

RAMAIAH Institute of Technology

CURRICULUM

Outcome Based Education (Effective from the Academic Year 2023 – 2024)

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 aggis of this foundation in the same year, creating a landmark in technical education in India. MSRIT offers 17 UG programs and 11 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) & Visvesvarava Technological University (VTU) have conferred Autonomous Status to MSRIT for both UG and PG Programs since 2007. The institute has also been conferred autonomous status for Ph.D. program since 2021. The institute is a participant to the Technical Education Ouality Improvement Program (TEOIP), an initiative of the Government of India. The institute has 380 competent faculty out of which 67% 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. Ramaiah Institute of Technology has obtained "Scimago Institutions Rankings" All India Rank 107 & world ranking 600 for the vear 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. The Institute is a member of DELNET, CMTI and VTU E-Library Consortium. The Institute has a modern auditorium, recording studio, 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, Ramaiah Institute of Technology has achieved 78th rank among 1314 top Engineering Institutions & 23rd Rank among 105 School of Architecture in India for the year 2023.

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 07 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, IETE Bangalore and IEEE MTTs student Branch.

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

- 1. Imparting quality technical education by nurturing a conducive learning environment through continuous improvement and customization
- 2. Establishing research clusters in emerging areas in collaboration with globally reputed organizations
- 3. 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

- 1. Providing high quality technical education to create world class Telecommunication engineers.
- 2. 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 consequentresponsibilities 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 environmentalrequirements.

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

Semester wise Credit Breakdown for B.E Degree Curriculum Batch 2022-26

Semester Course Category	First	Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth	Total Credits
Basic Sciences (BSC)	08	08	03	03					22
Engineering Sciences (ESC)	08	09							17
Humanities, Social Sciences and Management (HSMC)	02	02			03	03			10
Ability Enhancement Course (AEC)	02	01	01	01	01	-	03		09
Universal Human Values (UHV)	-		02						02
Professional Core Courses (PCC)			11	12	12	06	04		45
Integrated Professional Core Course (IPCC)			04	04	03		04		15
Professional Elective Courses (PEC)	-	-	-	-	03	06	03		12
Institutional Open Elective Courses (IOE)	-	-	-	-	-	03	03		06
Internship (INT)				Yes				05	05
Mini Project / Project Work (PW)						04	03	10	17
Non Credit Mandatory Courses (NCMC)			Yes		Yes			Yes	
Total Credits	20	20	21	20	22	22	20	15	160

	B.E. in Electronics and Telecommunication Engineering								
	Scheme of Teaching and Examination 2023-24								
		(Effective fr	om the academ	ic year 2023	5-24)				
C1			III SEMESTI	ER	1	-			
SI.	Subject	Subject	Teaching	Category	-		redit	5	Total
No.	Code		Department		L	Т	Р	Total	contact hours /week
1	ET31	Transform Techniques and Linear Programming	Maths	BSC	2	1	0	3	4
2	ET32	Data Structures Using C	ETE	IPCC	3	0	1	4	5
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 Value Course	ETE	UHV	2	0	0	2	2
9	ETAEC39	Ability Enhancement Course III	ETE	AEC	1	0	0	1	1
				Total	16	2	3	21	26
10	PE83	Physical Education			All s	tuden	ts hav	ve to regi	ister compulsorily for
	YO83 Yoga				any	one o	of the	e courses	with the concerned
	NS83	NSS			coord	linato	r (Yo	ga Teache	er/ Physical Education
				NCMC	JCMC Director/ NSS Coordinator) in the begin		or) in the beginning of		
					the II	I sem	ester.	Attendin	g the registered course
					from	III	to V	III semes	sters. Qualifying is
<u> </u>					manc	latory	for th	ne award	of the degree.
12	AM31	Additional Mathematics - I *	Maths	NCMC	0	0	0	0	3

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 04 and its Teaching–Learning hours (L : T : P) can be considered as (3 : 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.

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 upto 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.

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 (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.

	B.E. in Electronics and Telecommunication Engineering Scheme of Teaching and Examination 2023-24 (Effective from the academic year 2023-24)								
	IV SEMESTER Category Credits Total								
SI. No	Subject Code	Subject	Teaching Department	Category	L	T	P	Total	contact hours /week
1	ET41	Numerical Methods, Statistics and Probability	Maths	BSC	2	1	0	3	4
2	ET42	Systems Modelling and Control	ETE	IPCC	3	0	1	4	5
3	ET43	Microcontroller	ETE	PCC	3	0	0	3	3
4	ET44	Engineering Electromagnetics	ETE	PCC	2	1	0	3	4
5	ET45	Signal Processing	ETE	PCC	3	0	0	3	3
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	ETAEC49	Ability Enhancement Course IV	ETE	AEC	1	0	0	1	1
	Total 14 2 4 20 26								
10	AM41	Additional Mathematics II *	Maths	NCMC	0	0	0	0	3

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 04 and its Teaching–Learning hours (L : T : P) can be considered as (3 : 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.

* 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.

Innovation/ Societal/Entrepreneurship-based Internship: At the end of the fourth Semester a four-week Summer Internship shall be carried out, based on industrial/Govt./NGO/MSME/Rural Internship/Innovation/Entrepreneurship. All the students admitted shall have to undergo a mandatory internship of 04 weeks during the vacation of the IV semester. A Viva-Voce examination shall be conducted during the VI semester and the prescribed credit shall be included in the 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.

III Semester TRANSFORM TECHNIQUES AND LINEAR PROGRAMMING PROGRAMMING Subject Code: ET31 Credits: 2:1:0 Pre requisites: Nil Contact Hours: 28L+28T

Course Coordinator: Dr. Monica Anand and Dr. Shashi Prabha G. S.

Course Content

Unit I

Fourier Series: Review of orthogonal vectors and functions, Trigonometric Fourier series, orthonormal basis of Fourier series, Derivation of Fourier coefficients, Periodic functions, Dirichlet's conditions, Fourier series of periodic functions of period 2π and arbitrary period, Complex form of Fourier series, Half range Fourier series, Practical harmonic analysis, Solution of 1D- heat equation using Fourier series.

- 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 II

Fourier Transforms: Derivation of Fourier transforms from Fourier series, Infinite Fourier transform, Infinite Fourier sine and cosine transforms, Properties, Inverse transforms, Convolution theorem and its significance, Parseval's identity, Fourier transform of derivatives and integrals, Solution of PDE's using Fourier transforms

- 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 III

Discrete Transforms: Z-transform of Standard functions, Linearity property, Damping rule, Shifting property, Initial and final value theorems, Convergence of Z-transforms, Inverse Z-transform, Convolution theorem, Application of Z-transforms to solve difference equations. Discrete Fourier transform (DFT), Inverse DFT, Fast Fourier transform (FFT), Limitations of Fourier transform.

- Pedagogy / Course delivery tools: Chalk and talk
- Links: https://nptel.ac.in/courses/111/107/111107119/
- Impartus Recording: https://a.impartus.com/ilc/#/course/119635/593

Unit IV

Linear Programming I: 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.

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

Unit V

Linear Programming II: Duality in linear programming, Fundamental theorem of Duality, Dual simplex method. Transportation problem, Finding initial basic feasible solution by North-West corner method, Vogel's approximation method, Test for optimality – MODI method, Assignment problem – Hungarian method.

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

Text Books:

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

References:

- Oran Brigham E Fast Fourier Transform and Its Applications Pearson 1st edition -1988
- Debnath, L., & Bhatta Integral Transforms and Their Applications D Chapman and Hall/CRC 2nd edition - 2015
- 3. Kalavathy S Operations Research Vikas Publishers- 4th edition-2013

Course Outcomes (COs):

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

- 1. Construct the Fourier series expansion of functions/tabulated data. (PO 1, 2 & PSO– 1)
- 2. Find the solution of PDE's analytically using Fourier transforms techniques.
- 3. (PO-1, 2 & PSO-1)
- 4. Solve difference equations using Z-transforms. (PO-1, 2 & PSO-1)
- 5. Formulate and solve a simple linear programming problem. (PO-1, 2 & PSO-1)
- 6. Solve Transportation and Assignment problems (PO-1, 2 & PSO-1)

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

Subject Code: ET32	Credits: 3:0:1
Pre requisites: Computing Fundamentals and	Contact Hours: 121 128D
C Programming	Contact Hours. 42L+201
Course Coordinator: Dr. Arvind Kumar G	

Course Content

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%20
- programming%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, Merge 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. Networks: Minimum spanning Tree & Shortest path Algorithms

- 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

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
	Program to insert, delete and display Circularly linked list by
5.	adding and deleting at the beginning
	Program to insert, delete and display Circularly linked list by
	adding and deleting at the end.
	Program to insert, delete and display Circularly linked list by
6.	adding at the end and deleting at the beginning
	Program to make a copy of a given singly linked list
	Program to create and reverse a Singly linked list and display thesame
7.	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

List of Experiments:

	Program to decide whether a switch is routable or not using astack.
9.	Program to convert infix to postfix
10.	Implementation of a Queue using singly linked list
	Program to implement Maximum /Minimum Priority Queue
	Programs for in order, preorder and post order traversal of trees
11.	Program to insert ,delete ,traverse and search in a binary searchtree
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, Secondedition,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 DataStructures", 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)

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

Subject Code: ET33	Credits: 2:1:0
Pre requisites: Basic Electronics	Contact Hours: 28L+28T
Course Coordinator: Mrs. Kusuma S M	

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 amplifiers

- 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 rejectionratio, 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-gsE3npYPJJDn
- EF3pdiHZT6Kj3
- 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- gsE3npYPJJDn
- EF3pdiHZT6Kj3
- 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=PLbRMhDVUMngcoKrA
- 4sH-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.
- A S. Sedra, K. C. Smith, "Microelectronic Circuits", Oxford University Press, 8thedition Nov 2019.
- Ramakant A Gayakwad, "Op-Amps and Linear Integrated Circuits", Pearson, 4thedition, May 2015.

Reference Books:

- 1. 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-c2ssFpRrzYwbzplXfXUT&index=88,
- https://www.youtube.com/watch?v=WzdmaSUCQGM&list=PLyYrySVqmyVPz vVlPW-TTzHhNWg1J_0LU&index=42
- https://www.youtube.com/watch?v=Bw6ahZ8znNU
- http://www.youtube.com/playlist?list=PLbRMhDVUMngcoKrA4sHzvbNVSE6IpEio
- http://www.youtube.com/playlist?list=PLbRMhDVUMngcoKrA4sHzvbNVSE6IpEio
- https://www.youtube.com/watch?v=ljlDriLo_7U&list=PLc7Gz02Znph-c2ssFpRrzYwbzplXfXUT&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)
- 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)

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 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 DESIGNSubject Code: ET34Credits: 3:0:0Pre requisites: Basic ElectronicsContact Hours: 42LCourse Coordinator: Dr. Ramya H R

Course Content

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 fulladder.

- 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", 2ndedition, 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)

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

Subject Code: ET35	Credits: 3:0:0
Pre requisites: Basic Electronics	Contact Hours: 42L
Course Coordinator: Dr. Viswanath Talasila	

Course Content

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 IV

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: <u>https://a.impartus.com/ilc/#/course/59763/295</u>

Unit V

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:

- William H. Hayt, Jack Kemmerly and Steven M. Durbin, "Engineering CircuitAnalysis", Kemmerly and Durbin, 8th Edition, McGraw Hill Education, 2013
- David K Cheng, "Analysis of Linear Systems", Narosa Publishing House, 11threprint, 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 fromlinear 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 designof linear circuits (PO-1, PO-2, PO-3, PO-4, PO-6, PO-12, PSO-1, PSO-2, PSO-3)
- Model linear electric circuits in the frequency domain using Laplace transformtechniques (PO-1, PO-2, PO-3, PO-4, PO-6, PO-12, PSO-1, PSO-2, PSO-3)

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

Subject Code: ETL36	Credits: 0:0:1
Pre requisites: Basic Electronics	Contact Hours: 28P
Course Coordinator: Mrs. 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-McGrawHill, 2017.
- 2. D. Roy Choudhury and Shail B Jain, "Linear Integrated Circuits", 5th editionreprint, New Age International, 2017.

Reference Book:

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)
- 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)

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

DIGITAL CIRCUIT DESIGN LAB

Subject Code: ETL37	Credits: 0:0:1
Pre requisites: Basic Electronics	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 circuitusing FPGA **XC3S400 IC** hardware with **Xilinx 14.7i** software.

List of Experiments:

- 1. Simplification, realization of Boolean expressions using logic gates/Universalgates.
- 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) Dtype.
- 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.

- Samir Palnitkar, "VERILOG HDL-A Guide to digital design and synthesis", 2ndedition, Pearson education, 2003.
- 4. Wayne Wolf, "FPGA based system design", Reprint 2005, Pearson Education, 2005

Reference Books:

- R D Sudhaker Samuel, "Logic Design A simplified approach", Sanguine Technical Publishers, 2011
- 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)
- Ability to design and evaluate sequential networks with a minimum number ofgates. (PO-1, PO-2, PO-3, PO-8, PO-9, PO-10, PO-12, PSO-1, PSO-2, PSO-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)
- 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)

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

UNIVERSAL HUMAN VALUE COURSE

Subject Code: UHV38

Pre requisites: Nil

Credits: 2:0:0

Course Coordinator: Mrs. 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/sGZtTPelhQ

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 Coexistence

- 1. Understanding the harmony in the Nature
- 2. Interconnectedness and mutual fulfillment among the four orders of naturerecyclability and self-regulation in nature
- 3. Understanding Existence as Co-existence (Sah-astitva) of mutually interacting
- 4. units in all-pervasive space
- 5. 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 ecofriendlyproduction systems,
 - C. Ability to identify and develop appropriate technologies and management patternsfor 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:

 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
- https://www.youtube.com/watch?v=P4vjfE-YnVk&list=PLWDeKF97v9SP7wSlapZcQRrT7OH0ZlGC4
- Course handouts: https://drive.google.com/drive/folders/1zioX_4L2fCNX4Agw282PN86pcZZT3 Osr?usp=sharing
- Presentation slides: https://drive.google.com/drive/folders/1rMUKh1s0HPRB1pp_b1mpSduNRcwS6YH?usp=sharing

Course Outcomes (COs):

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 fora 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 Levelsof Human Existence. (PO-6)
- 5. Explain the Holistic understanding of Harmony and Professional Ethics at Individual Level and Society. (PO-6, PO-8)

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	20 (10 +		
Presentation	10)	CO1, CO2, CO3, CO4, CO5	
Model / mini project			
Any other			
Semester End Examination (SEE)	100	CO1, CO2, CO3, CO4, CO5	

ABILITY ENHANCEMENT COURSE – III Technical Writing and LaTex

Subject Code: ETAEC39

Credits: 1:0:0 Contact Hours: 14L

Pre requisites: Nil Course Coordinator: Dr. Shobha K R

Course Content

Unit I

Technical Communications: Research papers, reports, emails, Resume, webpages, posters

Introduction to LaTex: Document types, packages

- Pedagogy / Course delivery tools: PPT & Online Hands-on sessions
- Links: https://www.latex-project.org/ https://onlinecourses.nptel.ac.in/noc20 hs56/preview

https://onlinecourses.nptel.ac.in/noc20_hs06/preview

Unit II

Technical Writing: Introduction to technical writing, choosing the right words, requirements for technical documents

LaTex Elements: Packages for fonts, figures and tables

- Pedagogy / Course delivery tools:PPT & Online Hands-on sessions
- Links: https://www.overleaf.com

https://onlinecourses.nptel.ac.in/noc20_hs56/preview https://onlinecourses.nptel.ac.in/noc20_hs06/preview

Unit III

Report Writing: Traditional writing process, writing tools, graphical methods for representing results, Plagiarism

LaTex Elements: Document classes, sectioning, building the references section

- Pedagogy / Course delivery tools: PPT & Online Hands-on sessions
- Links: https://www.overleaf.com

https://onlinecourses.nptel.ac.in/noc20_hs56/preview https://onlinecourses.nptel.ac.in/noc20_hs06/preview

Unit IV

Research Papers: Elements of a research paper, surveys, methodology, results & discussion

Mathematical Elements with LaTex: IEEE Formats, Equations, Matrices/Arrays

- Pedagogy / Course delivery tools PPT & Online Hands-on sessions
- Links: https://www.ieee.org/conferences/publishing/templates.html https://onlinecourses.nptel.ac.in/noc20_hs56/preview https://onlinecourses.nptel.ac.in/noc20_hs06/preview

Unit V

Resume: Elements of a resume, order of items and chronology, example resumes **Popular LaTex Packages:** beamer, amsmath, siunitx, fancyhdr, hyperref, geometry

- · Pedagogy / Course delivery tools: PPT & Online Hands-on sessions
- Links: https://onlinecourses.nptel.ac.in/noc20_hs56/preview https://onlinecourses.nptel.ac.in/noc20_hs06/preview

Text Books:

- 1. Phillip A Laplante, "Technical Writing: A Practical Guide for Engineers and Scientists", 1st Edition, CRC Press, 2011.
- 2. Tobias Oetiker , "The Not So Short Introduction to LATEX" 2e https://cslab.pepperdine.edu/warford/cosc320/lshort.pdf [retreived 18 Oct. 22]

Course Outcomes (COs):

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

- 1. Identify different types of technical documents for a given requirement. (POs:3, 8, 10, 11)
- Create well-written short technical documents and typeset it in LaTex. (POs:3, 8, 10, 11)
- Create a simple report for a given technical topic, and typeset it in LaTex. (POs:3, 8, 10, 11)
- 4. Create a sample research paper in a technical topic, and typset it in LaTex templates from publisher sites. (POs:3, 8, 10, 11)
- 5. Create a professional resume, including suitable elements in the correct order. networks. (POs:3, 8, 10, 11)

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	Marks	Course outcomes addressed	
Sample Report	10	CO1, CO2, CO3	
Sample Research Paper	5	CO1, CO2, CO4	
Sample Resume	5	CO1, CO2, CO5	
Semester End Examination	100	CO1, CO2, CO3, CO4, CO5	
(SEE):			

PHYSICAL EDUCATION

Subject 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 anycareer.
- 2. To instill in them concepts of team spirit and team building
- 3. To develop positive thinking, goal setting and decision-making abilities underduress.
- 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:

Outdo	or Games	Indoor Ga	ames	Athletics	
Games	No. of Students	Games	No. of Students	Events	No. of Students
Volleyball	12 x 4 = 48	Badminton	30	Sprint - 100mt, 200mt, 400mt	
Basketball	12 x 4 = 48	Table Tennis	30	Middle distance running – 800mt, 1,500mt	
Kabaddi	12 x 4 = 48	Chess	30	Long distancerunning – 5,000mt, 10,000mt	60
Kho Kho	12 x 4 = 48	Weight Training[Gym]	35	Jumping Events – Long Jump Triple Jump High Jump	30
Throwball	12 x 4 = 48			Throwing Events Shot Put DiscussJavelin	30

Football	16 x 4 = 64	
Hockey	16 x 4 = 64	Note: Students should bring their own sports attires
Cricket	16 x 4 = 64	

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

Session 1

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

Session 2

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

Session 3

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 (COs):

- 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.

- 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 theCommittee.
- 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 theacademic 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		
Subject 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 (COs):

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 theCommittee.
- 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 theacademic 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

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

NATIONAL SERVICE SCHEME

Subject Code: NS83

Credits: NCMC

Pre requisites: Nil

Creans: NCN

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 certainshortcomings 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 wellrecognizedorganizations.
- 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 anyof the above causes.

Course Outcomes (COs):

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 coursecoordinator.

- 1. The candidates shall maintain a record of activities in a Diary, and get themendorsed during the contact sessions at least 3 times in a semester.
- 2. A detailed project report should be submitted during the last fortnight of these mester
- 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 (FOR LATERAL ENTRY DIPLOMA STUDENTS)

Subject Code: AM31 Pre requisites: Nil

Credits: 0:0:0

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/ •
- 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/
- Impartus recording: 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 a vector 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. (PO-1,2)
- 2. Apply the concept of reduction formula to determine the length, area, volume of revolution of an arc of the curve. (PO-1,2)
- 3. Solve the problems related to velocity and acceleration. (PO-1,2)
- 4. Apply vector differentiation to identify solenoidal and irrotational vectors. (PO-1,2)
- 5. Apply the concept of various methods to solve first order first degree differential equations. (PO-1,2)

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	Marks	Course outcomes addressed	
Quiz	10	CO1, CO2, CO3	
Assignment	10	CO3, CO4, CO5	

IV Semester

NUMERICAL METHODS, STATISTICS AND PROBABILITY		
Subject Code: ET41	Credits: 2:1:0	
Pre requisites: Nil Contact Hours: 28L+28T		
Course Coordinator: Dr. Monica Anand and Dr. Shashi Prabha G. S.		

Course Content

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.

Numerical Differentiation and Numerical Integration: Derivatives using Newton-Gregory forward and backward interpolation formulae, Newton-Cotes quadrature formula, Trapezoidal rule, Simpson's 1/3rd rule and Simpson's 3/8th 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, 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, central limit theorem, concepts of standard error and confidence interval, level of significance, type I and type II errors, one tailed and two tailed tests, Z-test: for single mean, for single proportion and for difference between means, Student's t –test: for single mean and for difference between two means, F – test for equality of two variances, Chi-square test: for goodness of fit and 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:

- Erwin Kreyszig Advanced Engineering Mathematics Wiley publication 10th edition-2015
- B. S. Grewal Higher Engineering Mathematics Khanna Publishers 44th edition – 2017
- 3. Murray R Spiegel Probability and Statistics John Schiller & R. Alu Srinivasan 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
- 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, 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, 2 & PSO-1)
- 3. Find parameters of continuous probability distributions and calculate the marginal and conditional distributions of bivariate random variables. (PO-1, 2 & PSO-1)
- 4. Determine the parameters of stationary random processes and use Markov chain in prediction of future events. (PO-1, 2 & PSO-1)
- 5. Choose an appropriate test of significance and make inference about the population from a sample. (PO-1, 2 & PSO-1)

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

Subject Code: ET42	Credits: 3:0:1
Pre requisites: Network Analysis	Contact Hours: 42L+ 28P
Course Coordinator: Dr. Viswanath Talasila	

Course Content

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, Modeling the Predator Prey equations from Ecology

- 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, Design of a basic feedback control system

- 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. Data visualization
- 2. Creating user defined functions (Conditional logic and loops)
- 3. Operations on Signal:
 - a. Perform operations on signals to modify their frequency, addition of two signals
 - b. Introduce synthetic noise into signals
- 4. Modeling from data: Curve Fitting
 - a. Fit polynomial models to data to illustrate first steps towards datadriven modeling
- 5. Modeling from first principles: Transfer functions with MATLAB
 - a. Compute poles/zeros (eigenvalues), damping factor etc
 - b. Compute time response for first and second order systems
- 6. Modeling from first principles: State Space systems with MATLAB
 - a. Compute poles/zeros (eigenvalues), damping factor etc
 - b. Compute time response for first and second order systems
- 7. Compute time response specifications for first and second order systems for various input signals, and comment on stability
- 8. Pole placement design 1
- 9. 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/18s997-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. <u>Viswanath Talasila</u>, https://onlinecourses.nptel.ac.in/noc17_ee12/preview
- MIT OpenCourse in Feedback Control Systems, http://ocw.mit.edu/courses/aeronautics-and-astronautics/16-30-feedbackcontrol- systems-fall-2010/
- MIT Open Course in Systems and Control, http://ocw.mit.edu/courses/mechanical-engineering/2-04a-systems-and-controlsspring-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):

- 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 placementto 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)
- 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)
- 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)

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 related Assignment	10	CO1, CO2		
Lab related Assignment	10	CO1, CO2, CO3, CO4, CO5		
Semester End Examination (SEE)	100	CO1, CO2, CO3, CO4, CO5		

MICROCONTROLLERSubject Code: ET43Credits: 3:0:0Pre requisites: Computing fundamentals and
C ProgrammingContact Hours: 42LCourse Coordinator: Dr. Shobha K RContact Hours: 42L

Course Content

Unit I

Introduction to Microcontroller: Small Microcontroller, Anatomy of a Typical Small Microcontroller, Memory, Software, where does MSP430 fit, The Outside View—Pin-Out, Functional Block Diagram, Central Processing Unit, Memory-Mapped Input and Output, Clock Generator, Exceptions: Interrupts and Resets, Development Environment, Assembly Language., Access to the Microcontroller for Programming and Debugging.

- Pedagogy / Course delivery tools: Blackboard teaching
- Links: https://onlinecourses.nptel.ac.in/noc20_ee98/preview
- Impartus Recording: https://a.impartus.com/ilc/#/course/59760/295

Unit II

Architecture of the MSP430 Processor: Central Processing Unit., Addressing Modes, Constant Generator and Emulated Instructions, Instruction Set, Examples, Reflections on the CPU and Instruction Set, Resets.

- Pedagogy / Course delivery tools: Blackboard teaching
- Links: https://onlinecourses.nptel.ac.in/noc20_ee98/preview
- Impartus Recording: https://a.impartus.com/ilc/#/course/59760/295

Unit III

Digital I/Os, Interrupts and LP Modes: Parallel ports, Interrupts on Inputs, Application: examples of hex keypad, multiplexed display, LCD and DC motor interfaces. Interrupts and ISRs. Low Power Modes of operation.

Development Environment: Introduction, Aspects of C for Embedded Systems, Access for debugging, MSP430- starter kit

- Pedagogy / Course delivery tools: Blackboard teaching
- Links: https://onlinecourses.nptel.ac.in/noc20_ee98/preview
- Impartus Recording: https://a.impartus.com/ilc/#/course/59760/295

Unit IV

Clock System & Timers: Clock modules; Crystal oscillators, VLO and DCO, Clock module control, Oscillator Faults, FLL+.

Timers: Watchdog timer, Basic Timer1, RTC, Timer_A; Timer block, Capture and compare channels, Interrupts, Example application –Generation of a precise frequency and a simple PWM

- Pedagogy / Course delivery tools: Blackboard teaching
- Links: https://onlinecourses.nptel.ac.in/noc20_ee98/preview
- 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://onlinecourses.nptel.ac.in/noc20_ee98/preview
- Impartus Recording: https://a.impartus.com/ilc/#/course/59760/295

Text Books:

- 1. John H. Davies, "MSP430 Microcontroller Basics", Newnes, Elsevier, 2010.
- 2. Cris Nagy, "Embedded Systems Design using the TI MSP430 Series", Newnes, Elsevier, 2003.

Reference Books:

1. 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/117104072

Course Outcomes (COs):

- 1. Ability to understand the basics of Microcontroller (PO-1, PO-2, PO-12, PSO-1, PSO-3)
- 2. Implement and evaluate basic assembly/ C programs in MSP 430 (PO-1, PO-2, PO-3, PO-12, PSO-1, PSO-3)
- 3. Implement applications using interrupt and low power modes (PO-1, PO-2, PO-3, PO-5, PO-7, PO-12, PSO-1, PSO-2, PSO-3)

- 4. Understand and analyze the usage of timers and implement timing based applications (PO-1, PO-2, PO-3, PO-5, PO-6, PO-12, PSO-1, PSO-2, PSO-3)
- 5. Implement applications using serial peripheral interfaces (PO-1, PO-2, PO-3, PO-5, PO-6, PO-12, PSO-1, PSO-2, PSO-3)

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 will be taken for 30 marks.				
Other components				
Assignment	10	CO1, CO2, CO3, CO4, CO5		
Surprise Test	10	CO1, CO2, CO3, CO4,CO5		
Semester End Examination (SEE)	100	CO1, CO2, CO3, CO4, CO5		

ENGINEERING ELECTROMAGNETICS

Subject Code: ET44	Credits: 2:1:0	
Pre requisites: Transform Techniques and	Contact Hourse 281 + 28T	
Linear Programming	Contact Hours: 28L + 281	
Course Coordinator: Dr. B K Sujatha / Mrs. Nisha S L		

Course Content

Unit I

Coluomb's Law and Electric Field Intensity: Experimental law of Coulomb, Electric field intensity, 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 ofpoint 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: SkinEffect.

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:

- W.H. Hayt, J.A. Buck and M. Jaleel Akhtar, "Engineering Electromagnetics", 8th Edition, McGraw-Hill, 2015.
- 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", McGrawHill, 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)
- 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)
- 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)
- Analyse the importance of Electrostatic, Magnetic boundary condition, Timevarying 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)
- 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)

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

Subject Code: ET45	Credits: 3:0:0
Pre requisites: Knowledge of Mathematics	Contact Hours: 42L
Course Coordinator: Ms. Akshata S K	

Course Content

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-Gm0yRYwTjwxaqapPsS
- AHzs4_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.

- Pedagogy / Course delivery tools: Chalk and talk
- Links:https://www.youtube.com/playlist?list=PLqGm0yRYwTjwxaqapPsSAH zs4_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=PLqGm0yRYwTjwxaqapPsSAH zs4_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.

- Pedagogy / Course delivery tools: Chalk and talk
- Links:https://www.youtube.com/playlist?list=PLqGm0yRYwTjwxaqapPsSAH zs4_nkQLVr
- Impartus Recording: http://a.impartus.com/ilc/#/course/96153/452

Unit V

Z-Transforms: Introduction, Z- transform, properties of ROC, properties of Z-transforms, inverse Z- transforms. Z-Transform analysis of LTI systems.

- Pedagogy / Course delivery tools: Chalk and talk
- Links:https://www.youtube.com/playlist?list=PLqGm0yRYwTjwxaqapPsSAH zs4_nkQLVr
- Impartus Recording: http://a.impartus.com/ilc/#/course/96153/452

Text Books:

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.
- Ganesh Rao and Satish Tunga, "Signals and Systems", Cengage India PrivateLimited, 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)
- 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)
- 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)
- 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

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 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

Subject Code: ETL46	Credits: 0:0:1
Pre requisites: Computing fundamentals and	Contract House, 28D
C Programming	Contact Hours: 28P
Course Coordinator: Dr. Shobha K 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-onembedded-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)
- Understand the development environment of MSP430 processor for the assemblyprograms, 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)

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

SIGNAL PROCESSING LAB

Subject Code: ETL47	Credits: 0:0:1
Pre requisites: Knowledge of Mathematics and	Contact Hourse 28D
Programming	Contact Hours: 28F
Course Coordinator: Ms. Akshata S Kori	

List of Experiments Conducted Using MATLAB

- 1. Basic Operation on matrices.
- 2. Generation on various signals and sequences
- 3. Operations, finding the even and odd parts on signals and sequences.
- 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 difference equation.
- 10. Verification of linearity and time invariance properties of a given continuous /discrete system.
- 11. Computation of unit sample, unit step and sinusoidal response of the given LTI system and verifying its properties.
- 12. Verification of sampling theorem.
- 13. Locating the zeros and poles and plotting the pole zero maps in s-plane and z-plane for the given transfer function.
- 14. Solve a difference equation using Z-transform technique.

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)
- 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)

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

OOPS USING PYTHON LAB

Subject Code: ETL48

Credits: 0.0.1 Contact Hours: 28P

Pre requisites: Nil

Course Coordinator: Dr. Venu K N

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

- Program to illustrate the use of the list 1
- 2 Program to illustrate the use of a dictionary
- 3 Program to read and write into files with and without JSON format
- Program that illustrates the implementation of function and function modules. 4
- 5. Program illustrating the concept of recursion
- Program related to the creation of class and modification of attributes and 6 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 object-oriented Python applications maintainable 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
- 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)
- Implement the use of functions, class, and concepts of recursion and use of methods a class (PO-1, PO-2, PO-3, PO-5, PO-8, PO-10, PO-12, PSO-1, PSO-2, PSO-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)

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

Course Assessment and Evaluation:

ABILITY ENHANCEMENT COURSE – IV Agriculture Technology

	8	80
Subject Code: ETAEC49		Credits: 1:0:0
Pre requisites: Nil		Contact Hours: 14L
Course Coordinator: Dr. A	Arvind Kumar G	

Course Content

Unit I

Introduction of Indian agricultural heritage; Ancient agricultural practices, Relevance of heritage to present day agriculture

- Pedagogy / Course delivery tools: Chalk and talk
- Links: http://eagri.org/eagri50/AGRO102/lec01.pdf

Unit II

Agronomy and its scope, Principles of Agronomy, seeds and sowing, Methods of sowing, timing of sowing, Depth of Sowing.

- Pedagogy / Course delivery tools: Chalk and talk
- Links: https://www.agricultureinindia.net/agronomy/principles/agronomyprinciples-8-major-principles-of-agronomy-agriculture/19884

Unit III

Crop nutrition, manures and fertilizers, nutrient use efficiency, water resources, and soil-plant-water relationship.

- Pedagogy / Course delivery tools: Chalk and talk
- Links: http://eagri.org/eagri50/AGRO102/lec01.pdf

Unit IV

HYDROPONICS- Principles and Concepts of Hydroponic Technology, essential plant nutrient elements, Preparation of nutrient solution and rooting media

- Pedagogy / Course delivery tools: Chalk and talk
- Links: https://psci.princeton.edu/tips/2020/11/9/the-future-of-farminghydroponics

Unit V

IoT in Hydroponics – Why IoT in Agriculture. Basic Building Blocks of an IoT based Smart farming system. Development of a Smart Hydroponic system using IoT.

- Pedagogy / Course delivery tools: Chalk and talk
- Links: https://risehydroponics.in/step-by-step-guide-to-grow-plantshydroponically/

Text Books:

- 1. N.R. Das., "Introduction to crops of India", Scientific Publishers. 2020
- 2. ICAR, "Handbook of Agriculture" ICAR-New Delhi 2018
- 3. J. Benton Jones. Jr. "Growing Plants Hydroponically" 4th Edition, The Future Garden Press, 2003

Reference Books:

- 1. Aubrey Ortiz, Hilary Rotatori, Liz Schreiber, George von Roth "Hydroponic Farming in Mahasarakham" scientific publishers 2019
- 2. Hydropnics Farming Technology –A skilling program training manual. By DoA Ministry of Agriculture and Forests, Royal Govt. of Bhutan. 2010

Course Outcomes (COs):

- 1. Understand the basic principles, practices and modernization of Indian Agriculture (PO 1, 7, 12) (PSO 2)
- 2. Understand the fundamentals of Agronomy, timing of seeds sowing, tillage and tilth
- 3. (PO 1, 7, 12) (PSO 2)
- 4. Illustrate the need of crop nutrition, manures and fertilizers, nutrient use efficiency and water resources (PO 1,2,3,7,12) (PSO 2)
- 5. Appraise the need of Hydroponics farming (PO 1, 2, 3, 7, 12) (PSO 2)
- 6. Develop a prototype for Hydroponics farming. (PO 1, 2, 3, 7, 12) (PSO 2, 3)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks				
Assessment Tool	Marks	Course outcomes addressed		
Internal Test-I	30	CO1, 2, 3		
Internal test-II	30	CO3, 4, 5		
Average of the two internal tests will be taken for 30 marks.				
Other components	Marks	Course outcomes addressed		
MINI PROJECT	20	CO1, CO2, CO3, CO4, CO5		
Semester End Examination (SEE)	50	CO1, CO2, CO3, CO4, CO5		

ADDITIONAL MATHEMATICS – II (For Lateral Entry Diploma Students)

Subject Code: AM41 Pre requisites: Nil Credits: 0:0:0 Contact Hours: 42L

Course Coordinator: Dr. Veena B N

Course Content

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
- 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
- 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/
- Impartus recording: https://a.impartus.com/ilc/#/course/283623/703

Text Books:

- 1. B.S. Grewal Higher Engineering Mathematics, Khanna Publishers, 44th edition, 2017.
- 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. (PO-1,2)
- 2. Solve the problems related to Jacobians, the extreme values of a function and Taylors series. (PO-1,2)
- 3. Exhibit the interdependence of line, surface and volume integrals using integral theorems. (PO-1,2)
- 4. Find the solution of second and higher order ODEs with constant and variable coefficients. (PO-1,2)
- 5. Solve the problems on conditional probability and Baye's theorem. (PO-1,2)

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	Marks	Course outcomes addressed		
Quiz	10	CO1, CO2, CO3		
Assignment	10	CO3, CO4, CO5		