Schmitt trigger using Opamp IC741.
9. Design and testing of Analog High pass filter using OpampIC741.
10. Design and testing of Astable multivibrator using timer IC555.
11. Design and testing of ADC and DAC

Simulation experiments.

1. Design and testing Analog Low pass filter using Opamp IC741
2. Design and testing of rectifiers with filters
3. Design and testing Non-Inverting amplifier using Opamp IC741
4. Design and testing of integrator Opamp IC741
5. Design and testing of Mono stable multivibrator using timer IC555.

Text Books:

1. Jacob Millman and Christos C. Halkias, "Integrated Electronics", Tata-McGraw Hill, 2017.
2. D. Roy Choudhury and Shail B Jain, "Linear Integrated Circuits", 5th edition reprint, New Age International, 2017.

Reference Books:

1. Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuit theory", Pearson Education, 11th Edition, 2017.

Web Links and Video Lecture (e-Resources):

- https://www.vlab.co.in/broad-area-electronics-and-communications

Course Outcomes (COs):

1. Design and evaluate Analog signal wave shaping circuits. (PO-1, PO-2, PO-3, PO-4, PO-5, PO-6, PO-9, PO-10, PO-12, PSO-1, PSO-2, PSO-3)
2. Design and evaluate different types of amplifiers and oscillators. (PO-1, PO-2, PO-3, PO-4, PO-5, PO-6, PO-9, PO-10, PO-12, PSO-1, PSO-2, PSO-3)
3. Design and evaluate Linear and nonlinear Op Amp based applications. (PO-1, PO-2, PO-3, PO-4, PO-5, PO-6, PO-9, PO-10, PO-12, PSO-1, PSO-2, PSO-3)
4. Design and evaluate Timing control and conversion circuits (PO-1, PO-2, PO-3, PO-4, PO-5, PO-6, PO-9, PO-10, PO-12, PSO-1, PSO-2, PSO-3)
5. Design and evaluate rectification and regulation circuits. (PO-1, PO-2, PO-3, PO-4, PO-5, PO-6, PO-9, PO-10, PO-12, PSO-1, PSO-2, PSO-3)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment Tool	**Marks**	**Course outcomes addressed**
Weekly evaluation of laboratory observation/records after the conduction of every experiment	30	CO1, CO2, CO3, CO4, CO5
Practical test	20	CO1, CO2, CO3, CO4, CO5
Semester End Examination (SEE)	50	CO1, CO2, CO3, CO4, CO5

DIGITAL CIRCUIT DESIGN LAB

Course Code: ETL37	Credits: 0:0:1
Pre – requisites: Basic Electronics (EC13)	Contact Hours: 28P
Course Coordinator: Dr. Ramya H R	

Note:

I. Student should design the logic circuit using **gates** and wiring the circuit using **trainer kit** to verify the design.
II. Student should write the Verilog module to simulate and synthesize the logic circuit using FPGA **XC3S400 IC** hardware with **Xilinx 14.7i** software.

List of Experiments:

1. Simplification, realization of Boolean expressions using logic gates/Universal gates.
2. Realization of Half/Full adder and Half/Full Subtractors using logic gates.
3. Realization of 4-bit parallel adder/Subtractors using 7483 chip.
4. Realization of 3-bit Binary to Gray code conversion and vice versa.
5. MUX/DEMUX – use of 74153, 74139 for arithmetic circuits and code converter.
6. Realization of One/Two/Four-bit comparator.
7. Design of Decoder and Encoder with & without priority (74147).
8. Truth table verification of Flip-Flops: (i) JK Master slave (ii) T type and (iii) D type.
9. Realization of 3 bit counters as a sequential circuit and MOD – N counter design (7476, 74192).
10. Shift left; Shift right, SIPO, SISO, PISO, PIPO operations using 74S95.
11. Realization of Ring/Johnson Counter using 74S95.
12. Interfacing of Stepper motor to control the direction.
13. Interfacing of DC-motor to change the speed.
14. Generation of square, ramp & triangular waveforms using DAC.

Text Books:

1. John M Yarbrough, "Digital Logic Applications and Design", Thomson Learning, 2009.
2. Donald D Givone, "Digital Principles and Design ", Tata McGraw Hill Edition, 2007.
3. Samir Palnitkar, "VERILOG HDL-A Guide to digital design and synthesis", 2nd edition, Pearson education, 2003.

4. Wayne Wolf, "FPGA based system design", Reprint 2005, Pearson Education, 2005

Reference Books:

1. R D Sudhaker Samuel, "Logic Design – A simplified approach", Sanguine Technical Publishers, 2011
2. Stephen Brown and Zvonko Vranesic, "Fundamentals of Digital logic with VERILOG design", TMH, 2013

Web Links And Video Lectures (e-Resources):

- https://dld-iitb.vlabs.ac.in
- https://de-iitr.vlabs.ac.in
- https://de-iitg.vlabs.ac.in
- http://vlabs.iitkgp.ac.in

Course Outcomes (COs):

1. Ability to design and evaluate combinational logic circuits with minimum gates. (PO-1, PO-2, PO-3, PO-8, PO-9, PO-10, PO-12, PSO-1, PSO-2, PSO-3)
2. Ability to design and evaluate sequential networks with a minimum number of gates. (PO-1, PO-2, PO-3, PO-8, PO-9, PO-10, PO-12, PSO-1, PSO-2, PSO-3)
3. Ability to design and evaluate simple or complex logical circuits using Verilog HDL. (PO-1, PO-2, PO-3, PO-5, PO-8, PO-9, PO-10, PO-12, PSO-1, PSO-2, PSO-3)
4. Ability to design & evaluate memory blocks with minimum number of gates using FPGA architecture. (PO-1, PO-2, PO-3, PO-5, PO-8, PO-9, PO-10, PO-12, PSO-1, PSO-2, PSO-3)
5. Design and synthesize digital circuit on FPGA processor using EDA tools. (PO-1, PO-2, PO-3, PO-5, PO-8, PO-9, PO-10, PO-12, PSO-1, PSO-2, PSO-3)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment Tool	**Marks**	**Course outcomes addressed**
Weekly evaluation of laboratory observation/records after the conduction of every experiment	30	CO1, CO2, CO3, CO4, CO5
Practical test	20	CO1, CO2, CO3, CO4, CO5
Semester End Examination (SEE)	50	CO1, CO2, CO3, CO4, CO5

UNIVERSAL HUMAN VALUES

Course Code: UHV38	**Credits:** 2:0:0
Pre – requisites: Nil	**Contact Hours:** 28L
Course Coordinator: Nisha S L	

Course content

Unit I

Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

1. Understanding the need, basic guidelines, content and process for Value Education
2. Self-Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration
3. Continuous Happiness and Prosperity- A look at basic Human Aspirations
4. Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority
5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
6. Method to fulfill the above human aspirations: understanding and living in harmony at various levels

- Pedagogy / Course delivery tools: Chalk and talk, Power point presentation, Videos.
- Lab component / Practical Topics: Survey/polls for self-exploration
- Links: Holistic Development and Role of Education https://youtu.be/sGZtTPe-lhQ

Unit II

Understanding Harmony in the Human Being - Harmony in Myself!

- Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
- Understanding the needs of Self ('I') and 'Body' - *Sukh* and *Suvidha*
- Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
- Understanding the characteristics and activities of 'I' and harmony in 'I'
- Understanding the harmony of I with the Body: *Sanyam* and *Swasthya*; correct appraisal of Physical needs, meaning of Prosperity in detail
- Programs to ensure *Sanyam* and *Swasthya*

Practice Exercises and Case Studies will be taken up in Practice Sessions.

- Pedagogy / Course delivery tools: Chalk and talk, Power point presentation, Videos.
- Lab component / Practical Topics: Survey/polls for self-exploration

- Links: Harmony in Human Being- Self and Body
  https://youtu.be/0ERSMkRPQBM
  Links: Harmony in Human Being- Self https://youtu.be/83oGJ4oDeIg
  Links: Harmony between Self and Body Prosperity
  https://youtu.be/aJ_BU2OgpKs

Unit III
Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship

1. *Understanding Harmony in the family – the basic unit of human interaction*
2. Understanding values in human-human relationship; meaning of *Nyaya* and program for its fulfillment to ensure *Ubhay-tripti*;
3. Trust (*Vishwas)* and Respect (*Samman)* as the foundational values of relationship
4. Understanding the meaning of *Vishwas*; Difference between intention and competence
5. Understanding the meaning of *Samman*, Difference between respect and differentiation; the other salient values in relationship
6. Understanding the harmony in the society (society being an extension of family):
7. *Samadhan, Samridhi, Abhay, Sah-astitva* as comprehensive Human Goals
8. Visualizing a universal harmonious order in society- Undivided Society (*Akhand Samaj),* Universal Order (*Sarvabhaum Vyawastha)*- from family to world family!

Practice Exercises and Case Studies will be taken up in Practice Sessions.
- Pedagogy / Course delivery tools: Chalk and talk, Power point presentation, Videos.
- Lab component / Practical Topics: Survey/polls for self-exploration
- Links: Harmony in Family- Trust https://youtu.be/F2KVW4WNnS8
  Links: Harmony in family- Respecthttps://youtu.be/iLqNRPuv0_8
  Links: Harmony in family- Other Feeling Justice https://youtu.be/TcYJB7reKnM
  Links: Harmony in the Society https://youtu.be/BkWgFinrnPw

Unit IV
Understanding Harmony in the Nature and Existence - Whole existence as Co-existence

1. Understanding the harmony in the Nature
2. Interconnectedness and mutual fulfillment among the four orders of nature-recyclability and self-regulation in nature

3. Understanding Existence as Co-existence (*Sah-astitva*) of mutually interacting

units in all-pervasive space
4. Holistic perception of harmony at all levels of existence

Practice Exercises and Case Studies will be taken up in Practice Sessions.
- Pedagogy / Course delivery tools: Chalk and talk, Power point presentation, Videos.
- Lab component / Practical Topics: Survey/polls for self-exploration
- Links: Harmony in Nature https://youtu.be/K1Jpd_ojydw
- Links: Harmony in Existence https://youtu.be/mormUeZ_RUE

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

Suggested Learning Resources:
- Pedagogy / Course delivery tools: Chalk and talk, Power point presentation, Videos.
- Lab component / Practical Topics: Survey/polls for self-exploration

Text Books:
1. **R.R Gaur, R Sangal, G P Bagaria**, A foundation course in Human Values and professional Ethics, Excel books, New Delhi, 2010, ISBN 978-8-174-46781-2

Reference Books:

1. **B L Bajpai**, 2004, *Indian Ethos and Modern Management*, New Royal Book Co., Lucknow. Reprinted 2008.
2. **PL Dhar, RR Gaur**, 1990, *Science and Humanism*, Commonwealth Publishers.
3. **Sussan George**, 1976, *How the Other Half Dies,* Penguin Press. Reprinted 1986, 1991
4. **Ivan Illich**, 1974, *Energy & Equity,* The Trinity Press, Worcester, and HarperCollins, USA
5. **Donella H. Meadows, Dennis L. Meadows, Jorgen Randers**, William W. Behrens III, 1972, limits to Growth, Club of Rome's Report, Universe Books.
6. **Subhas Palekar**, 2000, *How to practice Natural Farming,* Pracheen(Vaidik) Krishi Tantra Shodh, Amravati.
7. **A Nagraj**, 1998, *Jeevan Vidya ek Parichay,* Divya Path Sansthan, Amarkantak.
8. **E.F. Schumacher**, 1973, *Small is Beautiful: a study of economics as if people mattered*, Blond & Briggs, Britain.
9. **A.N. Tripathy**, 2003, *Human Values*, New Age International Publishers.

Web links and Video Lectures (e-Resources):

1. https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw
2. https://www.youtube.com/watch?v=P4vjfE-YnVk&list=PLWDeKF97v9SP7wSlapZcQRrT7OH0ZlGC4
3. **Course handouts:**
   https://drive.google.com/drive/folders/1zioX_4L2fCNX4Agw282PN86pcZZT3Osr?usp=sharing
4. **Presentation slides:**
   https://drive.google.com/drive/folders/1rMUKh1s0HPRBlpp_b1mpS-duNRcwS6YH?usp=sharing

Course Outcomes (CO's):

At the end of the course, Students will be able to:
1. Apprehend the need of Value Education over Human aspirations (PO-6)
2. Assimilate Harmony over the physical needs and to overcome the self- needs for a prosperous life. (PO-6)
3. Recognize the need of Harmony in the Family and Society for a better World. (PO-6)
4. Explain the need of mutual understanding for Holistic Harmony in all the Levels of Human Existence. (PO-6)
5. Explain the Holistic understanding of Harmony and Professional Ethics at Individual Level and Society. (PO-6, PO-8)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE)		
Assessment Tool	**Marks**	**Course outcomes addressed**
Internal test-I	30	CO1, CO2, CO3
Internal test-II	30	CO3, CO4, CO5
Average of the two internal tests will be taken for 30 marks.		
Other components		
• Assignment • Quiz • Presentation • Model / mini project • Any other	20 (10 + 10)	CO1, CO2, CO3, CO4, CO5
Semester End Examination (SEE)	100	CO1, CO2, CO3, CO4, CO5

CONSTITUTION OF INDIA AND PROFESSIONAL ETHICS	
Course Code: HS392	**Credits:** 1:0:0
Pre – requisites: Nil	**Contact Hours:** 14L
Course Coordinator: Mrs. Kanya Kumari S	

Course Content

Unit I
Introduction to the Constitution of India

Meaning and Significances of the Constitution, making of the Indian Constitution and its salient features, Preamble of the Constitution, Fundamental Rights and relevant cases.

- Pedagogy/Course delivery tools: Chalk and Talk, power point presentation

Unit II
Relevance of Directive Principles of State Policy -part-IV

Fundamental Duties & their significance. Special constitutional provisions for the betterment of Women, children and backward classes in India.

- Pedagogy/Course delivery tools: Chalk and Talk, power point presentation

Unit III
Union executive and State executive

President of India, Vice President, Prime Minister & Council of Ministers. The Union Legislature, Compositions & the functions of Parliament and the Supreme court of India -composition & Jurisdictions

State executive-Governor, Chief Minister& council of Ministers, State legislature-composition & functions of legislative assembly& legislative council and State Judiciary.

- Pedagogy/Course delivery tools: Chalk and Talk, power point presentation

Unit IV
Local self-Governments, Emergency provisions, Electoral process & Major Constitutional Amendments

Local Self Governments- Panchayath Raj system, Emergency provisions, election commission of India & Electoral process, Amendment procedure and Major Constitutional amendments.

- Pedagogy/Course delivery tools: Chalk and Talk, power point presentation

Unit V
Human Rights and Professional Ethics

Human Rights - meaning and significances of Human Rights. Universal Declaration of Human Rights (UDHR) protection of Human Rights in Indian Context. Scope and Aim of Ethics. Responsibility of Engineers, impediment to Responsibility.

- Pedagogy/Course delivery tools: Chalk and Talk, power point presentation

Text Books:
1. A Primer on Constitution of India & Professional ethics, VTU Publication-2007.

Reference Books:
1. Durga Das Basu,- ' Introduction to Constitution of India' - 19th /20th edition 2001
2. M.V.Pylee.- ' An Introduction to Constitution of India, 4th edition, 2008
3. Dr. K. R. Phaneesh,- 'Constitution of India & Professional ethics' –Sudha publication, Tenth revised edition 2018.

Course outcomes (COs):

At the end of the course students will be able to
1. Identify the fundamental principles of Indian constitution. (PO-12)
2. Examine various provisions of the Directive principles of state policies and fundamental duties. (PO-6, PO-12)
3. Understand the powers & functions of executive, Legislature and judicial system at the center and state level. (PO-6, PO-12)
4. Identify the role of government. (PO-12)
5. Understand about basic Human rights in India (PO-6, PO-8, PO-12)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 marks		
Assessment tool	**Marks**	**Course outcome attained**
Internal test-1	30	CO1, CO2, CO3
Internal test-1I	30	CO4, CO5
Average of the two internal tests will be taken for 30 marks.		
Other components		
Assignment	10	CO1, CO2
quiz	10	CO3, CO4, CO5
Semester end examination (SEE)	100	CO1, CO2, CO3, CO4, CO5

ABILITY ENHANCEMENT COURSE - III

Course Code: AEC310	Credits: 1:0:0
Pre – requisites: Nil	Contact Hours: 14L
Course Coordinator: Dr. Rama Shivakiran Reddy	

Ability Enhancement Courses (AEC) are the generic skill courses which are basic and needed by all to pursue any career. These courses are designed to help students enhance their skills in communication, language, and personality development. They also promote a deeper understanding of subjects like social sciences and ethics, culture and human behaviour, human rights and the law.

Every student shall register for AEC course under the supervision of his/her proctor. For III, IV & V semester, the student shall select the Ability Enhancement Course online such that the selected course does not overlap with any professional core/ elective course offered by the parent department of the student. After selection, the registration of the course has to be done by the student at his/her parent department.

PHYSICAL EDUCATION

Course Code: PE83	**Credits:** NCMC
Pre – requisites: Nil	
Course Coordinator: Dr. Kiran Kumar H K	

Course Learning Objectives:

1. To introduce students to the importance of physical fitness for success in any career.
2. To instill in them concepts of team spirit and team building
3. To develop positive thinking, goal setting and decision-making abilities under duress.
4. To harness values and skills like leadership, communication and sacrifice.
5. To inculcate in students, the ability to handle success and failures with equanimity.

Selection Process: A Student shall select any one of the following Sports based on his/her interest and the facility available. The details **of Sports Facilities available (both indoor and outdoor) at institute campus** are as below:

Outdoor Games		Indoor Games		Athletics	
Games	**No. of Students**	**Games**	**No. of Students**	**Events**	**No. of Students**
Volleyball	12 x 4 = 48	**Badminton**	30	**Sprint** - 100mt, 200mt, 400mt	60
Basketball	12 x 4 = 48	**Table Tennis**	30	**Middle distance running** – 800mt, 1,500mt	
Kabaddi	12 x 4 = 48	**Chess**	30	**Long distance running** – 5,000mt, 10,000mt	
Kho Kho	12 x 4 = 48	**Weight Training [Gym]**	35	**Jumping Events** – Long Jump Triple Jump High Jump	30
Throw ball	12 x 4 = 48			**Throwing Events** Shot Put Discuss Javelin	30
Football	16 x 4 = 64	**Note: Students should bring their own sports attires**			
Hockey	16 x 4 = 64				
Cricket	16 x 4 = 64				

Contact Sessions: A student shall abide by the following during the sessions scheduled in the semester.

<div align="center">

Session 1
</div>

Fundamentals of Physical Education, value addition to personality through fitness education, discipline and team building activities, Orientation towards particular sports and skill training

<div align="center">

Session 2
</div>

Formation of teams based on student's orientation and preference. Team practice and skill enhancement.

<div align="center">

Session 3
</div>

Conduction of matches in all sporting events registered by Students. Evaluation of each student shall be based on their performance either in team or individual. The student representing the Institute at University/State/National/International Level will be awarded additional marks during evaluation.

Course Outcomes (CO's):

1. Develop interest and skill in playing particular sports.
2. Understand the process of organizing sporting events.
3. Appreciate the role of fitness for a better lifestyle.
4. Derive lessons from sports activities for effective planning and discipline in Life.
5. Analyze situations and optimize end results.

Course Assessment & Evaluation:

1. A committee consisting of Sports Director and Coaches of respective Sports will be formed to observe and evaluate the students for CIE in each semester.
2. Students shall follow the schedules, rules and regulations as prescribed by the Committee.
3. Students shall mandatorily have 85% attendance to be eligible for evaluation.
4. All the Sessions and evaluation process will be common for all semesters of the academic year.
5. The final result will be reflected on the grade card of 8th Semester.
6. The final marks shall be calculated after scaling down CIE to 50 marks & combining with 50 marks for SEE.

YOGA	
Course Code: YO83	**Credits:** NCMC
Pre – requisites: Nil	
Course Coordinator: Dr. Hari Chandra B P & Dr. Parimala P	

Course Learning Objectives:

1. To introduce to the students, the fundamental theoretical aspects of yoga.
2. To inculcate in students a habit of practicing yoga.
3. To be able to demonstrate basic yoga asanas.
4. To be able to practice fundamental breathing practices and mudras.
5. To understand the relevance of yoga and research in modern times.

Course Content

Introduction: Definition of yoga, benefits, astangas of yoga, Relevance of yoga and yoga-research in modern times.

Asanas: Kriyathmakachalanas, Suryanamaskar, Superbrain yoga, Vrikshasana, Trikonasana, Veerabhadrasana, Paschimotasana, Purvothanasana, Bharadwajasana, Amruthasana, Parivruttha Trikonasana, Parsvakonasana, Ustrasana, Padmasana, Jaaanushirshasana, Navasana, Ardhachakrasana, Ardhakatichakrasana, Jataraparivarthanasana, Sethubandasana, Sarvangasana, Mathyasana, Dhanurasana, Shirshasana.

Pranayamas: Anuloma-Viloma, Suryanuloma, Chandranuloma, Brahmari, Suryanbedhana, Chandrabedhana, Sheetali, Seethkari, Sadantha, bastrika.

Mudras: Chinmudra-Jnanamudra, Praana mudra, panchaprana mudras, panchabhoota mudras, Pruthvi mudra, Shoonya mudra, Surya mudra, Jalodharanashaka mudra, Kundalini mudra, shoonyavaayu mudra, shakti mudra, sandhi mudra, vajra mudra and garuda mudra.

Course Outcomes (CO's):

At the end of the course, a student will

1. Understand the fundamental and theoretical aspects of yoga.
2. Develop a habit of practicing yoga.
3. Demonstrate basic yoga asanas.
4. Demonstrate fundamental breathing practices.
5. Understand the relevance of yoga and its research in modern times.

Reference books:
1. Light on yoga, B K S Iyengar, Publisher -Thorsons, UK, 2006
2. Light on pranayama, B K S Iyengar, Publisher - Element; First Edition
3. The Essential Yoga Mudras for Healing, Dr. Aasoori K. Rangaraja Iyengar, Saranga Publishing; First Edition 2021

Pedagogy:
Chalk and talk, demonstration, videos, ppt.

Contact Sessions:
There would be one introduction class, and five contact classes in each semester.
The candidates shall practice yoga on a daily basis, or in the worst case on alternate days at their place of residence and maintain a short diary in the format provided by yoga teacher. The same shall be brought to the classes.

Online reference sources:
- Yoga for beginners part 1: https://www.youtube.com/watch?v=VwPeThpwfWI
- Yoga for beginners part 2: https://www.youtube.com/watch?v=s_pnJTcOp8A
- Suryanamaskar: https://www.youtube.com/watch?v=nUdlucNd6go&t=133s
- Yoga for anxiety and stress: https://www.youtube.com/watch?v=hJbRpHZr_d0
- Common yoga protocol: https://www.youtube.com/watch?v=Av5ib_XRKT4
- Relevance of yoga in modern times: www.youtube.com/watch?v=HUzBCts7BTo

Course Assessment & Evaluation:
1. A committee consisting of Yoga Instructors will be formed to observe and evaluate the students for CIE in each semester.
2. Students shall follow the schedules, rules, and regulations as prescribed by the Committee.
3. Students shall mandatorily have 85% attendance to be eligible for evaluation.
4. All the Sessions and evaluation processes will be common for all semesters of the academic year.
5. The final result will be reflected on the grade card of 8th Semester.
6. The final marks shall be calculated after scaling down CIE to 50 marks & combining it with 50 marks for SEE.

Scheme of SEE

Practical Demonstration	30 marks
Write-up	10 marks
Viva	10 marks
Total	**50 marks**

NATIONAL SERVICE SCHEME	
Course Code: NS83	**Credits:** NCMC
Pre – requisites: Nil	
Course Coordinator: Dr. Puttabore Gowda & Dr. Siddaraju C	

Course Learning Objectives:

1. To introduce students to the importance of national service
2. To harness values and skills like leadership, teamwork and sacrifice.
3. To serve society through educational services and health
4. To work towards rural and local development through technological services
5. To inculcate in students, the ability to handle socially relevant projects.

Students shall involve in activities related to national and regional technical and non-technical services, as listed below.

- Serving society by bringing awareness on education and cleanliness.
- Blood donation camps
- Developing technologies for rural masses.
- Conduction and participation in camps for a social cause.
- Educating towards health and well-being of individuals/society.
- Cultural and educational programs for society.
- Contributing towards the improvement of civil services and bringing certain shortcomings to the notice of higher authorities for suitable remedial actions.
- Contribution towards traffic management and other public services.
- Clean up and development of water sources around public places.
- Services during a disaster or other needy situations.
- Camps for the rejuvenation of lakes and water bodies.
- Serving nature and agriculture.
- Awareness programs on health and food adulteration.
- Presenting papers/talks in various fora on the above topics.
- Developing technologies for rural masses beyond academic requirements.
- Plantation programs.
- Conducting programs for self-sustainability, and human and national development.
- Contribution towards orphans and challenged individuals through well-recognized organizations.
- Carrying out designated activities in villages.
- Development and implementation of strategies for solid waste, E-waste etc.

- Education towards pollution control and traffic management.
- Production of documentaries and short films/videos for motivating people on any of the above causes.

Course Outcomes (CO's):

At the end of the course, a student will be able to
1. Understand the importance of national service.
2. Gain skills like leadership and teamwork.
3. Volunteer towards educational services and health.
4. Contribute to rural and local development through technical services.
5. Comprehend socially relevant projects

Contact Sessions:

The students shall attend the review and contact sessions as scheduled by the course coordinator.

Course Assessment & Evaluation:

1. The candidates shall maintain a record of activities in a Diary, and get them endorsed during the contact sessions at least 3 times in a semester.
2. A detailed project report should be submitted during the last fortnight of the semester
3. Evaluation will be done during each semester based on the nature of the contribution.
4. The final marks shall be calculated after scaling down CIE to 50 marks & combining with 50 marks for SEE

ADDITIONAL MATHEMATICS – I

Course Code: AM31	Credits: 0:0:0
Pre – requisites: Nil	Contact Hours: 42L
Course Coordinator: Dr. Shashi Prabha Gogate S	

Course Content

Unit I

Differential Calculus: Successive differentiation, nth derivatives of some standard functions, Leibnitz theorem, Polar curves. Angle between the radius vector and the tangent, angle between curves, length of the perpendicular from pole to the tangent, pedal equations. Taylor's and Maclaurin's expansions.

- Pedagogy/Course delivery tools: Chalk and Talk
- Links: https://nptel.ac.in/courses/111/105/111105121/
  https://nptel.ac.in/courses/111/104/111104144/
- Impartus recording: https://a.impartus.com/ilc/#/course/107625/1030

Unit II

Integral Calculus: Introduction, Reduction formula, Reduction formula for $\int Sin^n x \ dx$, $\int Cos^n x \ dx$ and $\int Sin^n x \ Cos^m x \ dx$. Evaluation of double and triple integrals.

- Pedagogy/Course delivery tools: Chalk and Talk
- Links: https://nptel.ac.in/courses/111/105/111105121/
- https://a.impartus.com/ilc/#/course/107625/1030

Unit III

Vector Algebra: Scalar and vectors. Vector addition and subtraction. Multiplication of vectors (Dot and Cross products). Scalar and vector triple product-simple problems. Vector functions of a single variable. Derivative of a vector function, geometrical interpretation. Velocity and acceleration.

- Pedagogy/Course delivery tools: Chalk and Talk
- Links: https://nptel.ac.in/courses/111/105/111105134
- Impartus recording: https://a.impartus.com/ilc/#/course/107625/1030

Unit IV

Vector Differentiation: Scalar and vector fields, gradient of a scalar field, directional derivative, divergence of a vector field, solenoidal vector, curl of avector field,

irrotational vector. Laplace's operator. Vector identities connected with gradient, divergence and curl.

- Pedagogy/Course delivery tools: Chalk and Talk
- Links: https://nptel.ac.in/courses/111/105/111105134
- Impartus recording: https://a.impartus.com/ilc/#/course/107625/1030

Unit V

First Order Differential Equations: Solution of first order and first degree differential equations, variable separable methods, homogeneous equations, linear and Bernoulli's equations, exact differential equations.

- Pedagogy/Course delivery tools: Chalk and talk, Power Point Presentation
- Links: https://nptel.ac.in/courses/111/105/111105121/
- Impartus recording: https://a.impartus.com/ilc/#/course/59742/295

Text Books:

1. **B.S. Grewal** – Higher Engineering Mathematics, Khanna Publishers, 44th edition, 2017.
2. **Erwin Kreyszig** – Advanced Engineering Mathematics – Wiley Publication, 10th Edition, 2015.

Reference Books:

1. **H. K. Dass** – Higher Engineering Mathematics – S Chand Publications, 1998.
2. **B. V. Ramana** – Engineering Mathematics – Tata McGraw-Hill Publishing Co. Ltd., New Delhi, 2008.

Course Outcomes (COs):
At the end of the course the student will be able to

1. Solve problems related to nth derivative to some standard functions, polar curves and power series expansions.
2. Apply the concept of reduction formula to determine the length, area, volume of revolution of an arc of the curve.
3. Solve the problems related to velocity and acceleration.
4. Apply vector differentiation to identify solenoidal and irrotational vectors.
5. Apply the concept of various methods to solve first order first degree differential equations.

NUMERICAL METHODS AND PROBABILITY MODELS	
Course Code: ET41	**Credits:** 2:1:0
Pre – requisites: Nil	**Contact Hours:** 28L+28T
Course Coordinator: Dr. Monica Anand & Dr. M. Girinath Reddy	

Unit I

Finite Differences and Interpolation: Forward and backward differences, Interpolation, Newton-Gregory forward and backward interpolation formulae, Lagrange's interpolation formula and Newton's divided difference interpolation formula (no proof).

Numerical Differentiation and Numerical Integration: Derivatives using Newton-Gregory forward and backward interpolation formulae, Newton-Cotes quadrature formula, Trapezoidal rule, Simpson's $1/3^{rd}$ rule and Simpson's $3/8^{th}$ rule.

- Pedagogy/Course delivery tools: Chalk and Talk
- Links: https://nptel.ac.in/courses/111/105/111105134/
- Impartus recording: https://a.impartus.com/ilc/#/course/96127/452

Unit II

Statistics: Curve fitting by the method of least squares, Fitting linear, quadratic and geometric curves. Correlation and Regression.

Random Variables and Discrete Probability Distributions: Random variables, Binomial and Poisson distributions.

- Pedagogy/Course delivery tools: Chalk and Talk
- Links: https://nptel.ac.in/courses/111/105/111105035/
- Impartus recording: https://a.impartus.com/ilc/#/course/96127/452
  https://a.impartus.com/ilc/#/course/619570/1030

Unit III

Continuous Probability Distributions: Uniform, Exponential, Normal and Gamma distributions.

Joint Probability Distributions: Joint and marginal probability distributions of discrete and continuous random variables, Covariance and Correlation of discrete and continuous random variables, Conditional probability distributions.

- Pedagogy/Course delivery tools: Chalk and Talk
- Links: https://nptel.ac.in/courses/111/105/111105035/
- Impartus recording: https://a.impartus.com/ilc/#/course/96127/452

Unit IV

Stochastic Processes: Introduction, Classification of stochastic processes, Discrete time processes, Stationary stochastic processes, Autocorrelation, Ergodicity.

Markov Chain: Probability vectors, Stochastic matrices, Regular stochastic matrices, Markov processes, Markov chains, Higher transition probabilities, Stationary distribution of regular Markov chains and absorbing states.

- Pedagogy/Course delivery tools: Chalk and Talk
- Links: https://nptel.ac.in/courses/111103022
- Impartus recording: https://a.impartus.com/ilc/#/course/96127/452

Unit V

Sampling and Statistical Inference: Sampling distributions, Concepts of standard error and confidence interval, Central Limit Theorem, Type I and Type II errors, Level of significance, One tailed and two tailed tests, Z-test: for single mean, for single proportion, for difference between means, Student's t –test: for single mean, for difference between two means, F – test: for equality of two variances, Chi-square test: for goodness of fit, for independence of attributes.

- Pedagogy/Course delivery tools: Chalk and Talk
- Links: https://nptel.ac.in/courses/111/105/111105035/
- Impartus recording: https://a.impartus.com/ilc/#/course/96151/1112

Text Books:

1. Erwin Kreyszig –Advanced Engineering Mathematics – Wiley publication – 10th edition-2015.
2. B. S. Grewal – Higher Engineering Mathematics – Khanna Publishers – 44th edition – 2017.
3. Murray R Spiegel, John Schiller & R. Alu Srinivasan – Probability and Statistics – Schaum's outlines – 4th edition-2013.

Reference Books:

1. R.E. Walpole, R. H. Myers, R. S. L. Myers and K. Ye – Probability and Statistics for Engineers and Scientists – Pearson Education – Delhi – 9th edition – 2012.
2. Glyn James – Advanced Modern Engineering Mathematics – Pearson Education – 4th edition – 2010.

Course Outcomes (COs):

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

1. Find functional values, derivatives, areas and volumes numerically from a given data. (PO-1, PO-2, PSO-1)
2. Fit a least squares curve to a given data, analyze the given discrete random data and its probability distribution. (PO-1, PO-2, PSO-1)
3. Find parameters of continuous probability distributions and calculate the marginal and conditional distributions of bivariate random variables. (PO-1, PO-2, PSO-1)
4. Determine the parameters of stationary random processes and use Markov chain in prediction of future events. (PO-1, PO-2, PSO-1)
5. Choose an appropriate test of significance and make inference about the population from a sample. (PO-1, PO-2, PSO-1)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment Tool	**Marks**	**Course outcomes addressed**
Internal test-I	30	CO1, CO2, CO3
Internal test-II	30	CO3, CO4, CO5
Average of the two internal tests shall be taken for 30 marks.		
Other components		
Quiz	10	CO1, CO2, CO3
Assignment	10	CO3, CO4, CO5
Semester End Examination (SEE)	100	CO1, CO2, CO3, CO4, CO5

SYSTEMS MODELLING AND CONTROL	
Course Code: ET42	**Credits:** 2:0:1
Pre – requisites: Network Analysis (EC35)	**Contact Hours:** 28L+28P
Course Coordinator: Dr. Viswanath Talasila	

Unit I

Transfer Function Approach to Modelling of Systems and Control Systems:
Transfer Function Models of physical systems from various domains, Types of Control Systems, Notion of stability

- Pedagogy / Course delivery tools: Blackboard teaching
- Links: https://onlinecourses.nptel.ac.in/noc21_ee14/preview
- Impartus Recording: https://a.impartus.com/ilc/#/course/59763/295

Unit II

State Space Modelling of Physical Systems (Stability and Controllability):
Transition from differential equations to state space models, Modeling systems from different application domains (electrical, mechanical, ecological etc, Basic notions of stability

- Pedagogy / Course delivery tools: Blackboard teaching
- Links: https://onlinecourses.nptel.ac.in/noc21_ee14/preview
- Impartus Recording: https://a.impartus.com/ilc/#/course/59763/295

Unit III

Analysis of State Space Systems:
Linearization of nonlinear state space systems, Controllability, observability

- Pedagogy / Course delivery tools: Blackboard teaching
- Links: https://onlinecourses.nptel.ac.in/noc21_ee14/preview
- Impartus Recording: https://a.impartus.com/ilc/#/course/59763/295

Unit IV

Performance Specifications of Control Systems: Standard test signals, First and second order systems, Time response specifications, Steady state errors.

- Pedagogy / Course delivery tools: Blackboard teaching
- Links: https://onlinecourses.nptel.ac.in/noc21_ee14/preview
- Impartus Recording: https://a.impartus.com/ilc/#/course/59763/295

Unit V

Pole Placement (controller design): Theory of elementary pole placement, Full State/output feedback, Design of controllers for pole placement.

- Pedagogy / Course delivery tools: Blackboard teaching
- Links: https://onlinecourses.nptel.ac.in/noc21_ee14/preview
- Impartus Recording: https://a.impartus.com/ilc/#/course/59763/295

List of Experiments for Integrated Lab:

1. Introduction to MATLAB, Matrix data manipulation
2. Algebraic operations
3. Data visualization
4. Creating user defined functions (Conditional logic and loops)
5. Signals:
   a. To create various signals: step, square, sinusoidal, exponential, ramp etc and visualize them
6. Signal operations:
   a. Perform operations on signals to modify their frequency, addition of two signals etc; Introduce noise into signals
7. Curve Fitting
   a. Fit polynomial models to data to illustrate first steps towards data driven modeling
8. Transfer functions with MATLAB
   a. Compute poles/zeros (eigenvalues), damping factor etc
   b. Compute time response for first and second order systems
9. State Space systems with MATLAB
   a. Compute poles/zeros (eigenvalues), damping factor etc
   b. Compute time response for first and second order systems
10. Compute time response specifications for first and second order systems for various input signals, and comment on stability
11. Pole placement design - 1
12. Pole Placement design - 2

Text Books:

1. K Ogata, "Modern Control Engineering", , PHI, 4th Edition, 2002
2. Farid and Kuo, "Automatic Control Systems", John Wiley and Sons, 9th Edition

Reference Books:

1. Tariq Samad et. al., Impact of Control Technology, IEEE – Control Systems Society Report, February 2011
2. Rudra Pratap, Getting Started with MATLAB – A Quick Introduction for Scientists and Engineers, Oxford Publishers, 2010
3. MIT's online course material: http://ocw.mit.edu/courses/mathematics/18-s997-introduction-to-matlab-programming-fall-2011/Syllabus/

Web Links and Video Lectures (e-Resources):

- NPTEL material on Control Engineering by Dr. Ramkrishna Pasumarthy and Dr.Viswanath Talasila, https://onlinecourses.nptel.ac.in/noc17_ee12/preview
- MIT Open Course in Feedback Control Systems, http://ocw.mit.edu/courses/aeronautics-and-astronautics/16-30-feedback-control-systems-fall-2010/
- MIT Open Course in Systems and Control, http://ocw.mit.edu/courses/mechanical-engineering/2-04a-systems-and-controls-spring-2013/
- MIT's online course material: http://ocw.mit.edu/courses/mathematics/18-s997-introduction-to-matlab-programming-fall-2011/Syllabus/
- https://elearn.nptel.ac.in/shop/nptel/control-engineering-2/

Course Outcomes (COs):

1. Acquire knowledge of modelling physical systems using transfer functions and state space techniques, in the context of various application domains. (PO-1, PO-2, PO-3, PO-4, PO-5, PO-6, PO-10, PO-12, PSO-1, PSO-2, PSO-3)
2. Compute and Analyse system performance and stability metrics. (PO-1, PO-2, PO-3, PO-4, PO-5, PO-6, PO-10, PSO-1, PSO-2)
3. Use of controllability and observability to design controllers using pole placement to meet desired specifications in the context of various application domains. (PO-1, PO-2, PO-3, PO-4, PO-5, PO-6, PO-10, PO-12, PSO-1, PSO-2, PSO-3)
4. Understand basic data manipulation in MATLAB, develop user defined functions, conditional logic and loops to simulate signals. (PO-1, PO-2, PO-3, PO-4, PO-5, PO-6, PO-10, PO-12, PSO-1, PSO-2, PSO-3)
5. Create system models and analyze both open and closed loop behaviour using control theory and MATLAB. (PO-1, PO-2, PO-3, PO-4, PO-5, PO-6, PO-10, PO-12, PSO-1, PSO-2, PSO-3)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment Tool	**Marks**	**Course outcomes addressed**
Internal Test-I	30	CO1, CO2, CO3
Internal test-II	30	CO1, CO2, CO3, CO4, CO5
Average of the two internal tests will be taken for 30 marks.		
Other components		
Lab Test	10	CO1, CO2
Lab Test	10	CO1, CO2, CO3, CO4, CO5
Semester End Examination (SEE)	100	CO1, CO2, CO3, CO4, CO5

MICROCONTROLLER	
Course Code: ET43	**Credits:** 3:0:0
Pre – requisites: Computing fundamentals and C Programming (CS14)	**Contact Hours:** 42L
Course Coordinator: Dr. Ramya H R	

Unit I

Introduction: Overview of embedded systems, embedded system design challenges, common design metrics and optimizing them. Survey of different embedded system design technologies, trade-offs. Custom Single- Purpose Processors, Design of custom single purpose processors, Embedded System Design Process, Requirements, Specification, Architecture Design, Designing Hardware and Software Components, System Integration, Concept of Real time Systems, Introduction to RTOS.

- Pedagogy / Course delivery tools: Blackboard teaching
- Links: https://nptel.ac.in/courses/117104072
- Impartus Recording: https://a.impartus.com/ilc/#/course/59760/295

Unit II

General Purpose Processors: Software, Basic Architecture, Operation, Programmer's View, Development Environment, ASIPS.
Standard Single Purpose Processors: Peripherals, Timers, Counters, UART, PWM, LCD Controllers, Keypad controllers, Stepper Motor Controller, A to D Converters, Examples.

- Pedagogy / Course delivery tools: Blackboard teaching
- Links: https://nptel.ac.in/courses/117104072
- Impartus Recording: https://a.impartus.com/ilc/#/course/59760/295

Unit III

Introduction to MSP430 Microcontroller: Introduction to MSP430 Microcontroller, functional block diagram, Development Environment, Addressing Modes, Instruction Set, Programing and Debugging
Digital I/Os, Interrupts and LP Modes: Exceptions, Interrupts - ISRs, Resets, Parallel ports, Keypad interfacing, LED, LCD and DC motor interfaces. Low Power Modes of operation, Aspects of C for Embedded Systems

- Pedagogy / Course delivery tools: Blackboard teaching
- Links: https://nptel.ac.in/courses/117104072
- Impartus Recording: https://a.impartus.com/ilc/#/course/59760/295

Unit IV

Timers: Watchdog timer, Basic Timer1, RTC, Timer_A, Example application – Generation of a precise frequency and a simple PWM.

Mixed Signal Systems and Communication Interfaces: Introduction to Basic operations of ADC, DAC and UART

- Pedagogy / Course delivery tools: Blackboard teaching
- Links: https://nptel.ac.in/courses/117104072
- Impartus Recording: https://a.impartus.com/ilc/#/course/59760/295

Unit V

Mixed Signal Systems and Communication Interfaces: General and practical issues with ADCs, Architecture and Basic operations of - The ADC10 Successive-Approximation, Basic introduction to DAC12, Serial Peripheral Interface, SPI with USCI, Software UART using Timer_A.

- Pedagogy / Course delivery tools: Blackboard teaching
- Links: https://nptel.ac.in/courses/117104072
- Impartus Recording: https://a.impartus.com/ilc/#/course/59760/295

Text Books:

1. Frank Vahid / Tony Givargis "Embedded System Design A Unified Hardware/Software Introduction "1st Edition, John Wiley & Sons, 2017.
2. John H. Davies, "MSP430 Microcontroller Basics", Newnes, Elsevier, 2008.
3. Cris Nagy, "Embedded Systems Design using the TI MSP430 Series", Newnes, Elsevier, 2003.

Reference Books:

1. Raj Kamal, "Embedded Systems: Architecture and Programming", TMH, 2013.
2. Tammy Noergaard, "Embedded Systems Architecture – A Comprehensive Guide for Engineer and Programmers", Elsevier Publication, Newnes, 2015
3. Dr. K.V. K. K.Prasad, "Embedded Real Time Systems: Concepts Design and Programming", Dreamtech Press New Delhi, 2013
4. https://www.hep.princeton.edu//~marlow/rrs/Guides/Workbench.pdf

Web Links and Video Lectures (e-Resources):

1. www.msp430.com
2. https://nptel.ac.in/courses/108102045
3. https://nptel.ac.in/courses/106105193
4. https://onlinecourses.nptel.ac.in/noc20_ee98/preview

Course Outcomes (COs):

1. Ability to differentiate general computing systems and embedded systems, its characteristics, challenges, embedded design process, their applications and need for RTOS. (PO-1, PO-2, PO-12, PSO-1, PSO-3)
2. Ability to understand general and Single purpose processors along with their peripherals (PO-1, PO-2, PO-12, PSO-1, PSO-3)
3. Implement and evaluate programs for MSP430 based embedded systems and its interrupts, low power modes, Timers and communication interface (PO-1, PO-2, PO-3, PO-5, PO-8, PO-12, PSO-1, PSO-2, PSO-3)
4. Ability to implement and assess programs for Timers, mixed signal systems and communication interface (PO-1, PO-2, PO-3, PO-5, PO-8, PO-12, PSO-1, PSO-2, PSO-3)
5. Ability to Implement and test ADC, DAC and communication interface programs (PO-1, PO-2, PO-3, PO-5, PO-8, PO-12, PSO-1, PSO-2, PSO-3)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment Tool	**Marks**	**Course outcomes addressed**
Internal Test-I	30	CO1, CO2, CO3
Internal test-II	30	CO1, CO4, CO5
Average of the two internal tests will be taken for 30 marks.		
Other components		
Assignment	10	CO1, CO2, CO3, CO4, CO5
Surprise Test	10	CO1, CO2, CO3, CO4
Semester End Examination (SEE)	100	CO1, CO2, CO3, CO4, CO5

ENGINEERING ELECTROMAGNETICS	
Course Code: ET44	**Credits:** 3:0:0
Pre – requisites: Transform Techniques and Linear Programming (ET31)	**Contact Hours:** 42L
Course Coordinator: Nisha S L	

Unit I

Coluomb's Law and Electric Field Intensity: Experimental law of Coulomb, Electric field intensity, Field due to continuous volume charge distribution, Field of a line charge and Sheet charge.

Electric flux density and Gauss's Law: Applications of Gauss's Law, divergence, Maxwell's First equation (Electrostatics), Vector Operator Dell and divergence theorem.

- Pedagogy / Course delivery tools: Chalk and talk
- Links: https://nptel.ac.in/courses/108104087
- Impartus Recording: http://a.impartus.com/ilc/#/course/81460/295

Unit II

Energy and Potential: Energy expended in moving a point charge in an electric field, The line integral, Definition of potential difference and potential, The potential field of point charge, Energy density in the electrostatic field.

Conductors, Dielectrics and Capacitance: Current and current density, Continuity of current, Metallic conductors, Conductor properties and boundary conditions, boundary conditions for perfect Dielectrics, Capacitance and examples.

- Pedagogy / Course delivery tools: Chalk and talk
- Links: https://nptel.ac.in/courses/108104087
- Impartus Recording: http://a.impartus.com/ilc/#/course/81460/295

Unit III

Poisson's And Laplace's Equations: Derivation of Poisson's and Laplace's Equations, Examples of the solution of Laplace's equation.

The Steady Magnetic Field: Biot-Savart Law, Ampere's circuital law, Curl, Stokes' theorem, Magnetic flux and magnetic flux density, Scalar and Vector Magnetic Potentials.

- Pedagogy / Course delivery tools: Chalk and talk
- Links: https://nptel.ac.in/courses/108104087
- Impartus Recording: http://a.impartus.com/ilc/#/course/81460/295

Unit IV

Magnetic Forces: Force on a moving charge, differential current elements, Force between differential current elements. Force and Torque on a closed circuit, Magnetic boundary conditions

Time-varying fields and Maxwell's equations: Faraday's law, displacement current, Maxwell's equations in point form, Maxwell's equations in integral form, the retarded potential.

- Pedagogy / Course delivery tools: Chalk and talk
- Links: https://nptel.ac.in/courses/108104087
- Impartus Recording: http://a.impartus.com/ilc/#/course/81460/295

Unit V

Uniform Plane Wave: Wave propagation in free space, Wave propagation in dielectrics, Poynting's theorem and wave power, Propagation in good conductors: Skin Effect.

Transmission lines: Introduction, transmission line equation and solution, Reflection and transmission coefficients, SWR, line impedance, and line admittance, Smith chart.

- Pedagogy / Course delivery tools: Chalk and talk
- Links: https://nptel.ac.in/courses/108104087
- Impartus Recording: http://a.impartus.com/ilc/#/course/81460/295

Text Books:

1. W.H. Hayt, J.A. Buck and M. Jaleel Akhtar, "Engineering Electromagnetics", 8th Edition, McGraw-Hill, 2015.
2. Mathew N.O. Sadiku and S.V. Kulkarni, "Principles of Electromagnetics", 6th Edition, Oxford University Press, 2015.

Reference Books:

1. John Krauss and Daniel A Fleisch, "Electromagnetics with applications", Mc GrawHill, reprint 2014.
2. N. Narayana Rao, "Fundamentals of Electromagnetics for Engineering", Pearson, reprint 2012.

Web Links and Video Lectures (E-RESOURCES):

- http://videolectures.net/mit6013f05_electromagnetics_applications/

Course Outcomes (COs):

1. State several laws and principles of electric, magnetic, and electromagnetic fields (PO-1, PO-12, PSO-1, PSO-3)
2. Solve problems by applying the concepts of electric, magnetic, electromagnetic fields and to use smith Chart. (PO-1, PO-2, PO-3, PO-5, PO-6, PO-7, PO-9, PO-10, PO-11, PO-12, PSO-1, PSO-2, PSO-3)
3. Analyse theoretical and practical meaning of different expressions related to electric and magnetic fields. (PO-1, PO-2, PO-3, PO-5, PO-6, PO-7, PO-8, PO-9, PO-10, PO-11, PO-12, PSO-1, PSO-2, PSO-3)
4. Analyse the importance of Electrostatic, Magnetic boundary condition, Time-varying fields, and Maxwell's equations. (PO-1, PO-2, PO-3, PO-5, PO-6, PO-7, PO-8, PO-9, PO-10, PO-11, PO-12, PSO-1, PSO-2, PSO-3)
5. Evaluate wave equation for Uniform Plane Waves in good conductor, dielectric, transmission lines, and power associated with EM waves using Poynting theorem. ((PO-1, PO-2, PO-3, PO-5, PO-6, PO-7, PO-8, PO-9, PO-10, PO-11, PO-12, PSO-1, PSO-2, PSO-3)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment Tool	**Marks**	**Course outcomes addressed**
Internal Test-I	30	CO1, CO2, CO3
Internal test-II	30	CO1, CO2, CO3, CO4, CO5
Average of the two internal tests will be taken for 30 marks.		
Other components		
Assignment	10	CO1, CO2, CO3, CO4, CO5
Mini Project	10	CO1, CO2, CO3, CO4, CO5
Semester End Examination (SEE)	100	CO1, CO2, CO3, CO4, CO5

SIGNAL PROCESSING	
Course Code: ET45	**Credits:** 2:1:0
Pre – requisites: Knowledge of Mathematics	**Contact Hours:** 28L+28T
Course Coordinator: Dr. Satish Tunga	

Unit I

Introduction: Definitions of a signal and a system, classification of signals, basic operations on signals, elementary signals, and systems viewed as interconnections of operations, properties of systems.

- Pedagogy / Course delivery tools: Chalk and talk
- Links: https://www.youtube.com/playlist?list=PLq-Gm0yRYwTjwxaqapPsSAHzs4_nkQLVr
- Impartus Recording: http://a.impartus.com/ilc/#/course/96153/452

Unit II

Time-domain representation for LTI systems: Convolution, impulse response representation, Convolution Sum and Convolution Integral. Properties of LTI systems in terms of its impulse response representation. Differential and difference equation representations, Block diagram representations.

- Pedagogy / Course delivery tools: Chalk and talk
- Links: https://www.youtube.com/playlist?list=PLq-Gm0yRYwTjwxaqapPsSAHzs4_nkQLVr
- Impartus Recording: http://a.impartus.com/ilc/#/course/96153/452

Unit III

Fourier representation for signals: Fourier representation of signals, Discrete and continuous time Fourier representation of periodic and non-periodic signals and its properties with relevant problems.

- Pedagogy / Course delivery tools: Chalk and talk
- Links: https://www.youtube.com/playlist?list=PLq-Gm0yRYwTjwxaqapPsSAHzs4_nkQLVr
- Impartus Recording: http://a.impartus.com/ilc/#/course/96153/452

Unit IV

Applications of Fourier representations: Introduction, Frequency response of LTI systems, Fourier transform analysis of LTI systems.

Unit V

Z-Transforms: Introduction, Z- transform, properties of ROC, properties of Z-transforms, inverse Z- transforms. Z-Transform analysis of LTI systems, unilateral Z transform and its application to solve difference equations.

- Pedagogy / Course delivery tools: Chalk and talk
- Links: https://www.youtube.com/playlist?list=PLq-Gm0yRYwTjwxaqapPsSAHzs4_nkQLVr
- Impartus Recording: http://a.impartus.com/ilc/#/course/96153/452

Text Book:

1. Simon Haykins and Barry Van Veen, "Signals and Systems", John Wiley & Sons, January 2021.

Reference Books:

1. Alan V Oppenheim, Alan S, Willsky and A Hamid Nawab, "Signals and Systems", Pearson Education Asia/PHI, 2nd edition, 1997. Indian reprint 2010.
2. Ganesh Rao and Satish Tunga, "Signals and Systems", Cengage India Private Limited, 2017

Course Outcomes (COs):

1. Recall the classifications of signals, properties of systems, and definitions of various transforms. (PO-1, PO-12, PSO-1, PSO-3)
2. Understand the basic operations on signals, convolution in LTI systems, and properties of various transforms. (PO-1, PO-2, PO-3, PO-5, PO-12, PSO-1, PSO-2, PSO-3)
3. Apply the properties of Fourier representations and Z transforms to obtain frequency domain representations of signals from time-domain and vice-versa. (PO-1, PO-2, PO-3, PO-5, PO-12, PSO-1, PSO-2, PSO-3)
4. Analyse the LTI system to determine system properties, using time-domain and transform-domain techniques. (PO-1, PO-2, PO-3, PO-5, PO-12, PSO-1, PSO-2, PSO-3)
5. Evaluate the LTI system response by solving differential and difference equations, using the time-domain and transform-domain techniques. (PO-1, PO-2, PO-3, PO-5, PO-12, PSO-1, PSO-2, PSO-3)

Web Links And Video Lectures (e-Resources):

1. https://www.tutorialspoint.com/signals_and_systems/index.asp
2. https://www.youtube.com/watch?v=s8rsR_TStaA
3. http://www.satishkashyap.com/2012/04/iit-video-lectures-on-signals-and.html
4. https://freevideolectures.com/course/3540/signals-and-systems-i

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment Tool	**Marks**	**Course outcomes addressed**
Internal Test-I	30	CO1, CO2, CO3, CO4, CO5
Internal test-II	30	CO1, CO2, CO3, CO4, CO5
Average of the two internal tests will be taken for 30 marks.		
Other components		
Assignment	10	CO1, CO2, CO3
Quiz	10	CO1, CO2, CO3, CO4, CO5
Semester End Examination (SEE)	100	CO1, CO2, CO3, CO4, CO5

MICROCONTROLLER LAB

Course Code: ETL46	**Credits:** 0:0:1
Pre – requisites: Computing fundamentals and C Programming (CS14)	**Contact Hours:** 28P
Course Coordinator: Dr. Ramya H R	

List of Experiments:

1. Simple data handling programs in ALP -- Addition and subtraction
2. Multiplication and division
3. Block move and block exchange
4. Finding largest and smallest
5. Ascending order and descending order
6. Square and cube of 8 bit and 16-bit data.
7. Interfacing on board LED
8. LED using Timer
9. LCD Interfacing.
10. Stepper motor Interface
11. ADC Interfacing
12. DAC Interfacing
13. 4 Experiments using MSP430 Launch Pad

Text Books:

1. John H. Davies, "MSP430 Microcontroller Basics", Newnes, Elsevier, 2008.
2. Cris Nagy, "Embedded Systems Design using the TI MSP430 Series", Newness, Elsevier, 2003.

Web Links and Video Lectures (e-Resources):

1.https://elearn.nptel.ac.in/shop/iit-workshops/completed/lab-workshop-on-embedded-c-and-arm-cortex-microcontrollers/
2.https://nptel.ac.in/courses/117104072

Course Outcomes (COs):

1. Ability to understand the concepts of microcontroller and assembly language programming, interrupts, low power modes, Timers and communication interface (PO-1, PO-2, PO-3, PO-5, PO-8, PO-9, PO-10, PO-12, PSO-1, PSO-2, PSO-3)
2. Understand the development environment of MSP430 processor for the assembly programs, Low power modes, Timers and communication interface (PO-1, PO-2, PO-3, PO-5, PO-8, PO-9, PO-10, PO-12, PSO-1, PSO-2, PSO-3)
3. Implement and evaluate the assembly programs (PO-1, PO-2, PO-3, PO-5, PO-8, PO-9, PO-10, PO-12, PSO-1, PSO-2, PSO-3)
4. Implement and evaluate C programs for interrupts, Low power modes and Timers (PO-1, PO-2, PO-3, PO-5, PO-8, PO-9, PO-10, PO-12, PSO-1, PSO-2, PSO-3)
5. Implement and evaluate C programs for communication interface PO-1, PO-2, PO-3, PO-5, PO-8, PO-9, PO-10, PO-12, PSO-1, PSO-2, PSO-3)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment Tool	**Marks**	**Course outcomes addressed**
Weekly evaluation of laboratory observation/records after the conduction of every experiment	30	CO1, CO2, CO3, CO4, CO5
Practical test	20	CO1, CO2, CO3, CO4, CO5
Semester End Examination (SEE)	50	CO1, CO2, CO3, CO4, CO5

SIGNAL PROCESSING LAB

Course Code: ETL47	**Credits:** 0:0:1
Pre – requisites: Knowledge of Mathematics and Programming	**Contact Hours:** 28P
Course Coordinator: Akshata S Kori	

List of Experiments Conducted Using Matlab

1. Generation of different types of signals.
2. Verification of sampling theorem.
3. Verification of properties of DFT: Linearity, Circular time shift & Circular frequency shift.
4. Impulse response of a given system.
5. Linear convolution of two given sequences.
6. Circular convolution of two given sequences.
7. Autocorrelation of a given sequence and verification of its properties.
8. Cross correlation of given sequences and verification of its properties.
9. Solving a given difference equation.
10. Computation of N point DFT of a given sequence and to plot magnitude and phase spectrum.
11. Linear and Circular convolution of two sequences using DFT and IDFT.
12. Computation of N point FFT in time domain.
13. Computation of N point FFT in frequency domain.
14. Linear filtering using DFT/FFT techniques.

Text Books:

1. Proakis & Manolakis, "Digital signal processing - Principles Algorithms & Applications", Pearson education, 4th Edition, New Delhi, 2007.

Reference Books:

1. Oppenheim & Schafer, "Discrete Time Signal Processing", PHI, 2003.
2. S. K. Mitra, "Digital Signal Processing", Tata Mc-Graw Hill, 2nd Edition, 2004.
3. D. Ganesh Rao and Vineeta P Gejji, "Digital Signal Processing", 2nd Edition, Sanguine Technical Publications Pearson, 2012.

Web Links And Video Lectures (e-Resources):

1. https://www.nitt.edu/home/academics/departments/ece/facilitiesnservices/labs/signal_processing_lab/
2. http://ece.cet.ac.in/digital-signal-processing-lab/

Course Outcomes (COs):

1. Understand the signal processing concepts like Sampling theorem & convolution. (PO-1, PO-2, PO-3, PO-5, PO-8, PO-12, PSO-1, PSO-2, PSO-3)
2. Analyze the signal processing concepts like DFT & IDFT. (PO-1, PO-2, PO-3, PO-5, PO-8, PO-12, PSO-1, PSO-2, PSO-3)
3. Understand the concepts of correlation and solution for a difference equation using MATLAB. (PO-1, PO-2, PO-3, PO-5, PO-8, PO-12, PSO-1, PSO-2, PSO-3)
4. Ablility to compute FFT & IFFT in time domain & frequency domain. (PO-1, PO-2, PO-3, PO-5, PO-8, PO-12, PSO-1, PSO-2, PSO-3)
5. Ability to design filter by using DFT/FFT techniques. ((PO-1, PO-2, PO-3, PO-5, PO-8, PO-12, PSO-1, PSO-2, PSO-3)

Course Assessment and Evaluation:

Continuous Internal Evaluation: 50 Marks		
Assessment Tool	**Marks**	**Course outcomes addressed**
Weekly evaluation of laboratory observation/records after the conduction of every experiment	30	CO1, CO2, CO3, CO4, CO5
Practical test	20	CO1, CO2, CO3, CO4, CO5
Semester End Examination (SEE)	50	CO1, CO2, CO3, CO4, CO5

OBJECT ORIENTED PROGRAMMING (OOPS) USING PYTHON LAB	
Course Code: ETL48	**Credits:** 0:0:1
Pre – requisites: Nil	**Contact Hours:** 28P
Course Coordinator: Dr. Venu K N	

List of Experiments to be Conducted using Python Idle Shell or Jupiter Notebook

1. Program to illustrate the use of the list
2. Program to illustrate the use of a dictionary
3. Program to read and write into files with and without JSON format
4. Program that illustrates the implementation of function and function modules.
5. Program illustrating the concept of recursion
6. Program related to the creation of class and modification of attributes and methods in a class
7. Program that illustrates the concept of inheritance
8. Program that illustrates the overriding of methods of parent class by the methods of child class
9. Program that illustrates the operator overloading
10. Importing multiple classes from a module
11. Program that illustrates multiple inheritances
12. Program that illustrates polymorphism
13. Program that illustrates the role of the static method
14. Program that illustrates the use of an abstract method

Text Books:

1. David Beazley and Brian K jones ," Python Cookbook", third edition O'Reilly, May 2013
2. Al Sweigart Automate, "The boring stuff with python" , no starch press San Francisco 2015

Reference Books:

1. Steven F. Lott, "Python Object-Oriented Programming: Build robust and maintainable object-oriented Python applications and libraries", 4th Edition,2021
2. Dusty Phillips, "Python 3 Object-oriented Programming: Building robust and maintainable software with object oriented design patterns in Python", Packt publishing 2nd Edition

3. Irv Galib , "Object-oriented python, master OOP, by building games and GUIs", No Starch Press , 2022
4. Dusty Philips, "Python 3 object oriented programming", Packt publishing.

Web Links and Video Lectures (e-Resources):

1. https://www.youtube.com/watch?v=JeznW_7DlB0
2. https://www.youtube.com/watch?v=t8pPdKYpowI
3. https://www.youtube.com/watch?v=XKHEtdqhLK8

Course Outcomes (COs):

1. Illustrate the use of list, dictionary and JSON format concepts (PO-1, PO-2, PO-3, PO-5, PO-8, PO-10, PO-12, PSO-1, PSO-2, PSO-3)
2. Implement the use of functions, class, and concepts of recursion and use of methods in a class (PO-1, PO-2, PO-3, PO-5, PO-8, PO-10, PO-12, PSO-1, PSO-2, PSO-3)
3. Implement inheritance, overriding of methods, and operator overloading concepts (PO-1, PO-2, PO-3, PO-5, PO-8, PO-10, PO-12, PSO-1, PSO-2, PSO-3)
4. Analyse the use of multiple classes and polymorphism (PO-1, PO-2, PO-3, PO-5, PO-8, PO-10, PO-12, PSO-1, PSO-2, PSO-3)
5. Illustrate the use of static and abstract methods. (PO-1, PO-2, PO-3, PO-5, PO-8, PO-10, PO-12, PSO-1, PSO-2, PSO-3)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment Tool	**Marks**	**Course outcomes addressed**
Weekly evaluation of laboratory observation/records after the conduction of every experiment	30	CO1, CO2, CO3, CO4, CO5
Practical test	20	CO1, CO2, CO3, CO4, CO5
Semester End Examination (SEE)	50	CO1, CO2, CO3, CO4, CO5

<table>
<tr><td colspan="2" align="center">**KANNADA KALI**</td></tr>
<tr><td>**Course Code:** HS491K</td><td>**Credits:** 1:0:0</td></tr>
<tr><td>**Pre – requisites:** Nil</td><td>**Contact Hours:** 14L</td></tr>
<tr><td colspan="2">**Course Coordinator:** Mrs. KanyaKumari S</td></tr>
</table>

Unit I
(Parichaya) - Introduction

Kannada Bhashe - About Kannada Language, Eight Kannada Authors – JnanpiTh Awardies

Introduction to Kannada Language, Karnataka State and Literature.

- Pedagogy/Course delivery tools: Chalk and Talk, power point presentation

Unit II
naamapadagaLu – Sarva namapadagaLu – (Nouns -Pronouns) and it's usage in Kannada

Kannada namavisheshanagaLu - (Adjectives-Interrogatives)

kriyapadagaLu,kriya visheshaNagaLu- (verb-adverb)

Sambhashaneyalli Prashnarthaka padagalu –vaakyagaLu mattu kriyapadagaLu-visheshaNagaLu (Kannada- Interrogative words & Sentences and verb-adverb in Conversation)

- Pedagogy/Course delivery tools: Chalk and Talk, power point presentation

Unit III
Samanya Sambhashaneyalli Kannadada Padagalu mattu Vaakyagalu

(Kannada Words and Sentences in General Conversation with activities)

sambhashaNe: (Conversation with Friends- Teachers, between Friends)

(Conversation in Shop, Hostel, Market, Bus and Train)

Shabdakosha: Vocabulary – chaTuvaTike: Exercises

Vicharaneya / Bedikeya vakyagalu(Enquiry /Request sentences in Conversation)

Sambhashane Conversation with House Owner and Room mate

Shabdakosha – Vocabulary - Exercises to test their knowledge of understanding the Language.

- Pedagogy/Course delivery tools: Chalk and Talk, power point presentation

Unit IV

Kannada padagaLu (eakavachana,bahuvachanagaLu,virudda padagaLu dina nityadalli baLasuva padagaLu mattu sankya vyavaste

Sambhashaneyalli Eakavachana mattu Bhahuvachana- (Singular and Plural nouns) Conversation- Sambhashaneyalli Linga rupagaLu- Genders in Conversation

Viruddha padagalu /Virodarthaka padagalu (Antonyms) Asamanjasa Uchcharane (Inappropriate Pronunciation)

Sankhya Vyavasthe(Numbers system) -Samaya /Kalakke Sambhandhisida padhagalu (Words Relating to time) – Dikkugalige sambhadisida padhagalu (Words Relating to Directions)

Aaharakke sambandisida padagaLu(Names connected with food)

Manavana shareerada bhagagalu / Angagalu (Parts of the Human body) Manava Sambhandhada da padhagalu (Terms Relating to Human Relationship)

Manavana Bhavanegalige sambandisida Padagalu (Words Relating to Human's feelings and Emotions)

Vaasada staLakke sambhandisidanthaha padhagalu (Words Relating to place of leaving)

- Pedagogy/Course delivery tools: Chalk and Talk, power point presentation

Unit V

Kannada akshara maale (Kannada alphabets and their practices with pronunciations)

swara aksharagaLu –vyanjanaksharagaLu- gunitaksharagaLu, tantragnana mattu AaDalita padagaLu-Technical and administrative worlds in Kannada

- Pedagogy/Course delivery tools: Chalk and Talk, power point presentation

Text Book:

1. Dr. L. Thimmesh, Prof. Keshava muurthy, 'BaLake kannada' prasarangaa, VTU,2020.

Reference Book:

1. Smt. KanyaKumari.S –'Kannada Kali ' Kinnari publications' First edition, Bengaluru,2022
2. Lingadevaru Halemane – 'Kannada Kali', Prasaranga kannada University Hampi, 6rd Edition. 2019

Course out comes (COs):

At the end of the course students will be able to:
1. Develop vocabulary (PO-10)
2. Identify the basic Kannada language skill (PO-10)
3. Develop listing & speaking skill in Kannada language. (PO-6, PO-12)
4. Enrich language skill. (PO-12)
5. Apply Kannada language skill for various purpose (PO-12)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 marks		
Assessment tool	**Marks**	**Course outcome attained**
Internal test-1	30	CO1, CO2, CO3
Internal test-1I	30	CO4, CO5
Avarege of the Two Internal Test Two will be Taken for 30 Marks		
Other components		
Assignment	10	CO1, CO2
quiz	10	CO3, CO4, CO5
Semester end examination (SEE)	100	CO1, CO2, CO3, CO4, CO5

ಕನ್ನಡ ಮನಸು	
Course Code: HS491M	**Credits:** 1:0:0
Pre – requisites: Nil	**Contact Hours:** 14L
Program: B.E(Common to all the Branches)	**Semester:** IV
Course Coordinator: Mrs. KanyaKumari.S	

ಘಟಕ – 1 (Unit I)

ಲೇಖನಗಳು (Articles)– ಕಾವ್ಯಭಾಗ **(poetry)**

ಕನ್ನಡ ಭಾಷೆ ನಾಡು – ನುಡಿ

ಕರ್ನಾಟಕ ಸಂಸ್ಕೃತಿ

ಆಡಳಿತ ಭಾಷೆಯಾಗಿ ಕನ್ನಡ

ವಚನಗಳು–ಅಕ್ಕಮಹಾದೇವಿ–ಬಸವಣ್ಣ–ಅಲ್ಲಮಪ್ರಭು

- Pedagogy/Course delivery tools: Ch Chalk and Talk, power point presentation

ಘಟಕ – 2 (Unit II)

ಕೀರ್ತನೆ ಮತ್ತು ತತ್ವ ಪದಗಳು

ಪುರಂದರ ದಾಸರು ಮತ್ತು ಕನಕದಾಸರ ಪದಗಳು

ಶಿಶುನಾಳ ಶರೀಫರು ಮಹಾಂತ ಶಿವಯೋಗಿಗಳ ಪದಗಳು

ಜನಪದ ಗೀತೆ

- Pedagogy/Course delivery tools: Ch Chalk and Talk, power point presentation

ಘಟಕ – 3 (Unit III)

ಆಧುನಿಕ ಕಾವ್ಯಗಳು

ಮಂಕುತಿಮ್ಮನ ಕಗ್ಗ

ಕುರುಡು ಕಾಂಚಾಣ

ಚೋಮನ ಮಕ್ಕಳ ಹಾಡು

Pedagogy/Course delivery tools: Ch Chalk and Talk, power point presentation

ಘಟಕ –4 (Unit IV)

ತಾಂತ್ರಿಕ ಧುರೀಣರು(ವ್ಯಕ್ತಿ ಪರಿಚಯ) ಕಥೆ–ಪ್ರವಾಸ ಕಥನ

ಡಾ.ಸರ್.ಎಂ.ವಿಶ್ವೇಶ್ವರಯ್ಯ– ವ್ಯಕ್ತಿ ಮತ್ತು ಇತಿಹ್ಯ – ಎ,ಎನ್.ಮೂರ್ತಿರಾಯರು

ಯುಗಾದಿ –ವಸುಧೇಂದ್ರ

ಮೆಗಾನೆ ಎಂಬ ಗಿರಿಜನ ಪರ್ವತ –ಹಿ.ಚಿ.ಬೋರಲಿಂಗಯ್ಯ

- Pedagogy/Course delivery tools: Ch Chalk and Talk, power point presentation

ಘಟಕ– ೫ (Unit V)

ಕರಕುಶಲ ಕಲೆಗಳು –ತಾಂತ್ರಿಕ ವಿಜ್ಞಾನ (technical science)

ಕರಕುಶಲ ಕಲೆಗಳು –ಮತ್ತು ಪರಂಪರೆ ವಿಜ್ಞಾನ– ಕರಿಗೌಡ ಬೇಚನ ಹಳ್ಳಿ

ಕಂಪ್ಯೂಟರ್ ಹಾಗು ಮಾಹಿತಿ ತಂತ್ರಜ್ಞಾನ–

ಕ'ಮತ್ತು ಬ ಬರಹ ತಂತ್ರಾಂಶಗಳು ಮತ್ತು .ಕಂಪ್ಯೂಟರ್ ಮುಖಾಂತರ ಕನ್ನಡ ಟೈಪಿಂಗ್ ತಾಂತ್ರಿಕ ಪದಕೋಶ ತಾಂತ್ರಿಕ ಹಾಗು ಪಾರಿಭಾಷಿಕ ಕನ್ನಡ ಪದಗಳು

- Pedagogy/Course delivery tools: Ch Chalk and Talk, power point presentation

ಪಠ್ಯ ಪುಸ್ತಕ (text book):
ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ'
ಸಂಪಾದಕರು : ಡಾ.ಹಿ.ಚಿ, ಬೋರಲಿಂಗಯ್ಯ –ವಿಶ್ರಾಂತ ಕುಲಪತಿಗಳು, ಕನ್ನಡ ವಿಶ್ವವಿದ್ಯಾಲಯ ,ಹಂಪಿ,ಪ್ರಸಾರಾಂಗ ವಿಶ್ವೇಶ್ವರಯ್ಯತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ,ಬೆಳಗಾವಿ,ಪ್ರಥಮ ಮುದ್ರಣ-2020
ಪೂರಕ ಪಠ್ಯ (reference book)
ಕನ್ನಡ ಮನಸು, ಪ್ರಸಾರಾಂಗ – ಕನ್ನಡ ವಿಶ್ವವಿದ್ಯಾಲಯ–ಹಂಪಿ,ಆರನೇಮುದ್ರಣ 2016

ಕನ್ನಡ ಕಲಿಕೆಯ ಉದ್ದೇಶಗಳು:

- ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡದ ಜೊತೆಗೆ ಕ್ರಿಯಾತ್ಮಕ, ಸಾಹಿತ್ಯ ಮತ್ತು ಸಂಸ್ಕೃತಿ ಮತ್ತು ನಾಡು–ನುಡಿಯ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು (PO-6)

- ಕನ್ನಡ ಭಾಷೆಯ ವ್ಯಾಕರಣ, ಭಾಷಾರಚನೆ ಯ ನಿಯಮಗಳನ್ನು ಪರಿಚಯಿಸುವುದು(PO-10)

- ಕನ್ನಡ ಭಾಷಾಬರಹದಲ್ಲಿ ಕಂಡು ಬರುವ ದೋಷಗಳು ಮತ್ತು ಅವುಗಳ ನಿವಾರಣೆ(PO10)

- ಸಾಮಾನ್ಯ ಅರ್ಜಿಗಳು, ಸರ್ಕಾರಿ ಹಾಗು ಸರ್ಕಾರಿ ಪತ್ರವ್ಯವಹಾರದ ಬಗ್ಗೆ ಅರಿವು ಮೂಡಿಸುವುದು(PO-12)

- ಭಾಷಾಂತರ ಮತ್ತು ಪ್ರಬಂಧ ರಚನೆ ಬಗ್ಗೆ ಅರಿವು ಮೂಡಿಸುವುದು ಕನ್ನಡ ಭಾಷಾಭ್ಯಾಸ,ಸಾಮಾನ್ಯ ಕನ್ನಡ ಹಾಗು ಆಡಳಿತ ಕನ್ನಡದ ಪದಗಳ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು. (PO-12)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 marks		
Assessment tool	**Marks**	**Course outcome attained**
Internal test-1	30	CO1, CO2, CO3
Internal test-1I	30	CO4, CO5
Avarege of the Two Internal Test Two will be Taken for 30 Marks		
Other components		
Assignment	10	CO1, CO2
quiz	10	CO3, CO4, CO5
Semester end examination (SEE)	100	CO1, CO2, CO3, CO4, CO5

ABILITY ENHANCEMENT COURSE - IV

Course Code: AEC410	Credits: 1:0:0
Pre – requisites: Nil	Contact Hours: 14L
Course Coordinator: Dr. Rama Shivakiran Reddy	

Ability Enhancement Courses (AEC) are the generic skill courses which are basic and needed by all to pursue any career. These courses are designed to help students enhance their skills in communication, language, and personality development. They also promote a deeper understanding of subjects like social sciences and ethics, culture and human behaviour, human rights and the law.

Every student shall register for AEC course under the supervision of his/her proctor. For III, IV & V semester, the student shall select the Ability Enhancement Course online such that the selected course does not overlap with any professional core/ elective course offered by the parent department of the student. After selection, the registration of the course has to be done by the student at his/her parent department.

ADDITIONAL MATHEMATICS – II

Course Code: AM41	Credits: 0:0:0
Pre – requisites: Nil	Contact Hours: 42L
Course Coordinator: Dr. Veena B N	

Unit I

Differential Calculus- I: Partial differentiation, Euler's theorem, total differential coefficient, differentiation of composite and implicit functions.

- Pedagogy/Course delivery tools: Chalk and talk
- Online tools: Use of open source software's to demonstrate methods and solve problems on interpolation
- Links: https://nptel.ac.in/courses/111/105/111105121/
- Impartus recording: https://a.impartus.com/ilc/#/course/107625/1030

Unit II

Differential Calculus- II: Jacobian and Properties. Taylor's theorem for function of two variables, maxima and minima for functions of two variables.

- Pedagogy/Course delivery tools: Chalk and talk
- Online tools: Use of open source software's to demonstrate methods and solve problems on numerical differentiation and integration.
- Links: https://nptel.ac.in/courses/111/105/111105121/
- Impartus recording: https://a.impartus.com/ilc/#/course/107625/1030
  https://a.impartus.com/ilc/#/course/59742/295

Unit III

Vector Integration: Line integrals, surface integrals and volume integrals. Green's theorem, Stokes' and Gauss divergence theorem (without proof) and problems, orthogonal curvilinear coordinates.

- Pedagogy/Course delivery tools: Chalk and talk
- Links: https://nptel.ac.in/courses/111/105/111105134/
- Impartus recording: https://a.impartus.com/ilc/#/course/619570/1030

Unit IV

Higher Order Differential Equations: Higher order linear differential equations, method of variation of parameters, Cauchy's and Legendre's homogeneous differential equations.

- Pedagogy/Course delivery tools: Chalk and talk

- Links: https://nptel.ac.in/courses/111/105/111105121/
- Impartus recording: https://a.impartus.com/ilc/#/course/96127/452
  https://a.impartus.com/ilc/#/course/59742/295

Unit V

Probability: Introduction. Sample space and events. Axioms of probability. Addition and multiplication theorems. Conditional probability- illustrative examples. Bayes theorem – examples.

- Pedagogy/Course delivery tools: Chalk and talk
- Links: https://nptel.ac.in/courses/111/107/111107119/
  https://nptel.ac.in/courses/111/107/111107119/
- Impartus recording: https://a.impartus.com/ilc/#/course/283623/703

Text Books:

1. **B.S. Grewal** – Higher Engineering Mathematics, Khanna Publishers, 44th edition, 2017.
2. **Erwin Kreyszig** – Advanced Engineering Mathematics – Wiley Publication, 10th Edition, 2015.

Reference Books:

1. **H. K. Dass** – Higher Engineering Mathematics – S Chand Publications, 1998
2. **B. V. Ramana** – Engineering Mathematics – Tata McGraw-Hill Publishing Co. Ltd., New Delhi, 2008.

Course Outcomes (COs):

At the end of the course the student will be able to
1. To carryout differentiation of function of several variables.
2. Solve the problems related to Jacobians, the extreme values of a function and Taylors series.
3. Exhibit the interdependence of line, surface and volume integrals using integral theorems.
4. Find the solution of second and higher order ODEs with constant and variable coefficients.
5. Solve the problems on conditional probability and Baye's theorem.