VIT Vidyalankar Institute of Technology
Accredited A+ by NAAC

Vidyalankar Institute of Technology

An Autonomous Institute affiliated to University of Mumbai

Bachelor of Technology

in

Electronics & Telecommunication Engineering

Second Year Scheme and Syllabus

(As per AICTE guidelines, with effect from the Academic Year 2022-23)

Preamble

To meet the challenge of ensuring excellence in engineering education, the issue of quality needs to be addressed, debated, and taken forward in a systematic manner. Therefore, autonomy for Vidyalankar Institute of Technology is not merely a transition from pre-cooked syllabi to self-designed curriculum. Autonomy curriculum of the Institute offers required academic flexibility with emphasis on industry requirements and market trends, employability and problem-solving approach which leads to improving competency level of learners with diverse strengths. In line with this, the curriculum framework designed is **Choice-Based Credit and Grading System (CBCGS)**. Number of credits for each category of courses learnt by learners, internships and projects is finalized considering the scope of study and the ability that a learner should gain through the program. The overall credits and approach of curriculum proposed is in line with AICTE model curriculum.

The curriculum comprises courses from various categories like basic sciences, humanities and social sciences, engineering sciences, general education and branch specific courses including professional electives and open electives. The curriculum has core courses of branch of engineering positioned and sequenced to achieve sequential and integral learning of the entire breadth of the specific branch. These courses are completed by third year of the engineering program that enables learners to prepare for higher education during their final year. Professional elective courses, that begin from third year of program, offer flexibility and diversity to learners to choose specialization from a basket of recent developments in their field of technology. The selection of unique professional elective courses based on industrial requirements and organizing them into tracks is a salient feature of this curricula ensuring employability. Open Elective courses cover multi-disciplinary, special skill development, project management and similar knowledge that make learner capable to work in industrial environment.

For holistic development of learners, apart from technical courses, Humanities and Social Science courses develop the required soft-skills and attitude amongst learners. Our curriculum also introduces Social Service Internship and Internship with institutes abroad along with courses like Design Thinking, Wellness - Body, Mind & Spirit, Indian Traditional Knowledge System under General Education category. These general education courses aim to create balance in brain hemispheres and hence improve learners' clarity in thoughts and responses. In addition to this, the curriculum is augmented with Life Enrichment audit courses for knowledge inspiring experience.

Additionally, curriculum provides add-on minor/honours degree that involves field/ domain study. Learner can avail this degree by completing requirement of additional 18 credits.

Thus, the academic plan of VIT envisages a shift from summative to formative and competency-based learning system which will enhance learner's ability towards higher education, employability and entrepreneurship.

Chairman, Board of Studies
Department of Electronics & Telecommunication Engineering
Vidyalankar Institute of Technology

Chairman, Academic Council
Vidyalankar Institute of Technology

Second Year B. Tech. Electronics & Telecommunication Engineering **Semester: III**

Course Structure and Assessment Guidelines

Course		Head of Learning	Credits	Assessment guidelines (Marks)			Total marks (Passing@40% of total marks)
Code	Name			ISA	MSE	ESE	
HS07	Technical Communication	Practical	1	50	-	-	050
BS33	Engineering Mathematics-III	Theory	3	20	30	50	100
ET05T	Microprocessor and Microcontrollers	Theory	3	20	30	50	100
ET05P	Microprocessor and Microcontrollers Lab	Practical	1	25	-	25	050
ET01T	Electronic Devices and Circuits	Theory	2	15	20	40	075
ET01P	Electronic Devices and Circuits Lab	Practical	1	25	-	25	050
ET02T	Principles of Communication Engineering	Theory	2	15	20	40	075
ET02P	Principles of Communication Engineering Lab	Practical	1	25	-	25	050
ET08	Instrumentation and Control Systems lab	Practical	1	25	-	25	050
ET04T	Network Theory and Transmission lines	Theory	3	20	30	50	100
ET04P	Network Theory and Transmission lines Lab	Practical	1	25	-	25	050
ET17	Skill Based Lab	Practical	1	50	-	-	050

ISA=In Semester Assessment, MSE= Mid Semester Examination, ESE= End Semester Examination
* Refer to Appendix A for the list of General Education (GE) courses. Selection will be based on the subset of GE courses made available by the Institute for the semester.

The assessment guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to propose her/his assessment methodology based on the nature of the course. However, the proposed assessment methodology shall be approved by a panel constituted at Institute level and published to the learners before the commencement of the semester.

Second Year B. Tech. Electronics & Telecommunication Engineering **Semester: IV**

Course Structure and Assessment Guidelines

Course		Head of Learning	Credits	Assessment guidelines (Marks)			Total marks (Passing@40% of total marks)
Code	Name			ISA	MSE	ESE	
HS04	Presentation Skills	Practical	1	25	-	25	050
BS34T	Mathematical Theory of Communication	Theory	3	20	30	50	100
BS34P	Mathematical Theory of Communication Lab	Practical	1	25	-	25	050
ET07T	Data Structures and Analysis of Algorithms	Theory	2	15	20	40	075
ET07P	Data Structures and Analysis of Algorithms Lab	Practical	1	25	-	25	050
ET06T	Integrated Circuits	Theory	2	15	20	40	075
ET06P	Integrated Circuits Lab	Practical	1	25	-	25	050
ET09T	Digital Communication	Theory	2	15	20	40	075
ET09P	Digital Communication Lab	Practical	1	25	-	25	050
ET03T	Signal and systems	Theory	3	20	30	50	100
ET03P	Signal and systems Lab	Practical	1	25	-	25	050
ET45	Mini Project 1 (Hardware)	Practical	2	25	-	25	050
GEXXX*	Any GE course	As per course	As per course				

ISA=In Semester Assessment, MSE= Mid Semester Examination, ESE= End Semester Examination
* Refer to Appendix A for the list of General Education (GE) courses. Selection will be based on the subset of GE courses made available by the Institute for the semester.

The assessment guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to propose her/his assessment methodology based on the nature of the course. However, the proposed assessment methodology shall be approved by a panel constituted at Institute level and published to the learners before the commencement of the semester.

Detailed syllabus of Second Year Semester - III

Course Name: Technical Communication

Course Code: HS07

Category: Humanities, Social Sciences and Management

Preamble:

This course introduces the participants gain an understanding and knowledge of genres such as reports, feasibility studies, proposals, and specifications. Participants will construct a logical outline of a technical document; write with awareness of expository techniques such as definition, classification, and causal analysis; and design an effective format and layout for a technical publication.

Pre-requisites:

Nil

Course Objectives:

- Demonstrate rhetorical knowledge to create effective technical writing documents for endusers.
- Apply and adapt flexible writing process strategies to produce clear, high-quality deliverables in a multitude of technical writing genres.

Course Outcomes:

Student will be able to:

CO1: Write effective reports and design documentation
CO2: Make effective presentations
CO3: Apply ethical practices in technical communication

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
-	2	-	1

Assessment Guidelines:

Head of learning	ISA	MSE	ESE	Total
Practical	50	-	-	50

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide her/his assessment

methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

Detailed Syllabus:

Module No.	Module Name	Content	No. of Hours
1	Fundamentals of Technical Communication	Technical Communication: Features; Distinction between General and Technical Communication; Language as a tool of Communication; Dimensions of Communication: Reading & comprehension; Technical writing: sentences; Paragraph	6
2	Forms of Technical Communication	White paper writing, Email writing, Technical report, Synopsis writing, Technical research Paper writing, Lab manual, Instruction manual, Reading datasheets	10
3	Technical Presentation: Strategies & Techniques	Presentation: Classroom presentation, Poster presentation Public Speaking: method; Techniques: Clarity of substance; emotion; Humour; Modes of Presentation; Overcoming Stage Fear: Confident speaking; Audience Analysis & retention of audience interest. Methods of Presentation: Interpersonal; Impersonal; Audience Participation: Quizzes & Interjections Video making and presentation	10
4	Technical Communication Skills	Interview skills Group Discussion: Objective & Method; Features of Body Language Voice Modulation: Quality, Pitch; Rhythm; intonation; Pronunciation; Articulation; stress & accent Linguistic features of voice control: Vowel & Consonant Sounds	4
Total			**30**

Reference Books:

1. Technical Communication: Process and Product, MLA Update (9th Edition), by Sharon J. Gerson, Steven M. Gerson. Publisher: Pearson; 9 edition (February 9, 2017). ISBN-10: 0134678869. ISBN-13: 978-0134678863
2. The Elements of Style, Fourth Edition. Aug 2, 1999, by William Strunk Jr. and E. B. White. Publisher: Pearson. http://www.bartleby.com/141/

3. Technical Communication: A Practical Approach (8th Edition) Jan 7, 2012, by William S. Pfeiffer and Kaye A. Adkins, Publisher: Pearson.
4. Pocket Guide to Technical Communication (5th Edition) 5th Edition, by William S. Pfeiffer. Publisher: Pearson.
5. Engineering Communication (January 1, 2014). Knisely, Charles W., Knisely, Karin I. Publisher: Cengage

Course Name: Engineering Mathematics-III

Course Code: BS33

Category: Basic Science (BS)

Preamble:

The objective of the course is to impart the knowledge of Laplace Transform, Inverse Laplace Transform, Fourier Series, Fourier Transforms, Eigen value and Eigen vectors and Complex Variable. The course clarifies the concept of transforms and its applications. The course will enable students to learn different transforms of a function, Complex Variable and it will provide with a sound foundation in Mathematics to prepare them for graduate studies in Electronics and Telecommunication Engineering.

Pre-requisites:

Nil

Course Objectives:

- To understand and apply Laplace and inverse Laplace transform to solve differential equations.
- Understanding the fundamental of Fourier series, Fourier transform, Eigen value and Eigen vectors and Complex Variable to solve real world problems.
- To create a strong foundation by studying the basics of Engineering Mathematics and interfacing to various peripherals which will lead to a well-designed based System.
- To provide students with the sound foundation of Mathematics, Science, and Engineering fundamentals necessary to formulate, solve and analyse engineering problems and prepare them for Graduate studies.
- To impart knowledge of interfacing techniques and educate the student in the domain of Electronics and Telecommunication Engineering.

Course Outcomes:

Student will be able to:

CO1: Apply the knowledge of Laplace Transform to find Laplace Transform of a given function and to solve

real integrals in engineering problems.

CO2: Apply the knowledge of Inverse Laplace Transform to find Inverse Transform of a given function.

CO3: Find Fourier series of a given periodic functions by decomposing it into sine and cosine series.

CO4: Analyse the properties of Fourier transform and to compute Fourier transform of various functions.

CO5: Computing Eigen values and Eigen vectors of matrix.

CO6: Solve problems based on analyticity of complex valued functions.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
3	-	3	-

Assessment Guidelines:

Head of learning	ISA	MSE	ESE	Total
Theory	20	30	50	100

The assessment guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to propose her/his assessment methodology based on the nature of the course. However, the proposed assessment methodology shall be approved by a panel constituted at Institute level and published to the learners before the commencement of the semester.

Detailed Syllabus:

Module No.	Module Name	Content	No. of Hours
1	Laplace Transform	Definition of Laplace transform Laplace Transform (L) of Standard Functions, Properties of Laplace Transform: Linearity, First Shifting theorem, Second Shifting Theorem, change of scale Property, Multiplication by t, Division by t, Laplace Transform of derivatives and integrals (All Properties are without proofs). Evaluation of integral using Laplace Transform.	8
2	Inverse Laplace Transform	Formulae of Inverse Laplace Transform, Laplace Inverse using partial fraction, Properties of Inverse Laplace Transform, convolution Theorem (without proof).	8
3	Fourier Series	Fourier series of a periodic function in the interval of period 2π, 2L. Half range Sine and Cosine Fourier series, Complex form of Fourier series.	8
4	Fourier Transform	Fourier Transform, Fourier Sine & Cosine Transform. Inverse Fourier transforms.	7

5	Linear Algebra: Advance Matrix Theory	Eigen values and Eigen vectors Properties, Cayley Hamilton theorem (without proof), examples based on verification of Cayley Hamilton Theorem. Function of square matrices e.g., $tan(A)$, A^n, k^A,etc.	7
6	Complex Variable	Analytic function, C-R equations in polar & cartesian form (without proof), Harmonic function. Finding analytic function if $u\ or\ v\ or\ (u+v)\ or\ (u-v)$ is given, Milne-Thompson method, Orthogonal trajectories.	7
Total			**45**

Textbooks:

1. Dr. B. V. Ramana "Higher Engineering Mathematics", Tata McGraw Hill New Delhi, India 2006
2. P. N. Wartikar and J N Wartikar "Textbook of Applied Mathematics Volume I & II, Vidyarthi Ghriha Prakashan Pune 2005 9th Edition.
3. Kanti B Datta, "Mathematical methods for Science and Engineering", Cengage learning 2012.
4. N P Bali and Manish Goyal, "A textbook of Engineering Mathematics", Laxmi Publication 2006.

Reference Books:

1. Dr. B S Grewal, "Higher Engineering Mathematics", Khanna Publication, 44th Edition
2. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & sons, 10th Edition.
3. C. R. Wylie & L. C. Barrett, "Advanced Engineering Mathematics", Tata McGraw India, 6th Edition.
4. H K Das, "Advanced Engineering Mathematics", S Chand, 22nd Edition.
5. Murray R. Spiegel. "Schaum's Outline of Laplace Transform", Tata McGraw India, 1st Edition.
6. Murray R. Spiegel. "Schaum's Outline of Fourier analysis with applications", Tata McGraw India
7. ,1stEdition.
8. Robert Vich, "Z transform theory and its applications", Springer, 10th Edition.
9. Dr. B S Tyagi, "Function of a Complex variable", Kedar Nath & Ram Nath publication, 2021.

Course Name: Microprocessor and Microcontrollers

Course Code: ET05T

Category: Core

Preamble:

Microprocessor (MP) and microcontroller (MC) are fundamental building blocks in any smart application. To develop any application, it is important for the students to understand the hardware architecture and programming aspects of a microcontroller and interfacing of various types' devices with microcontroller. A microcontroller can be considered a self-contained system which is integrated with a processor, a memory and different peripheral devices like timers. Microcontrollers are widely used in the design of embedded systems like a temperature monitoring system. In contrast, the microprocessor is not a self-contained system and a device like memory is connected externally. Microprocessors are widely used in personal computers (PC's), laptops for general-purpose computing applications. This course prepares the students to gain fundamental knowledge of microprocessor and microcontroller architecture and develop skills for programming of microcontroller for application development.

Pre-requisites:

Logic Circuit, Electronic Devices and Circuits

Course Objectives:

- To enable learners to gain knowledge of hardware organization of microprocessor based system.
- To enable learners to gain knowledge of hardware organization of 8 bit microcontroller.
- To enable learners to gain knowledge for programming of 8 bit microcontroller.
- To enable learners to use different types of devices with 8 bit microcontroller.
- To enable learners to gain knowledge of advanced 8 bit microcontrollers.
- To enable learners to develop applications based on 8 bit microcontrollers.

Course Outcomes:

Student will be able to:

CO1: Understand the organization of processor based system.
CO2: Understand hardware organization of 8 bit microcontroller.
CO3: Understand the software development process for 8 bit microcontroller.
CO4: Use different peripheral devices with 8 bit microcontroller.
CO5: Interpret organization of advanced 8 bit microcontroller.
CO6: Develop applications based on 8 bit microcontroller.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
3	-	3	-

Assessment Guidelines:

Head of learning	ISA	MSE	ESE	Total
Theory	20	30	50	100

The assessment guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to propose her/his assessment methodology based on the nature of the course. However, the proposed assessment methodology shall be approved by a panel constituted at Institute level and published to the learners before the commencement of the semester.

Detailed Syllabus:

Module No.	Module Name	Content	No. of Hours
1	Processor architecture and memory systems	Functional block diagram of a computer, components of microprocessor based system, concept of bus, memory system, Introduction to processor architecture: Von Neumann and Harvard model, RISC and CISC	07
2	8051 Microcontroller	Intel 8051 microcontroller, features, architecture and hardware pins, memory organization, IO Ports, Timers, Interrupt system and serial port.	08
3	Programming 8051 Microcontroller	Addressing modes, Assembly language instructions for 8051 microcontroller, assembly language programming using 8051 microcontroller for Arithmetic and Logic operations, Block manipulations, sorting, searching. Bit level and byte level IO operations, Delay subroutines using Timer.	08
4	Interfacing Devices with 8 bit Microcontroller	Interfacing devices like LED, 7 Segment display, LCD, motors, sensors and memory with 8 bit microcontroller.	08
5	Atmega 328 microcontroller	Features, architecture and hardware pins, Registers, Memory organization, IO ports, serial ports, Timers in of	08

		Atmega328 microcontroller.	
6	Application development using Atmega development boards	Programming of Atmega 328 and Basic applications using standard development boards	06
Total			**45**

Text Books:

1. Computer Organization- By Carl Hamacher, Zvonko Vranesic and Safwat Zaky, McGraw Hill, Second Edition.
2. The 8051 Microcontroller & Embedded system using assembly & 'C'- By C. Kenneth J. Ayala and D. V. Gadre, Cengage Learning, Edition 2010.
3. The 8051 Microcontroller & Embedded systems- By M. A. Mazidi, J. G. Mazidi and R. D. Mckinlay, Pearson Publications, Second Edition 2006
4. AVR Microcontroller and Embedded Systems: Using Assembly and C for ATMEL AVR- by Muhammad Ali Mazidi, Sarmad Naimi, and Sepehr Naimi
5. Programming and Customizing the AVR Microcontroller- by Dhananjay Gadre

Reference Books:

1. Introduction to embedded systems- By Shibu K. V, McGraw Hill.
2. 8051 Microcontrollers MCS 51 Family and its variants - By Satish Shah, Oxford publication, first edition 2010.
3. Microcontrollers – Theory and Applications- By Dr. Ajay V. Deshmukh, Tata McGraw–Hill Companies –2005.

Course Name: Microprocessor and Microcontrollers Lab

Course Code: ET05P

Category: Core

Preamble:

Microprocessor (MP) and microcontroller (MC) are fundamental building blocks in any smart application. To develop any application, it is important for the students to understand the hardware architecture and programming aspects of a microcontroller and interfacing of various types' devices with microcontroller. A microcontroller can be considered a self-contained system which is integrated with a processor, a memory and different peripheral devices like timers. Microcontrollers are widely used in the design of embedded systems like a temperature monitoring system. In contrast, the microprocessor is not a self-contained system and a device like memory is connected externally. Microprocessors are widely used in personal computers (PC's), laptops for a general purpose computing applications. This course prepares the students to use fundamental knowledge of microprocessor and microcontroller architecture for developing applications. It prepares students to develop skills for programming of microcontroller.

Pre-requisites:

Logic Circuit, Electronic Devices and Circuits

Course Objectives:

- To enable learners to gain knowledge of hardware organization of microprocessor based system.
- To enable learners to gain knowledge of software tools for microprocessor and microcontrollers.
- To enable learners to gain knowledge for assembly language programming for microcontrollers.
- To enable learners to interface different types of devices with 8 bit microcontroller.
- To enable learners to use advanced 8 bit microcontrollers.
- To enable learners to develop basic applications based on 8 bit microcontrollers.

Course Outcomes:

Student will be able to:

CO1: Understand the organization of processor based system.
CO2: Use software tools for microprocessor and microcontrollers.
CO3: Develop programs using assembly language for 8 bit microcontrollers.
CO4: Use different types of devices with 8 bit microcontroller.
CO5: Understand organization of advanced 8 bit microcontroller.
CO6: Develop basic applications using 8 bit microcontroller.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
-	2	-	1

Assessment Guidelines:

Head of learning	ISA	MSE	ESE	Total
Theory	25	-	25	50

The assessment guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to propose her/his assessment methodology based on the nature of the course. However, the proposed assessment methodology shall be approved by a panel constituted at Institute level and published to the learners before the commencement of the semester.

Suggested List of Practical's:

1. Demonstrate basic arithmetic using 8 bit microcontroller.
2. Demonstrate working on data block using 8 bit microcontroller.
3. Demonstrate applications based on LED's using 8 bit microcontroller
4. Demonstrate applications based on 7 segment display using 8 bit microcontroller.
5. Demonstrate applications based on LCD using 8 bit microcontroller.
6. Demonstrate applications based on motors and sensors using 8 bit microcontroller.
7. Demonstration of standard development boards based on 8 bit microcontroller.
8. Design Applications based on standard development boards based on 8 bit microcontroller.
9. Mini Project

Text Books:

1. Computer Organization- By Carl Hamacher, Zvonko Vranesic and Safwat Zaky, McGraw Hill, Second Edition.
2. The 8051 Microcontroller & Embedded system using assembly & 'C'- By C. Kenneth J. Ayala and D. V. Gadre, Cengage Learning, Edition 2010.
3. The 8051 Microcontroller & Embedded systems- By M. A. Mazidi, J. G. Mazidi and R. D. Mckinlay, Pearson Publications, Second Edition 2006
4. AVR Microcontroller and Embedded Systems: Using Assembly and C for ATMEL AVR- by Muhammad Ali Mazidi, Sarmad Naimi, and Sepehr Naimi
5. Programming and Customizing the AVR Microcontroller- by Dhananjay Gadre

Reference Books:

1. Introduction to embedded systems- By Shibu K. V, McGraw Hill.
2. 8051 Microcontrollers MCS 51 Family and its variants - By Satish Shah, Oxford publication, first edition 2010.
3. Microcontrollers – Theory and Applications- By Dr. Ajay V. Deshmukh, Tata McGraw–Hill Companies –2005.

Course Name: Electronic Devices and Circuits

Course Code: ET01T

Category: Core

Preamble:

This course introduces students about Working and characteristics of various Active devices used to build various circuits. The course will offer in depth knowledge about modelling of devices and analysis and designing of various circuits used to develop the Electronics system.

Pre-requisites:

Nil

Course Objectives:

- Understanding, working, characteristics and biasing of BJT.
- Analyzing and designing various amplifiers using MOSFET
- To understand and evaluating various types of power amplifier circuits.
- Analyzing and designing various types of low and high frequency oscillator circuits.
- Understanding and Analysing MOSFET based differential amplifier circuits.

Course Outcomes:

Student will be able to:
CO1: Students will be able to Analyse various performance parameter of BJT & MOSFET Amplifier circuits.
CO2: Students will be able to Design Electronic circuits for given specification using BJT & MOSFET.
CO3: Students will be able to understand Operation of Power Amplifier.
CO4: Students will be able to understand Oscillator.
CO5: Students will be able to understand Differential Amplifier.

Course Scheme:

Contact Hours		**Credits Assigned**	
Theory	Practical	Theory	Practical
2	-	2	-

Assessment Guidelines:

Head of learning	ISA	MSE	ESE	Total
Theory	15	20	40	075

The assessment guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to propose her/his assessment methodology based on the nature of the course. However, the proposed assessment methodology shall be approved by a panel constituted at Institute level and published to the learners before the commencement of the semester.

Detailed Syllabus:

Module No.	Module Name	Content	No. of Hours
1	Bipolar Junction Transistor	Construction and working of B.J.T. CE Configuration of BJT and their characteristics. Biasing of BJT and its various circuits. BJT Modelling (hybrid-π model only). Introduction to CE Amplifier and Analysis of only CE Amplifier using only hybrid-π Model. Numerical based on BJT biasing and BJT Amplifier.	8
2	MOSFET	Construction working and characteristics of Enhancement MOSFET and depletion MOSFET. Dc load line and Biasing circuits for EMOSFET, DMOSFET. Numerical on Biasing circuits. Small Signal Equivalent circuits of MOSFET. Introduction and Analysis of CS Amplifier .	6
3	Power Amplifier:	Introduction to various types of power amplifier. Analysis of Class A, class B, Class AB power Amplifier using BJT. Heat sink and it's need. Study of Class C amplifier(study of transformer coupled and transformer less Push Pull qmplifiers)	5
4	Oscillator	Concept of feedback. Introduction to Positive and Negative Feedback [only block diagram and concept. No circuits and derivation] .Barkhauson's Criteria. RC phase shift and Wien bridge oscillator using BJT. General Topology of Tank circuits oscillator, Hartley, Colpitt and Clapp oscillator using BJT	6

5	Differential Amplifier.	Differential Amplifier: Need of Differential amplifier. Dc transfer characteristics of MOSFET passive load different amplifier DC & AC Analysis of MOS passive load Amplifier.	5
Total			**30**

Text Books:

1. Electronic Circuit Analysis and Design. D. A. Neamen, Tata McGraw Hill 2nd Edition, 2012
2. Microelectronics Circuits . Sedra and Smith OXFORD 7thEdition.

Reference Books:

1. Electronic Devices And Circuit. T. F. Bogart," Merrill 6thEdition. Reference Books
2. Electronic Devices and Circuits Salivahanan, N. Suresh Kumar," Tata McGraw Hill, 3rdEdition
3. Electronic Devices and Circuits J. Millman, Christos CHalkias, and Satyabratatajit, Millman's," Tata McGraw Hill, 3rdEdition
4. Microelectronics Circuits Analysis and Design Muhammad H. Rashid, Cengage Learning, 2nd Edition

Course Name: Electronic Devices and Circuits Lab

Course Code: ET01P

Category: Core

Preamble:

This course introduces students about Working and characteristics of various Active devices used to build various circuits. The course will offer in depth knowledge about modelling of devices and analysis and designing of various circuits used to develop the Electronics system.

Pre-requisites:

Nil

Course Objectives:

- Understanding, working, characteristics and biasing of BJT.
- Analyzing and designing various amplifiers using MOSFET
- To understand and evaluating various types of power amplifier circuits.
- Analyzing and designing various types of low and high frequency oscillator circuits.
- Understanding and Analysing MOSFET based differential amplifier circuits.

Course Outcomes:

Student will be able to:
CO1: Students will be able to Analyse various performance parameter of BJT & MOSFET Amplifier circuits.
CO2: Students will be able to Design Electronic circuits for given specification using BJT & MOSFET.
CO3: Students will be able to understand Operation of Power Amplifier.
CO4: Students will be able to understand Oscillator.
CO5: Students will be able to understand Differential Amplifier.

Course Scheme:

Contact Hours		**Credits Assigned**	
Theory	Practical	Theory	Practical
-	2	-	1

Assessment Guidelines:

Head of learning	**ISA**	**MSE**	**ESE**	**Total**

Practical	25	-	25	50

The assessment guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to propose her/his assessment methodology based on the nature of the course. However, the proposed assessment methodology shall be approved by a panel constituted at Institute level and published to the learners before the commencement of the semester.

Suggested List of Practicals:

1. Implementation and Designing of various biasing circuits for BJT.
2. Implementation and Designing of various biasing circuits for MOSFET.
3. Implementation and verifying the results of Common Emitter Amplifier.
4. Implementation and verifying the results of Common Source Amplifier
5. Frequency analysis of Common Emitter Amplifier.
6. Frequency analysis of Common source Amplifier.
7. Implementation of R-C Phase shift oscillator using BJT.
8. Implementation of Hartley oscillator using BJT
9. Implementation of Transformer coupled Class A Power Amplifier using BJT
10. Implementation of Transformer coupled Class B Power Amplifier using BJT
11. Implementation of Passive load Differential Amplifier using MOSFET.
12. V-I Characteristics of BJT using LT-SPICE.
13. V-I Characteristics of MOSFET using LT-SPICE
14. Simulation of Wien-Bridge Oscillator using BJT.
15. Simulation of Colpitt Oscillator using BJT

Suggested List of Mini-Project:

1. 5V DC Power supply.
2. Bugler Alarm
3. Light operated switch.
4. Auto door opening using sensors.
5. Pre Amplifier circuit.
6. Musical Siren.

Text Books:

1. Electronic Circuit Analysis and Design. D. A. Neamen, Tata McGraw Hill 2nd Edition, 2012
2. Microelectronics Circuits . Sedra and Smith OXFORD 7thEdition.

Reference Books:

1. Electronic Devices And Circuit. T. F. Bogart," Merrill 6thEdition. Reference Books

2. Electronic Devices and Circuits Salivahanan, N. Suresh Kumar," Tata McGraw Hill, 3rdEdition
3. Electronic Devices and Circuits J. Millman, Christos CHalkias, and Satyabratatajit, Millman's," Tata McGraw Hill, 3rdEdition
4. Microelectronics Circuits Analysis and Design Muhammad H. Rashid, Cengage Learning, 2ndEditio

Course Name: Principles of Communication Engineering

Course Code: ET02T

Category: Core

Preamble:

This course introduces students to basics of Communication Engineering with detailed understanding of various analog, angle modulation and demodulation techniques and all the applications dealt in detail. The course also covers pulse analog and digital modulation and demodulation techniques

Pre-requisites:

NIL

Course Objectives:

- To illustrate fundamentals of basic communication system
- To enable learners to understand various analog modulation and demodulation techniques
- To focus on applications of analog modulation and demodulation techniques
- To explain the key concepts of analog and Digital Pulse modulation and demodulation techniques

Course Outcomes:

Student will be able to:

CO1: Understand the basic components of communication and noises in communication system.

CO2: Explain various modulation and demodulation techniques.

CO3: Compare the performance of Transmitters and Receivers.

CO4: Explain various analog and Digital Pulse Modulation & Demodulation techniques.

CO5: Understand Time Division and Frequency Division Multiplexing & De-multiplexing.

Course Scheme:

Contact Hours		**Credits Assigned**	
Theory	Practical	Theory	Practical
2	-	2	-

Assessment Guidelines:

Head of learning	ISA	MSE	ESE	Total
Theory	15	20	40	075

The assessment guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to propose her/his assessment methodology based on the nature of the course. However, the proposed assessment methodology shall be approved by a panel constituted at Institute level and published to the learners before the commencement of the semester.

Detailed Syllabus:

Module No.	Module Name	Content	No. of Hours
1	Basics of Communication System	Block diagram, electromagnetic spectrum, signal bandwidth and power, types of communication channels, Introduction to time and frequency domain. Basic concepts of wave propagation. Types of noise, signal to noise ratio, noise figure, noise temperature and Friss formula.	4
2	Amplitude Modulation and Demodulation	Basic concepts, need for modulation, waveforms (time domain and frequency domain), modulation index, bandwidth, voltage distribution and power calculations. DSBFC: Principles, low-level and high-level transmitters, DSB suppressed carrier, Balanced modulators with diode (Ring modulator and FET) and SSB systems. Amplitude demodulation: Diode detector, practical diode detector, Comparison of different AM techniques, Applications of AM and use of VSB in broadcast television.	7
3	Angle Modulation and Demodulation	Frequency and Phase modulation (FM and PM): Basic concepts, mathematical analysis, FM wave (time and frequency domain), sensitivity, phase and frequency deviation, modulation index, deviation ratio, bandwidth requirement of angle modulated waves, narrowband FM and wideband FM. Varactor diode modulator, FET reactance modulator, stabilized ,AFC, Direct FM transmitter, indirect FM Transmitter, noise triangle, pre- emphasis and de-emphasis	7

		FM demodulation: Balanced slope detector, Foster-Seely discriminator, Ratio detector, FM demodulator using Phase lock loop, amplitude limiting and thresholding, Applications of FM and PM.	
4	Radio Receivers	Characteristics of radio receivers, TRF, Super - heterodyne receiver block diagram, tracking and choice of IF, AGC and its types and Communication receiver. FM receiver block diagram, comparison with AM receiver.	4
5	Analog and Digital Pulse Modulation & Demodulation	Sampling theorem for low pass signal, proof with spectrum, Nyquist criteria, Sampling techniques, aliasing error and aperture effect. PAM, PWM, PPM generation, detection and applications. Basics of PCM system and differential PCM system. Concepts of Delta modulation (DM) and Adaptive Delta Modulation (ADM).	6
6	Multiplexing & De-multiplexing	Frequency Division Multiplexing transmitter & receiver block diagram and applications. Time Division Multiplexing transmitter & receiver block diagram and applications	2
Total			**30**

Suggested List of Value-Added Home Assignments:

1. Reviewing Literature in the form of a technical paper preferably IEEE paper in the field of communication
2. Case Study presentation on the topics of Analog Communication
3. Technical Crossword

Suggested Online Courses:

1. Course on Analog communication on Udemy
   https://www.udemy.com/course/analog-communication/
2. Principles of Digital Communications By Prof. Abhishek Dixit
   https://onlinecourses.nptel.ac.in/noc21_ee30/preview?user

Text Books:

1. Kennedy and Davis, "Electronics Communication System,Tata McGraw Hill publication
2. B.P Lathi,Zhi Ding, "Modern Digital and Analog Communication system",Oxford University press ,Fourth Edition

3. Wayne Tomasi, "Electronics Communication System, Pearson education, Fifth Edition

Reference Books:

1. Taub,Schilling and Saha "Taub's Principles of communication Systems, Tata McGraw Hill,Third Edition
2. P.Sing and S.D Sapre, "Communication Systems: Analog and Digital", Tata McGraw Hill, Third edition
3. Dennis Roddy and John Coolen, Electronic Communication,Pearson, 4/e, 2011
4. Simon Haykin, Michel Moher, "Introduction to Analog and Digital Communication", Wiley, Second edition
5. Louis Frenzel, "Communication Electronics", Tata McGraw Hill, Third Edition

Course Name: Principles of Communication Engineering Lab

Course Code: ET02P

Category: Core

Preamble:

This course introduces students to basics of Communication Engineering with detailed understanding of various analog, angle modulation and demodulation techniques and all the applications dealt in detail.The course also covers pulse analog and digital modulation and demodulation techniques

Pre-requisites:

Nil

Course Objectives:

- To illustrate performance of different analog modulation and demodulation techniques using experimentation/simulation
- To enable learners to demonstrate sampling theorem and various sampling techniques using experimentation
- To focus on various pulse modulation schemes used for data transmission using experimentation/simulation
- To explain the key concepts of multiplexing techniques using experimentation/simulation

Course Outcomes:

Student will be able to:

CO1: Analyse performance of different analog modulation and demodulation techniques using experimentation/simulation.
CO2: Demonstrate Sampling theorem and various sampling techniques using experimentation.
CO3: Analyse analog and Digital Pulse Modulation & Demodulation techniques using experimentation/simulation
CO4: Understand the concept of Multiplexing & De-multiplexing using Experimentation/simulation.

Course Scheme:

Contact Hours		**Credits Assigned**	
Theory	Practical	Theory	Practical
-	2	-	1

Assessment Guidelines:

Head of learning	ISA	MSE	ESE	Total
Practical	25	-	25	050

The assessment guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to propose her/his assessment methodology based on the nature of the course. However, the proposed assessment methodology shall be approved by a panel constituted at Institute level and published to the learners before the commencement of the semester.

Suggested List of Practicals:

1. Generation of AM modulation and demodulation.
2. Generation of FM modulation and demodulation.
3 .Design and implement Pre-emphasis and De-emphasis circuit.
4. SSB Generation and Detection
5. Verification of Sampling theorem.
6. Generation of PAM modulation and demodulation.
7. Generation of PWM and PPM modulation and demodulation.
8. Demonstrate Digital pulse transmission technique (DM,ADM)
9. Observation of TDM multiplexing and de-multiplexing signals.
10. Observation of FDM multiplexing and de-multiplexing signals.
11. Obtain Frequency Spectrum of AM and determine its BW
12. Performance analysis of AM and FM

Suggested Online Courses:

1. Course on Analog communication on Udemy
   https://www.udemy.com/course/analog-communication/
2. Principles of Digital Communications By Prof. Abhishek Dixit
   https://onlinecourses.nptel.ac.in/noc21_ee30/preview?user

Text Books:

1. Kennedy and Davis, "Electronics Communication System,Tata McGraw Hill publication
2. B.P. Lathi,Zhi Ding, "Modern Digital and Analog Communication system",Oxford University press Fourth Edition
3. Wayne Tomasi, "Electronics Communication System, Pearson education, Fifth Edition

Reference Books:

1. Taub,Schilling and Saha "Taub's Principles of communication Systems, Tata McGraw Hill,Third Edition
2. P.Sing and S.D Sapre, "Communication Systems: Analog and Digital", Tata McGraw Hill, Third edition
3. Dennis Roddy and John Coolen, Electronic Communication,Pearson, 4/e, 2011
4. Simon Haykin, Michel Moher, "Introduction to Analog and Digital Communication", Wiley, Second edition
5. Louis Frenzel, "Communication Electronics", Tata McGraw Hill, Third Edition

Course Name: Instrumentation and Control Systems Lab

Course Code: ET08P

Category: Core

Preamble:

This course introduces students to the implementation of concepts of Instrumentation and Control using simulations and experimentations. Experiments on First and Second order Systems in time and frequency domain for different input will be performed and the results will be interpreted. Also, Basic theory of Transient and steady state analysis will be introduced. Furthermore, Stability analysis techniques in time and frequency domain will be introduced.

Pre-requisites:

NIL

Course Objectives:

- To theoretically understand basics of measurements, sensors and transducers and control theory
- To apply concepts of measurement in evaluating performance of Temperature, Displacement and Resistance sensors
- To analyse First and Second order systems using frequency response plots.
- To inspect stability of the system using simulations.

Course Outcomes:

Student will be able to:

CO1: Students will be able to theoretically understand basics of measurements, sensors and transducers and control theory.
CO2: Students will be able to apply concepts of measurement in evaluating performance of Temperature, Displacement and Resistance sensors.
CO3: Students will be able to analyse First and Second order systems using frequency response plots.
CO4: Student will be able to inspect stability of the system using simulations.

Course Scheme:

Contact Hours		**Credits Assigned**	
Theory	Practical	Theory	Practical
-	2	-	1

Assessment Guidelines:

Head of learning	ISA	MSE	ESE	Total
Practical	25	-	25	50

The assessment guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to propose her/his assessment methodology based on the nature of the course. However, the proposed assessment methodology shall be approved by a panel constituted at Institute level and published to the learners before the commencement of the semester.

Suggested List of Practical's:

1. To study various temperature, displacement, and resistance sensors.
2. To evaluate performance of thermistor and RTD Sensors.
3. Plot Time and Frequency response of first and second order system in MATLAB .
4. To Obtain pole, zero and gain values of a transfer function and draw its S-plane using MATLAB.
5. Analyse RLC Network and plot its response in MATLAB.
6. To determine stability of given equations using ROUTH Array method.
7. To study steady state and transient response analysis from theory and numerical point of view.
8. To inspect stability of System using Root Locus on MATLAB.
9. To inspect stability of System using Bode Plot on MATLAB.
10. To inspect stability of System using Polar Plot on MATLAB.

Text Books:

1. H.S. Kalsi, "Electronic Instrumentation", TMH, 2nd.ed.
2. M.Gopal, "Control System Engineering", TATA McGraw Hill 3rd Edition
3. David M. Pozar, "Microwave Engineering" , Wiley, Third Edition
4. Norman Nise, "Control System Engineering", Tata McGraw Hill, Fourth Edition

Reference Books:

1. Helfrick and Copper, "Modern Electronic Instrumentation and Measuring techniques", PHI, 3rd Edition.
2. Benjamin C Kuo, "Automatic Control Systems", Pearson Education, 7th Edition.

Course Name: Network Theory and Transmission Lines

Course Code: ET04T

Category: Core

Preamble:

This course introduces students to the basics of Electrical Circuit Theory and its analysis using various network solving techniques in time and frequency domain for different input signals. Students are introduced to the different network synthesis techniques. This course also discusses transmission lines which are used to carry information and energy, and its analysis using distributed circuit theory.

Pre-requisites:

Basic Electrical & Electronics Engineering.

Course Objectives:

- To analyse electrical circuits by using basic circuit theory concepts and network theorems.
- To analyse the circuits in time and frequency domain.
- To study network functions, network parameters, inter relationship among various circuit parameters, and to solve more complex network using these parameters.
- To synthesize passive networks by various methods.
- To analyse transmission lines using distributed circuit theory.

Course Outcomes:

Student will be able to:

CO1: Students will be able to apply mathematical knowledge in analysing circuits by using network theorems.
CO2: Students will be able to find the response of a given circuit for different inputs by using time domain and frequency domain analysis methods.
CO3: Students will be able to understand and determine various parameters and network functions of passive two port networks.
CO4: Students will be able to synthesize different networks by various synthesizing techniques.
CO5: Student will be able to understand transmission line parameters, transmission line equation an its solution.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
3	-	3	-

Assessment Guidelines:

Head of learning	ISA	MSE	ESE	Total
Theory	20	30	50	100

The assessment guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to propose her/his assessment methodology based on the nature of the course. However, the proposed assessment methodology shall be approved by a panel constituted at Institute level and published to the learners before the commencement of the semester.

Detailed Syllabus:

Module No.	Module Name	Content	No. of Hours
1	Analysis of DC and AC Circuits	Dependent Sources circuit analysis using mesh and node analysis. Network Theorems: Superposition, Thevenin's, Norton's, and Maximum power transfer. Analysis of Coupled circuits: Concept of Self and mutual inductances, coefficient of coupling, dot convention, equivalent circuit, and its analysis.	8
2	Time and Frequency Domain Analysis of R-L-C Circuits	Time Domain Analysis: Transient analysis of R, L, & C components. Time domain analysis of first order R-L and R-C Circuits, and second order RLC circuits. Frequency Domain Analysis: Frequency domain representation of R, L, and C components, Laplace Transform in analysis of electrical circuits. initial and final value theorem of Laplace transform.	9
3	Network Functions and Two Port Networks	Two port networks: Open Circuits, short Circuit, Transmission and Hybrid parameters, conditions for reciprocity and symmetry, relationship among the parameters. Interconnections of Two-Port Networks: Cascade, Series, Parallel and Series-Parallel connections.	8

4	Synthesis of Networks	Network functions: One port and Two port network functions, Poles, and Zeros of Network functions. Tests for Hurwitz polynomial: Routh Array and continued fraction expansion method. Positive Real Functions: Concept of positive real function, testing for necessary and sufficient conditions for Positive Real Functions. Synthesis of LC, RC & RL Circuits: properties of LC, RC & RL driving point functions, LC, RC & RL network Synthesis in Foster-I &II forms, Cauer-I & II forms.	10
5	Transmission Line Theory	Transmission line parameters, equivalent circuit, transmission line equation and its solution, propagation constant, characteristics impedances, reflection coefficient, input impedance, standing wave and SWR, transmission line as circuit element, impedance matching (concept only). Introduction to transmission line analysis using Smith Chart.	10
Total			**45**

Text Books:

1. Franklin F Kuo, "Network Analysis and Synthesis", Wiley Toppan, 2nd.ed. 1966
2. D Roy Choudhury, "Networks and Systems", New Age International 1998
3. David M. Pozar, " Microwave Engineering" , Wiley, Third Edition
4. Sudhakar, Shyammohan S. Palli, "Circuits and Networks", Tata McGraw Hill,Third Edition

Reference Books:

1. M E Van Valkenburg, "Network Analysis", Prentice-Hall of India Pvt Ltd, New Delhi, 26th Indian Reprint, 2000
2. A Chakrabarti, "Circuit Theory", Dhanpat Rai & Co., Delhi, 6h Edition
3. W L Everitt and G E Anner, "Communication Engineering", Mc-GrawHill, New York, 3rd Edition
4. Annapurna Das and S. K. Das, "Microwave Engineering", McGraw Hill,Third Edition

Course Name: Network Theory and Transmission Lines Lab

Course Code: ET04P

Category: Core

Preamble:

This course introduces students to the techniques, concepts of Electrical Circuit analysis using simulations and experimentations. It also discusses transmission line analysis for radio wave propagation.

Pre-requisites:

Basic Electrical & Electronics Engineering.

Course Objectives:

- To analyse and verify electrical circuits concepts and network theorems using simulation and experimentation.
- To analyse the response of R-L, R-C and R-L-C circuits.
- To analyse two port networks using network parameters.
- To analyse transmission lines for radio wave propagation.

Course Outcomes:

Student will be able to:

CO1: Students will be able to analyse electrical circuits using simulation and experimentation.
CO2: Students will be able to analyse the R-C and R-L-C circuits in time and frequency domain.
CO3: Students will be able to analyse and represent the network in terms of network parameters.
CO4: Student will be able to analyse transmission lines using distributed circuit theory.

Course Scheme:

Contact Hours		**Credits Assigned**	
Theory	Practical	Theory	Practical
-	2	-	1

Assessment Guidelines:

Head of learning	ISA	MSE	ESE	Total
Practical	25	-	25	50

The assessment guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to propose her/his assessment methodology based on the nature of the course. However, the proposed assessment methodology shall be approved by a panel constituted at Institute level and published to the learners before the commencement of the semester.

Suggested List of Practical's:

1. Thevenin's/Norton's Theorems verification/implementation and its applications.
2. Maximum power transfer theorem and its applications.
3. Dot coupled magnetic circuits and its applications.
4. Transient analysis of network.
5. Charging and discharging of R-C circuit and its applications.
6. Second order R-L_C circuit analysis.
7. Two port networks parameters analysis and its interpretation.
8. Transmission line analysis.

Text Books:

1. Franklin F Kuo, "Network Analysis and Synthesis", Wiley Toppan, 2nd.ed. 1966
2. D Roy Choudhury, "Networks and Systems", New Age International 1998
3. David M. Pozar, " Microwave Engineering" , Wiley, Third Edition
4. A. Sudhakar, Shyammohan S. Palli, "Circuits and Networks", Tata McGraw Hill,Third Edition

Reference Books:

1. M E Van Valkenburg, "Network Analysis", Prentice-Hall of India Pvt Ltd, New Delhi, 26th Indian Reprint, 2000
2. A Chakrabarti, "Circuit Theory", Dhanpat Rai & Co., Delhi, 6h Edition
3. W L Everitt and G E Anner, "Communication Engineering", Mc-GrawHill, New York, 3rd Edition
4. Annapurna Das and S. K. Das, "Microwave Engineering", McGraw Hill,Third Edition

Course Name: Skill Based Lab

Course Code: ET17

Category: Core

Preamble:

This course aims to provide fundamentals of Python Programming supplemented over the structural and object oriented programming. Student will learn the flexibility and comprehensiveness of Python programming and appreciate the application development through simple problem statements.

Pre-requisites: ES04: Structured Programming

Course Objectives:

- Describe the core syntax and semantics of Python programming language.
- Explore file handling in Python
- Infer the Object-oriented Programming concepts in Python
- Formulate GUI Programming operations in Python
- Develop applications using variety of libraries and functions

Course Outcomes:

After successful completion of the course student will be able to:
CO1: Create functions, modules and packages to develop different
CO2: Implement different file system objects.
CO3: Develop Python programs using Object Oriented Programming concepts.
CO4: Develop GUI
CO5: Preprocess & Visualize data using different Python libraries like Numpy, Pandas and Matplotlib.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
-	2	-	1

Assessment Guidelines:

Head of learning	ISA	MSE	ESE	Total
Practical	50	-	-	50

Detailed Syllabus:

Module no.	Module name	Topics	Hours
1	Object Oriented Programming	Classes and Objects, Public and Private Members, Class Declaration and Object Creation, Object Initialization, Class Variables and methods, Accessing Object and Class Attributes, Inheritance, Constructor in Inheritance	2
2	Introduction to Python	Introduction to Python, Installation and resources, Identifiers and Keywords, Comments, Indentation and Multi-lining, Variables (Local and Global), data types, Arithmetic, Comparative, Logical and Identity Operators, Bitwise Operators, Expressions, Print statement and Formats, Input Statements in python Strings, Lists, Tuples, Dictionaries, Sets, Accessing Elements, Properties, Operations and methods on these data structures. Decision Flow Control Statement: if and else statement, Nested If statement, Loop Statement: While Loop, do and while loop, for loop statement, Continue, Break and pass Statement, Conditional Statements	5
3	Functions & Modules	Functions: Built-in-functions, library functions, Defining and calling the functions, Return statements, Passing the arguments, Recursive functions, Modules and importing packages in python code.	4
4	File I/O Handling	File Input/Output: Files I/O operations, Read / Write Operations, File Opening, Modes, with keywords, Moving within a file, pickling	4
5	Graphical User Interface	Graphical User Interface using Tkinter Library module, creating simple GUI, Buttons, Labels, entry fields, widget attributes.	6
6	Numpy, Pandas, Matplotlib, Seaborn, Scipy	Introduction to Numpy, Creating and Printing Ndarray, Class and Attributes of Ndarray, Basic operation, Copy and view, Mathematical Functions of Numpy. Introduction to Pandas, Understanding Data frame, View and Select Data, Missing Values, Data Operations, File read and write operation. Introduction to Matplotlib library, Line properties, Plots and subplots, Types of Plots	5
Total			26

Text Books:

1. "Let us Python: Python is Future", Yashvant Kanetkar, BOB publication
2. "Core Python Programming", Nageshwar Rao
3. "Python & Tkinter Programming", John Grayson, Manning publications
4. Python 3 object oriented programming, Dusty Philips, PACKT Publisher

5. Introduction to coputing & problem solving using Python, E. Balguruswami, McGraw Hill Education.

Reference Books:

1. Python Cookbook:Receipes for Mastering Python 3, David Beazely, O'Reilly Media
2. "Head First Python", Paul Barry, O'Reilly
3. "Tkinter GUI Application Development Blueprints: Master GUI programming in Tkinter as you design, implement and deliver 10 real world application",Packt Publishing
4. "Python Crash Course A habds-on, Project Based Introduction to programming", Eric Matthes, No Starch Press.

Software Tools:

1. Python IDE: https://www.python.org/downloads/

2. Anaconda Environment: https://www.anaconda.com/distribution/

Online Repository:

1. Github
2. Python 3 Documentation: https://docs.python.org/3/
3. "The Python Tutorial", http://docs.python.org/release/3.0.1/tutorial/
4. http://spoken-tutorial.org
5. Python 3 Tkinter library Documentation: https://docs.python.org/3/library/tk.html
6. Numpy Documentation: https://numpy.org/doc/
7. Pandas Documentation: https://pandas.pydata.org/docs/
8. Matplotlib Documentation: https://matplotlib.org/3.2.1/contents.html
9. Scipy Documentation : https://www.scipy.org/docs.html
10. Machine Learning Algorithm Documentation: https://scikit-learn.org/stable/
11. https://nptel.ac.in/courses/106/106/106106182/

Detailed syllabus of Second Year Semester – IV

Course Name: Presentation Skills

Course Code: HS04

Category: Humanities and Social Sciences (HSS)

Preamble:

The course, Presentation Skills, is intended to equip students with the necessary skill-set to help them bridge the gap from the campus to the corporate world. It will help them to be industry ready in sync with the requirements of the program they are pursuing.

Pre-requisites:

Nil

Course Objectives:

- To help students to bridge the gap between the campus and the corporate world
- To help students to be industry ready by equipping them with the necessary soft skill-set

Course Outcomes:

Student will be able to:

CO1: Deliver Corporate Presentations, Storyboards, and Business Plan.
CO2: Participate in campus placements.
CO3: Build a personal brand and establish their presence as a global citizen.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	**Practical**	**Theory**	**Practical**
-	2	-	1

Assessment Guidelines:

ISA	MSE	ESE	Total
50	-	-	50

ISA:

50 Marks

Detailed Syllabus:

Module no.	Module name	Content	No. of Hours
1	Personal Branding	Introduction to Personal Branding –Purpose, Significance, Benefits and Techniques to build a personal brand	04
		Corporate/Organisational Branding	
		Online identity of Brand on social media	
		Maintenance and Improvement of your Brand	
		Factors affecting your Brand	
2	Corporate Presentations	Business Presentation Tips	04
		Digital Presentations	
		PAIBOC Model and Minto Pyramid Principles	
3	Business Plan Presentations	Introduction to Business Plans	04
		Company Overview & Industry Analysis	
		Persuasive Communication in Marketing Strategy	
		Operations Strategy in Financial Management	
		Implementation Plan	
4	Storyboarding and Storytelling	Visual Story Telling	04
		Video Presentations	
		Story Structure with images	
		Film and Animation	
5	Placement Readiness	Mock HR Interviews	04
		Mock GDs	
		Aptitude Tests	
		Placement ready resume	
6	Global Communication	An introduction to inter-cultural communication	04
		Introduction to languages and cultures	
		Global media in mass communication	
		Tips to become a global citizen	
		Respecting cultural diversity	
Total			**24**

Guidelines to conduct practical sessions:

1. Personal Branding
2. Personal Branding
3. Corporate Presentations
4. Corporate Presentations
5. Business Plan Presentations
6. Business Plan Presentations
7. Storyboarding and Storytelling
8. Storyboarding and Storytelling

9. Placement Readiness
10. Placement Readiness
11. Global Communication
12. Global Communication

List of Assignments:

1. Personal Branding (Individual)
2. Corporate Presentations (Group)
3. Business Plan Presentations (Group)
4. Storyboarding and Storytelling (Group)
5. Global Communication (Individual)

Skill Set:

1. Placement readiness and Personal branding techniques (H)
2. Corporate presentation and Business Plan techniques (M)
3. Inter-cultural communication to handle industry clients (H)

Tool Set:

1. Software for visual storytelling, film and animation
2. Software for digital presentations

Module Mapping:

Module	Skill Set	Tool Set
1	1	
2	2	2
3	2	
4	2	1
5	1	
6	3	

Recommended Online Courses:

1. Introduction to Personal Branding - https://www.coursera.org/learn/personal-branding
2. Strategic Self-Marketing and Personal Branding - https://www.coursera.org/learn/self-marketing
3. Learn to Storyboard for Film or Animation - https://www.udemy.com/course/storyboard-for-film-or-animation/
4. Powerful Tools for Teaching and Learning: Digital Storytelling - https://www.coursera.org/learn/digital-storytelling

5. Presentation Skills: Speechwriting, Slides and Delivery Specialization - https://www.coursera.org/specializations/presentation-skills
6. Business English for Cross-Cultural Communication - https://www.coursera.org/learn/cross-cultural-communication-business

Reference Books:

1. Effective Business Communication, Murphy, Tata McGraw Hill
2. Personal Development for Life and Work, Wallace and Masters, Thomson Learning
3. Organizational Behaviour, Robbins Stephens, Pearson Education
4. Business Communication- "Building Critical Skills," Kitty O Locker, McGraw Hill

Course Name: Mathematical Theory of Communication

Course Code: BS34T

Category: Basic Science (BS)

Preamble:

This course introduces students to Mathematical theory of Communication, with detailed Mathematical introduction to Complex Integration, Vector Spaces, Vector Integration and Statistical Techniques like Probability Distribution, Correlation and Regression which are widely applicable in Electronics and Telecommunication Engineering. This Course will also offer in-depth understanding of fundamental and theoretical underpinnings, applications, best practices, and research activities.

Pre-requisites:

Engineering Mathematics-I, II, III

Course Objectives:

- To understand and analyse the behaviour of functions defined in the complex plane and extends the integration of real valued function to complex valued functions.
- To develop fundamental understanding algebraic structure that underline the various areas of mathematics and its applications.
- To provide skills and knowledge to understand and apply vector integration techniques to solve problems involving vector fields, curves, surface and volumes.
- To provide students with a solid foundation in probability theory, including both discrete and continuous distributions and to develop analytical and problem-solving skills in applying probability distributions to real-world scenarios and to prepare students for further studies in statistics, data analysis, and related fields
- To provide students with solid foundation in the analysis and understanding of joint distribution marginal and conditional distributions.

Course Outcomes:

Student will be able to:

CO1: Evaluate complex integrals, compute residues & evaluate various contour integrals.
CO2: Understand the basics of Vector Spaces used in the field of Machine learning, AI, and Data science.
CO3: Evaluate problems on line integrals, green theorem and stokes theorem.
CO4: Illustrate the understanding of concept of probability distribution of various data.
CO5: Compute problems on joint distribution, marginal and conditional distributions.

CO6: Understand the basic statistical techniques like Correlation and Regression lines for the field of Data analysis.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
3	-	3	-

Assessment Guidelines:

Head of learning	ISA	MSE	ESE	Total
Theory	20	30	50	100

The assessment guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to propose her/his assessment methodology based on the nature of the course. However, the proposed assessment methodology shall be approved by a panel constituted at Institute level and published to the learners before the commencement of the semester.

Detailed Syllabus:

Module No.	Module Name	Content	No. of Hours
1	Complex Integration	Line Integral, Cauchy's Integral Theorem, Cauchy's Integral formula. Taylor's and Laurent's Series, Zeros, singularity, poles of (z), residues, Cauchy's Residue theorem.	8
2	Linear Algebra: Vector Spaces	n-dimensional vectors, angles Norms, Inner product, Cauchy-Schwarz Inequality (with proof). Vector spaces over a real field, Subspaces, Orthonormal basis, Gram-Schmidt process for vectors.	8
3	Vector Differentiation and Integration	Basics of Gradient, Divergence and Curl (Without Proof). Properties of vector field: Solenoidal and irrotational (conservative) vector field . Line Integral, Green's theorem in a plane (Without Proof), Stokes' theorem (Without Proof) only evaluation.	8
4	Probability Distributions	Random Variable: Probability distribution for discrete and continuous random variable, Bayes Theorem (without proof) Expectation, Variance, Moment generating function, Probability distributions (for detailed study): Binomial, Poisson, and Normal	7

		distributions.	
5	Two Dimensional Random variables	Two dimensional Discrete Random variables, Distribution function of a two dimensional random variables (X,Y). Probability Density function of two dimensional random variables. Marginal density function conditional distribution function. Conditional density function, independence of random variables. Function of two random variables	8
6	Statistical Techniques	Correlation: Covariance, Karl Pearson's Correlation Coefficient. Spearman's rank correlation coefficient, Regression lines, fitting of curves.	6
Total			**45**

Textbooks:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & sons, 10th Edition.
2. Dr. B V Ramana "Higher Engineering Mathematics", Tata McGraw Hill New Delhi, India 2006
3. P N Wartikar and J N Wartikar "Textbook of Applied Mathematics Volume I & II, Vidyarthi Ghriha Prakashan Pune 2005 9th Edition.
4. N P Bali and Manish Goyal, "A textbook of Engineering Mathematics", Laxmi Publication 2006.

Reference Books:

1. Dr. B S Grewal, "Higher Engineering Mathematics", Khanna Publication, 44th Edition.
2. C. R. Wylie & L. C. Barrett, "Advanced Engineering Mathematics", Tata McGraw India, 6th Edition.
3. H K Das, "Advanced Engineering Mathematics", S Chand, 22nd Edition.
4. Kenneth Hoffman. "Linear Algebra", Pearson 2018.
5. Seymour Lipschutz, "Schaum's Outline of Linear Algebra", Tata McGraw India, 6th Edition.
6. Seymour Lipschutz,"Schaum's Outline of Probability and Statistics", Tata McGraw India ,1st Edition.
7. T. Veerarajan, "Probability, Statistics and Random processes", Tata McGraw India, 2nd Edition.
8. Robert Weinstock, "Calculus of variation with application to physics and Engineering", Dover Publications, New York, 1st Edition.

Course Name: Mathematical Theory of Communication Lab

Course Code: BS34P

Category: Basic Science (BS)

Preamble:

This course introduces students to experimental implementation of Mathematical theory of Communication, with detailed Mathematical introduction to Complex Integration, Vector Spaces, Vector Integration and Statistical Techniques like Probability Distribution, Correlation and Regression using various software tools like python, matlab, sage etc. which are widely applicable in Electronics and Telecommunication Engineering. This Course will also offer hands on to code various mathematical problems.

Pre-requisites:

Engineering Mathematics-I, II, III

Course Objectives:

- To understand and analyse the behaviour of functions defined in the complex plane and extends the integration of real valued function to complex valued functions.
- To develop fundamental understanding algebraic structure that underline the various areas of mathematics and its applications.
- To provide skills and knowledge to understand and apply vector integration techniques to solve problems involving vector fields, curves, surface and volumes.
- To provide students with a solid foundation in probability theory, including both discrete and continuous distributions and to develop analytical and problem-solving skills in applying probability distributions to real-world scenarios and to prepare students for further studies in statistics, data analysis, and related fields
- To provide students with solid foundation in the analysis and understanding of joint distribution marginal and conditional distributions.

Course Outcomes:

Student will be able to:

CO1: Evaluate complex integrals, compute residues & evaluate various contour integrals.

CO2: Understand the basics of Vector Spaces used in the field of Machine learning, AI, and Data science.

CO3: Evaluate problems on line integrals , green theorem and stokes theorem.

CO4: Illustrate the understanding of concept of probability distribution of various data.

CO5: Compute problems on joint distribution, marginal and conditional distributions.

CO6: Understand the basic statistical techniques like Correlation and Regression lines for the field of Data analysis.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
	2	-	1

Assessment Guidelines:

Head of learning	ISA	MSE	ESE	Total
Theory	25	-	25	50

The assessment guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to propose her/his assessment methodology based on the nature of the course. However, the proposed assessment methodology shall be approved by a panel constituted at Institute level and published to the learners before the commencement of the semester.

Suggested List of Practical's:

1. Computing residue of integrand and residue theorem
2. Verification of Cauchy schwartz inequality
3. Finding Norm, angle, inner product between two vectors
4. Implementing Gram Smith Process for basis of vector space
5. Probability analysis of a random experiment. (E.g.Binary Communication Channel)
6. Probability density and distribution analysis for a random experiment.
7. Mean and variance analysis of random phenomenon using standard random variable distributions.
8. Simple data analysis using standard random variable distributions.

Textbooks:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & sons, 10th Edition.
2. Dr. B V Ramana "Higher Engineering Mathematics", Tata McGraw Hill New Delhi, India 2006
3. P N Wartikar and J N Wartikar "Textbook of Applied Mathematics Volume I & II, Vidyarthi Ghriha Prakashan Pune 2005 9th Edition.
4. N P Bali and Manish Goyal, "A textbook of Engineering Mathematics", Laxmi Publication 2006.

Reference Books:

1. Dr. B S Grewal, "Higher Engineering Mathematics", Khanna Publication, 44th Edition.
2. C. R. Wylie & L. C. Barrett, "Advanced Engineering Mathematics", Tata McGraw India, 6th Edition.
3. H K Das, "Advanced Engineering Mathematics", S Chand, 22nd Edition.
4. Kenneth Hoffman. "Linear Algebra", Pearson 2018.
5. Seymour Lipschutz, "Schaum's Outline of Linear Algebra", Tata McGraw India, 6th Edition.
6. Seymour Lipschutz,"Schaum's Outline of Probability and Statistics", Tata McGraw India ,1st Edition.
7. T. Veerarajan, "Probability, Statistics and Random processes", Tata McGraw India, 2nd Edition.
8. Robert Weinstock, "Calculus of variation with application to physics and Engineering", Dover
9. Publications, New York, 1st Edition.

Course Name: Data Structure & Analysis of Algorithms

Course Code: ET07T

Category: Core

Preamble:

This course deals with the various data structures we need to organize the data. It introduces the concept of data structures and presents various types of data structures along with the implementations of the various operations that can be performed on the data structure. It also further dives into comparison and implementation of various searching and sorting techniques.

Pre-requisites: ES04: Structured Programming and ES05: Object Oriented Programming

Course objective:

- To Introduce the fundamental knowledge & need of Data Structures for efficient storage mechanism of data.
- To understand the importance of Design and analysis of Algorithm for efficient programming.
- To Implement and perform different operation of Stack, Queue, Linked List, Trees, Graphs etc.
- To Understand the working of different Sorting, Searching & Hashing techniques.

Course Outcome:

After successful completion of the course the student will be able to:

CO1: Compare functions using asymptotic analysis and describe the relative merits of worst, average, and best-case analysis.
CO2: Implement various operations on Stack and Queue.
CO3: Demonstrate the operation of Linked list.
CO4: Implement and traverse nonlinear data structures like Trees & Graph data structures.
CO5: Implement various Sorting and Algorithms and compare their performance.
CO6: Apply different hashing and searching techniques to efficiently retrieve and manipulate data.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
2	-	2	-

Assessment Guidelines:

Head of learning	ISA	MSE	ESE	Total
Theory	15	20	40	75

Detailed Syllabus:

Module no.	Module name	Content	No. of Hours
1	**Introduction to Data Structure and Algorithms**	Concept of ADT, Types of Data Structures and Operations , Introduction to Data structure and its types. Introduction to Algorithms, Analysis of algorithms, Asymptotic Notations, Time complexity, space complexity,	4
2	**Stack & Queues**	**Introduction to Stack**, ADT of Stack, Operations on Stack, Array Implementation of Stack, applications of Stack- Infix to Postfix Expression Conversion, Postfix Expression Evaluation **Introduction to Queue**, ADT of Queue, Operations on Queue, ArrayImplementation of Queue, Types of Queue-Circular Queue, Priority Queue,Introduction to Double Ended Queue Applications of various types of Queue	6
3	**Linked List**	Introduction, Linked List v/s Array, Representation of Linked List, Types ofLinked List - Singly Linked List, Doubly Linked List Operations on Singly Linked List and Doubly Linked List, Singly Linked List Application-Polynomial Representation and Addition,	4
4	**Trees and Graphs**	**Trees :** Basic Tree Terminologies, Types of Binary Tree, Binary Search Tree Implementation ,Tree Traversal algorithms In order, Pre order and Post order Applications – Expression Tree **Introduction Graph :** Terminology, Memory Representation of Graph, Operations Performed on Graph, Graph Traversal: Breadth First Search, Depth First Search, Applications of the Graph, Shortest Path, Minimum Spanning Tree.	6
5	**Searching**	**Searching :** Sequential search, Binary Search, **Hashing**-Concept, Hash Functions, Common hashing functions, Collision resolution Techniques: Linear Probing, Quadratic probing, double hashing	6
6	**Sorting**	Comparison and Analysis Internal Sorting: Insertion Sort, Selection, Bubble Sort, Quick Sort, Merge Sort	4
Total			**30**

Text Books:

1. Data Structures using C by Reema THereja, Oxford Press, 2014
2. Data Structures Using Java, Y. Langsam, M.J. Augenstein and A.M. Tanenbaum, Pearson Education
3. Data Structure: A Pseudocode Approach with C R.F. Gilberg, Behrouz A. Forouzan Thomson Edition
4. Introduction to Data Structure and its Applications, Jean Paul Tremblay, P. G. Sorenson, McGraw-Hill Higher Education
5. Fundamentals of Computer Algorithms, Ellis Horowitz, Sartaj Sahani and Sanguthevar Rajasekaran, Universities Press (India) Pvt. Ltd.
6. "Learning with Python", Allen Downey, Jeffrey Elkner, Chris Meyers ,Dreamtech Press

Reference Books:

1. Data structures and algorithms in Java, Michael Goodrich & Roberto Tamassia, Wiley India
2. An introduction to data structures with Applications, Jean Paul Tremblay, Paul G. SorensonTata McGrawHill
3. "Algorithms", Sanjoy Dasgupta, Christos Papadimitriou, Umesh Vazirani, Tata McGrawHill Edition.

Course Name: Data Structure & Analysis of Algorithms Lab

Course Code: ET07P

Category: Core

Preamble:

This course deals with the various data structures we need to organize the data. It introduces the concept of data structures and presents various types of data structures along with the implementations of the various operations that can be performed on the data structure. It also further dives into comparison and implementation of various searching and sorting techniques.

Pre-requisites: ES04: Structured Programming and ES05: Object Oriented Programming

Course objective:

- Design and construct simple programs by using the concepts of structures as abstract data types.
- To have a broad idea how to use pointers in the implement of data structure.
- To enhance programming skills while improving their practical knowledge in data structures.
- To strengthen the practical ability to apply suitable data structure for real time applications.

Course Outcome:

Student will be able to:

CO1: Implement the abstract data type and reusability of a particular data structure.
CO2: Implement the linear data structures like stack, queues using array and linked list.
CO3: Understand and implement non-linear data structure like trees and graphs.
CO4: Implement various sorting and searching techniques.
CO5: Understand and implement Hashing technique.
CO6: Choose the appropriate data structure for solving the given problem.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
-	2	-	1

Assessment Guidelines:

Head of learning	ISA	MSE	ESE	Total
Practical	25	-	25	50

Suggested List of Practical's:

Sr. No.	Suggested Experiment
1	Write a program to implement a stack ADT using array.
2	Write a program to accept an infix expression from user and convert it into postfix expression.
3	Write a program to evaluate given postfix expression using stack.
4	Write a program to implement Circular Queue using array.
5	Write a program to implement Priority Queue using arrays.
6	Write a program to implement Linked List with the following functions. i) insertbeg ii) insertend iii) delete iv) display v) reverse vi) count vii) search
7	Write a program to implement Priority Queue using linked list.
8	Write a program to implement binary search tree with the following function. (i) insert (ii) delete (iii) search (iv) inorder (v) preorder (vi) postorder
9	Write a program to construct expression tree using postfix expression.
10	Write a program to implement modified bubble sort and insertion sort.
11	Write a program to implement merge sort.
12	Write a program to implement quick sort.
13	Write a program to implement binary search.
14	Write a program to implement hashing.

Text Books:

1. Data Structures using C by Reema THereja, Oxford Press, 2014
2. Data Structures Using Java, Y. Langsam, M.J. Augenstein and A.M. Tanenbaum, Pearson Education
3. Data Structure: A Pseudocode Approach with C R.F. Gilberg, Behrouz A. Forouzan Thomson Edition
4. Introduction to Data Structure and its Applications, Jean Paul Tremblay, P. G. Sorenson, McGraw-Hill Higher Education

5. Fundamentals of Computer Algorithms, Ellis Horowitz, Sartaj Sahani and Sanguthevar Rajasekaran, Universities Press (India) Pvt. Ltd.
6. "Learning with Python", Allen Downey, Jeffrey Elkner, Chris Meyers ,Dreamtech Press

Reference Books:

1. Data structures and algorithms in Java, Michael Goodrich & Roberto Tamassia, Wiley India
2. An introduction to data structures with Applications, Jean Paul Tremblay, Paul G. SorensonTata McGrawHill
3. "Algorithms", Sanjoy Dasgupta, Christos Papadimitriou, Umesh Vazirani, Tata McGrawHill Edition.

Course Name: Integrated Circuits

Course Code: ET06T

Category: Core

Preamble:

This course introduces the Linear Integrated circuits which are used to design basic building blocks of electronic system. This course introduces designing the linear circuit for given mathematical equations. This course also consists of Analysis and designing of various linear and non-linear applications using Operational Amplifier ICS. This course also includes special integrated circuits used to design various communication circuits.

Pre-requisites:

Electronics Devices and circuits.

Course Objectives:

Students will be able to

- Understand the Concept, working and Key Application of Various Linear Integrated circuits.
- To perform analysis of circuits based on linear integrated circuits.
- To Design circuits and systems for applications using linear integrated circuits.
- To Create DC Power supply for given Application and Specifications.
- Outline and classify all types of integrated circuits.

Course Outcomes:

Student will be able to:

CO1: Describe the Ideal and Practical characteristics of various Integrated circuits.

CO2: Design circuits for Various Linear and Non-Linear applications.

CO3: Identify the appropriate integrated circuit modules for designing engineering applications.

CO4: Demonstrate the application of Voltage regulator, Timer and PLL.

Course Scheme:

Contact Hours		**Credits Assigned**	
Theory	Practical	Theory	Practical
2	-	2	-

Assessment Guidelines:

Head of learning	ISA	MSE	ESE	Total
Theory	15	20	40	075

The assessment guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to propose her/his assessment methodology based on the nature of the course. However, the proposed assessment methodology shall be approved by a panel constituted at Institute level and published to the learners before the commencement of the semester.

Detailed Syllabus:

Module No.	Module Name	Content	No. of Hours
1	Introduction to Differential and Operational Amplifier.	1.1 Block diagram and working of Operational Amplifier. Various parameters of Operational Amplifier. Typical values for IC741. 1.2 Inverting, Non-Inverting amplifier using op-amp (Both open and close loop). Arithmetic circuits like Adder, Subtractor. Numerical based on op-amp circuits.	4
2	Linear applications of Operational Amplifier.	2.1 Need of Instrumentation amplifier analysis of 3 op-amp Instrumentation Amplifier. Basic and Practical Integrator and Differentiator circuits. Voltage to current and current to voltage converter circuits. 2.2 Filters using op-amp. Analysis and designing of 1st Order Butterworth Filter using op-amp. Working and designing of 2nd order filter using op-amp (No derivation for 2nd order filter)	7
3	Non-Linear Application of Operational amplifier	3.1 Comparator using op-amp, Working, analysis, designing and application of Schmitt-Trigger using op-amp. Precision half wave and full wave rectifier using op-amp. Sample and hold circuit, peak detector circuit using op-amp.	5

4	Voltage Regulator.	4.1 Functional Block diagram of voltage regulator. Working and designing of three terminal fixed voltage regulators(78XX,79XX). 4.2Functional block diagram, working and designing of general-purpose IC 723 Regulator. 4.32Functional block diagram, working and designing of general-purpose IC LM317 Regulator 4.4 Block diagram of SMPS, comparison between Switching and linear regulator.	5
5	Timer IC 555	5.1 Functional block diagram, specification and working of IC555.Design and working of Astable and Monostable Multivibrator using 555. 5.2 Application of 555 like VCO, PWM.	5
6	Special Purpose Integrated circuits	6.1 Functional block diagram and working of VCO IC 566. 6.2 Functional block diagram and working of PLL IC 565.	4
Total			**30**

Textbooks:

1. Op-Amps and Linear Integrated Circuits, Ramakant A Gayakwad, Pearson 4th Edition 2015
2. DESIGN WITH OP-AMP AND ANALOG INTEGRATED CIRCUITS By Sergio Franko, Tata McGraw Hill, 3rdEdition.
3. Linear Integrated circuits by Roy Choudhary, New age International Publishers,4th Edition

Reference Books:

1. Operational Amplifiers and Linear ICs, David A. Bell, Oxford,3rd Edition 2011
2. Linear Integrated Circuits S. Saliva Hanan, et al McGraw Hill 2nd Edition,2014

Course Name: Integrated Circuits Lab

Course Code: ET06P

Category: Core

Preamble:

This course introduces the Linear Integrated circuits which are used to design basic building blocks of electronic system. This course introduces designing the linear circuit for given mathematical equations. This course also consists of Analysis and designing of various linear and non-linear applications using Operational Amplifier ICS. This course also includes special integrated circuits used to design various communication circuits.

Pre-requisites:

Electronics Devices and circuits.

Course Objectives:

Students will be able to

- Understand the Concept, working and Key Application of Various Linear Integrated circuits.
- To perform analysis of circuits based on linear integrated circuits.
- To Design circuits and systems for applications using linear integrated circuits.
- To Create DC Power supply for given Application and Specifications.
- Outline and classify all types of integrated circuits.

Course Outcomes:

Student will be able to:

CO1: Describe the Ideal and Practical characteristics of various Integrated circuits.

CO2: Design circuits for Various Linear and Non-Linear applications.

CO3: Identify the appropriate integrated circuit modules for designing engineering applications.

CO4: Demonstrate the application of Voltage regulator, Timer and PLL.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
-	2	-	1

Assessment Guidelines:

Head of learning	ISA	MSE	ESE	Total
Theory	25	-	25	50

The assessment guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to propose her/his assessment methodology based on the nature of the course. However, the proposed assessment methodology shall beapproved by a panel constituted at Institute level and published to the learners before the commencementof the semester.

Suggested List of Practicals:

1. Design and implementation of Inverting and Non-inverting amplifier using IC741.
2. Frequency response of Operational Amplifier using IC741.
3. Design and Implementation of 1st and 2nd order Filter using IC 741.
4. Design and Implementation of Practical Integrator circuit using IC741.
5. Design and Implementation of Practical Differentiator circuit using IC741.
6. Design and Implementation of various Arithmetic circuits using IC741.
7. Design and Implementation of Instrumentation amplifier using IC741.
8. Design and Implementation of Schmitt -trigger circuit using IC741.
9. Design and Implementation of Precision rectifier using IC741.
10. Design and Implementation of voltage regulator circuit using IC723.
11. Design and Implementation of Astable Multivibrator circuit using IC555.
12. Design and Implementation of Monostable Multivibrator circuit using IC555.

Textbooks:

1. Op-Amps and Linear Integrated Circuits, Ramakant A Gayakwad, Pearson 4th Edition 2015
2. DESIGN WITH OP-AMP AND ANALOG INTEGRATED CIRCUITS By Sergio Franko, Tata McGraw Hill, 3rdEdition.
3. Linear Integrated circuits by Roy Choudhary, New age International Publishers,4th Edition

Reference Books:

1. Operational Amplifiers and Linear ICs, David A. Bell, Oxford,3rd Edition 2011
2. Linear Integrated Circuits S. Saliva Hanan, et al McGraw Hill 2nd Edition,2014

Course Name: Digital Communication

Course Code: ET09T

Category: Core

Preamble:

The course intends to identify the signals and functions of its various components, to learn about theoretical features of digital communication system and draw signal space diagrams, compute spectra of modulated signals, to learn about error detection and correction to produce optimum receiver. The objective is to equip the students with basic knowledge for analyzing analog and digital communication systems ranging from data networks and internet to mobile data communication systems such as cellular and WiFi systems. Specifically, the students will learn how to manage communication system resources including bandwidth and power by selecting a proper signaling and/or analog/pulse/digital modulation scheme.

Pre-requisites:

Principles of Communication Engineering .

Course Objectives:

- To describe the basics of information theory and source coding.
- To illustrate various error control codes.
- To describe baseband system.
- To learn different digital modulation and demodulation techniques

Course Outcomes:

Student will be able to:

CO1: Apply the concepts of Information Theory in source coding
CO2: Apply various error detection codes & Analyze different error correction codes.
CO3: Compare various baseband transmission methods for digital signals
CO4: Compare the performances of different digital modulation techniques
CO5: Evaluate the performance of optimum baseband detection in the presence of white noise.
CO6: Understand the principles of spread spectrum communications.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
2	-	2	-

Assessment Guidelines:

Head of learning	ISA	MSE	ESE	Total
Theory	15	20	40	75

The assessment guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to propose her/his assessment methodology based on the nature of the course. However, the proposed assessment methodology shall be approved by a panel constituted at Institute level and published to the learners before the commencement of the semester.

Detailed Syllabus:

Module No.	Module Name	Content	No. of Hours
1	Information Theory & Source Coding	Block diagram and sub-system description of a digital communication system, Proability, Information Theory ,measure of information and properties, entropy and it's properties Mini Source Coding, Shannon 's Source Coding Theorem, Shannon-Fano Source Coding, Huffman Source Coding ,mutual information and channel capacity, channel coding theorem, channel capacity theorem	4
2	Error Correction & detection Codes	Error detection codes: Vertical Redundancy Check (VRC) code, Longitudinal Redundancy Check (VRC) code, Cyclic Redundancy Check (CRC) code and Checksum code	3
3	Error Control systems	Error Correction Codes : Types of error control, error control codes, linear block codes, systematic linear block L4 codes, generator matrix, parity check matrix, syndrome testing, error correction, and decoder implementation Systematic and Non-systematic Cyclic codes: encoding with shift register and error detection and correction Convolution Codes: Time domain and transform domain approach, graphical representation, code tree, trellis, state diagram, decoding methods	8

4	Baseband Modulation & Transmission	Discrete PAM signals and it's power spectra Inter-symbol interference, Nyquist criterion for zero ISI, sinusoidal roll-off filtering, correlative coding, equalizers, and eye pattern	4
5	Bandpass Modulation & Demodulation	Generation, detection, signal space diagram, spectrum, bandwidth efficiency, and probability of error analysis of: Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK)Modulations, Binary Phase Shift Keying (BPSK) Modulation, Quaternary Phase Shift Keying QPSK), M-ary PSK Modulations, Quadrature Amplitude Modulation (QAM), Minimum Shift Keying (MSK)	8
6	Optimum Reception of Digital Signal	Baseband receiver, Probability of Error, Optimum Receiver and Filter, Matched Filter and its probability of error, Coherent Reception.	3
Total			**30**

Text Books:

1. H. Taub, D. Schlling, and G. Saha-Principles of Communication Systems, Tata Mc- Graw Hill, New Delhi, Third Edition, 2012.
2. Lathi B P, and Ding Z-Modern Digital and Analog Communication Systems, Oxford University Press, Fourth Edition, 2017.
3. Haykin Simon-Digital Communications, John Wiley and Sons, New Delhi, Fourth Edition,2014.
4. John G. Proakis-Digital Communications, McGraw-Hill, Fourth Edition

Reference Books:

1. Sklar B, and Ray P. K.-Digital Communication: Fundamentals and applications, Pearson,Dorling Kindersley (India), Delhi, Second Edition, 2009.
2. T L Singal-Analog and Digital Communication, Tata Mc-Graw Hill, New Delhi, First Edition,2012.
3. P Ramakrishna Rao-Digital Communication, Tata Mc-Graw Hill, New Delhi, First Edition,2011.
4. K. Sam Shanmugam-Digital and analog communication Systems, John Wiley and sons.
5. Upamanyu Madhow- Fundamentals of Digital Communication- Cambridge University Press
6. W.C. Huffman, Vera Pless- Fundamentals of Error Correcting Codes, Cambridge University Press
7. Graham Wade-Coding Techniques, Palgrave, New York

Course Name: Digital Communication Lab

Course Code: ET09P

Category: Core

Preamble:

The course intends to identify the signals and functions of its various components, to learn about theoretical features of digital communication system and draw signal space diagrams, compute spectra of modulated signals, to learn about error detection and correction to produce optimum receiver. The objective is to equip the students with basic knowledge for analyzing analog and digital communication systems ranging from data networks and internet to mobile data communication systems such as cellular and WiFi systems. Specifically, the students will learn how to manage communication system resources including bandwidth and power by selecting a proper signaling and/or analog/pulse/digital modulation scheme.

Pre-requisites:

Principles of Communication Engineering

Course Objectives:

- To describe the basics of information theory and source coding.
- To illustrate various error control codes.
- To describe baseband system.
- To learn different digital modulation and demodulation techniques

Course Outcomes:

Student will be able to:

CO1: Apply the concepts of Information Theory in source coding.
CO2: Apply various error detection codes & Analyze different error correction codes.
CO3: Compare various baseband transmission methods for digital signals.
CO4: Compare the performances of different digital modulation techniques.
CO5: Evaluate the performance of optimum baseband detection in the presence of white noise.
CO6: Understand the principles of spread spectrum communications.

Course Scheme:

Contact Hours		**Credits Assigned**	
Theory	Practical	Theory	Practical
-	2	-	1

Assessment Guidelines:

Head of learning	ISA	MSE	ESE	Total
Practical	25	-	25	50

The assessment guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to propose her/his assessment methodology based on the nature of the course. However, the proposed assessment methodology shall be approved by a panel constituted at Institute level and published to the learners before the commencement of the semester.

Suggested List of Practical's:

1. To understand Various line codes
2. Modulation and Demodulation of Binary Amplitude Shift Keying
3. Modulation and Demodulation of Binary Frequency Shift Keying.
4. Modulation and Demodulation of Phase Shift Keying
5. Modulation and Demodulation of Quadrature Phase Shift Keying
6. To Study and Perform Linear Block Codes
7. To Study and perform Cyclic codes.
8. Error detection and correction using Hamming code virtual lab
   http://vlabs.iitb.ac.in/vlabsdev/labs/mit_bootcamp/comp_networks_sm/labs/exp1/index.php
9. Performance Analysis of Digital Modulation techniques using BERTOOL (Matlab)

Mini Projects / Case Study :-

1. Designing of ASK / FSK / PSK Modulation kits (Using IC 555 / Op Amp)
2. Case study (any one) 1. Effect of various Communication systems on health, safety, and environment. 2. Professional engineering regulations, legislation and standards related to communication. 3. Code of ethics for wired and wireless systems for user/devices/companies

Text Books:

1. H. Taub, D. Schlling, and G. Saha-Principles of Communication Systems, Tata Mc- Graw Hill, New Delhi,Third Edition, 2012.
2. Lathi B P, and Ding Z-Modern Digital and Analog Communication Systems, Oxford University Press, Fourth Edition, 2017.
3. Haykin Simon-Digital Communications, John Wiley and Sons, New Delhi, Fourth Edition,2014.
4. John G. Proakis-Digital Communications, McGraw-Hill, Fourth Edition

Reference Books:

1. Sklar B, and Ray P. K.-Digital Communication: Fundamentals and applications, Pearson,Dorling, Kindersley (India), Delhi, Second Edition, 2009.
2. T L Singal-Analog and Digital Communication, Tata Mc-Graw Hill, New Delhi, First Edition,2012.
3. P Ramakrishna Rao-Digital Communication, Tata Mc-Graw Hill, New Delhi, First Edition,2011.
4. K. Sam Shanmugam-Digital and analog communication Systems, John Wiley and sons.
5. Upamanyu Madhow- Fundamentals of Digital Communication- Cambridge University Press
6. W.C. Huffman, Vera Pless- Fundamentals of Error Correcting Codes, Cambridge University Press
7. Graham Wade-Coding Techniques, Palgrave, New York

Course Name: Signals and Systems

Course Code: ET03T

Category: Core

Preamble:

This course introduces students to the basics of signals and systems and its classification, operations and analysis in time domain. Analysis of signals and systems in frequency domain and analysis of LTI continuous and discrete systems in frequency domain using Laplace, Fourier and Z-transforms. Introduction to FIR and IIR systems and its realization in different forms.

Pre-requisites:

Engineering Mathematics- III

Course Objectives:

- To introduce to the basics of signals and systems, and its classification, operations and analysis in time domain.
- To analyse the signals and systems in frequency domain and analysis of LTI continuous and discrete systems in frequency domain.
- To provide foundation of signal and system concepts to areas like communication, control and comprehend applications of signal processing in communication systems.
- To Introduce to FIR and IIR systems and its realization in different forms.

Course Outcomes:

Student will be able to:

CO1: Student will be able to classify and analyse different types of signals and systems.
CO2: Student will be able to analyse continuous time and discrete time LTI systems time domain.
CO3: Student will be able to analyse continuous time signals and systems and LTI systems in frequency domain using Laplace transform.
CO4: Student will be able to analyse continuous time signals and systems and LTI systems in frequency domain using Fourier transform.
CO5: Students will be able to analyse discrete time signals and systems and LTI systems in frequency domain using Z-transform.
CO6: Student will be able to understand FIR and IIR systems and realize it in different forms.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
3	-	3	-

Assessment Guidelines:

Head of learning	ISA	MSE	ESE	Total
Theory	15	20	40	075

The assessment guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to propose her/his assessment methodology based on the nature of the course. However, the proposed assessment methodology shall be approved by a panel constituted at Institute level and published to the learners before the commencement of the semester.

Detailed Syllabus:

Module No.	Module Name	Content	No. of Hours
1	Introduction to signals and systems	**Introduction to Signals:** Definition, Basic Elementary signals - exponential, sine, step, impulse, ramp, rectangular, triangular. Operations on signals. Classification of Signals: analog and discrete time signals, even and odd signals, periodic and non-periodic signals , deterministic and non-deterministic signals, energy and power signals. **Systems and Classification of systems:** System Representation, continuous time and discrete systems, system with and without memory, causal and non-causal system, linear and nonlinear system, time invariant and time variant system, stable system.	8
2	Time domain analysis of Continuous Time and Discrete Time systems	Linear Time Invariant (LTI) systems: Representation of systems using differential /difference equation, Impulse, step and exponential response, System Stability and Causality. Use of convolution integral and convolution sum for analysis of LTI systems, properties of convolution integral/sum, impulse response of interconnected systems. Correlation and spectral Density: auto-correlation, cross correlation, analogy between correlation and	9

		convolution, energy spectral density, power spectral density, relation of ESD and PSD with auto-correlation.	
3	Laplace Transform and Continuous time LTI systems	Need of Laplace Transform, Concept of Region of Convergence, Properties of Laplace Transform, Relation between continuous time Fourier Transform and Laplace Transform, unilateral Laplace Transform, inverse Laplace Transform. Analysis of continuous time LTI systems using Laplace Transform: Causality and stability of systems in s-domain, Total response of a system	7
4	Fourier Analysis of Continuous and Discrete Time Signals and Systems	Fourier transform of periodic and non-periodic functions, Properties of Fourier Transform, Inverse Fourier Transform, Frequency Response: computation of Magnitude and Phase Response, Limitations of Fourier Transform.	7
5	z-Transform and Discrete time LTI systems	Need of z-Transform, z-Transform of finite and infinite duration sequences, Concept of Region of Convergence, z-Transform properties, Standard z-transform pairs, relation between ztransform and discrete time Fourier Transform, one sided zTransform. Inverse z-Transform: Partial Fraction method only. Analysis of discrete time LTI systems using z-Transform: Systems characterized by Linear constant coefficient difference equation, Transfer Function, plotting Poles and Zeros of a transfer function , causality and stability of systems, Total response of a system.	8
6	FIR and IIR systems	Concept of finite impulse response systems and infinite impulse response systems, Linear Phase FIR systems. Realization structures of LTI system: Direct form –I and direct form II, Linear Phase FIR structures.	6
Total			**45**

Text Books:

1. Nagoor Kani, Signals and Systems, Tata McGraw Hill, Third Edition, 2011.
2. Rodger E Ziemer, William H. Tranter and D. Ronald Fannin, Signals and Systems, Pearson Education,
3. Fourth Edition 2009.
4. Alan V. Oppenhiem, Alan S. Willsky and S. Hamid Nawab, Signals and Systems, Prentice-Hall of India, Second Edition, 2002.
5. Simon Haykin and Barry Van Veen, Signals and Systems, John Wiley and Sons, Second Edition, 2004.

Reference Books:

1. Hwei. P Hsu, Signals and Systems, Tata McGraw Hill, Third edition, 2010
2. Simon Haykin and Barry Van Veen, Signals and Systems, John Wiley and Sons, Second Edition, 2004. 3) V. Krishnaveni and A. Rajeshwari, Signals and Systems, Wiley-India, First Edition 2012.
3. Michael J Roberts, Fundamentals of Signals and systems, Tata McGraw Hill, special Indian Economy edition, 2009.
4. Luis F. Chaparro, Signals and Systems Using MATLAB, Academic Press
5. Rangaraj M. Rangayyan, "Biomedical Signal Analysis- A Case Study Approach", Wiley 2002.
6. Signals and Systems Laboratory: Virtual Laboratory http://ssl-iitg.vlabs.ac.in/

NPTEL/ Swayam Course:

1. Course: Principles of Signals & Systems By Prof. Aditya K. Jagannatham (IIT Kanpur); https://swayam.gov.in/nd1_noc20_ee15/preview

Course Name: Signals and Systems Lab

Course Code: ET03P

Category: Core

Preamble:

This course introduces students to the basics of signals and systems and its classification, operations and analysis in time domain. Analysis of signals and systems in frequency domain and analysis of LTI continuous and discrete systems in frequency domain using Laplace, Fourier and Z-transforms. Introduction to FIR and IIR systems and its realization in different forms.

Pre-requisites:

Engineering Mathematics- III

Course Objectives:

- To introduce to the analysis in time domain of signals and systems.
- To analyse the signals and systems in frequency domain and analysis of LTI continuous and discrete systems in frequency domain.
- To provide applications of signal and system concepts to areas like communication, control and comprehend applications of signal processing in communication systems.
- To analyse FIR and IIR systems.

Course Outcomes:

Student will be able to:

CO1: Student will be able to analyse different types of signals and systems.
CO2: Student will be able to analyse continuous time and discrete time LTI systems in time domain.
CO3: Student will be able to analyse continuous time signals and systems and LTI systems in frequency domain.
CO4: Students will be able to analyse discrete time signals and systems and LTI systems in frequency domain.
CO5: Student will be able to analyse FIR and IIR systems.

Course Scheme:

Contact Hours		**Credits Assigned**	
Theory	Practical	Theory	Practical
-	2	-	1

Assessment Guidelines:

Head of learning	ISA	MSE	ESE	Total
Practical	25	-	25	50

The assessment guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to propose her/his assessment methodology based on the nature of the course. However, the proposed assessment methodology shall be approved by a panel constituted at Institute level and published to the learners before the commencement of the semester.

Suggested List of Practical's:

1. Generation of various continuous and discrete time signals.
2. Operations on signals and discrete time signals.
3. Convolution between signals and discrete time signals.
4. Auto correlation and cross correlation.
5. Continuous time signals and systems analysis using Laplace transform.
6. Continuous time signals and systems analysis using Fourier transforms and inverse Fourier transform.
7. Discrete time signals and systems analysis using Z-transform.
8. Noise analysis in systems.
9. Synthesis of sound signal.
10. Stability analysis of LTI systems.

Text Books:

1. Nagoor Kani, Signals and Systems, Tata McGraw Hill, Third Edition, 2011.
2. Rodger E Ziemer, William H. Tranter and D. Ronald Fannin, Signals and Systems, Pearson Education, Fourth Edition 2009.
3. Alan V. Oppenhiem, Alan S. Willsky and S. Hamid Nawab, Signals and Systems, Prentice-Hall of India, Second Edition, 2002.
4. Simon Haykin and Barry Van Veen, Signals and Systems, John Wiley and Sons, Second Edition, 2004.

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2. Simon Haykin and Barry Van Veen, Signals and Systems, John Wiley and Sons, Second Edition, 2004.
3. V. Krishnaveni and A. Rajeshwari, Signals and Systems, Wiley-India, First Edition 2012.
4. Michael J Roberts, Fundamentals of Signals and systems, Tata McGraw Hill, special Indian Economy edition, 2009.

5. Luis F. Chaparro, Signals and Systems Using MATLAB, Academic Press
6. Rangaraj M. Rangayyan, "Biomedical Signal Analysis- A Case Study Approach", Wiley 2002.
7. Signals and Systems Laboratory: Virtual Laboratory http://ssl-iitg.vlabs.ac.in/

NPTEL/ Swayam Course:

1. Course: Principles of Signals & Systems By Prof. Aditya K. Jagannatham (IIT Kanpur); https://swayam.gov.in/nd1_noc20_ee15/preview

Course Name: Mini Project

Course Code: ET45

Category: Project and Internship

Preamble:

This course introduces students to the implementation of concepts of Electrical and electronics domain. Students can develop basic projects based on analog and or digital electronics-based subjects.

Pre-requisites:

Basic Electrical & Electronics Engineering, Electronics devices and circuits, Integrated circuits.

Course Objectives:

- To make students familiar with the basics of electronic devices and circuits, electrical circuits and digital systems.
- To familiarize the students with the designing and making of Printed circuit boards(PCB).
- To improve the knowledge of electronics hardware among students.

Course Outcomes:

Student will be able to:

CO1: Create the electronics circuit for particular application/experiment.
CO2: Design and simulate the circuits by putting together the analog and digital components.
CO3: Learn the technique of soldering and circuit implementation on general purpose printed circuit board (GPP).
CO4: Realize the PCB design process and gain up-to-date knowledge of PCB design software.
CO5: Utilize the basic electronic tools and equipment's (like DMM, CRO, DSO etc.)
CO6: Analysis of hardware fault (Fault detection and correction).

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
-	2	-	2

Assessment Guidelines:

Head of learning	ISA	MSE	ESE	Total
Practical	25	-	25	50

The assessment guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to propose her/his assessment methodology based on the nature of the course. However, the proposed assessment methodology shall be approved by a panel constituted at Institute level and published to the learners before the commencement of the semester.

Detailed Syllabus:

Module No.	Unit No.	Topics	Hrs.
1.0		**Identification and Designing of Circuit**	**04**
	1.1	Identification of particular application with understanding of its detail operation. Study of necessary components and devices required to implement the application.	
	1.2	Designing the circuit for particular application (either analog , digital, electrical , analog and digital, etc)	
2.0		**Software simulation and Implementation on GPP**	**06**
	2.1	Simulation of circuit for particular application using software's to verify the expected results	
	2.2	Implementation of verified circuit on general purpose printed circuit board (GPP). Now Verify the hardware results by using electronic tools and equipment's like millimeter, CRO, DSO etc.	
3.0		**PCB design and optimization**	**06**
	3.1	Design the circuit by placing components using PCB design softwares.	
	3.2	Reduce the size of PCB by varying the position of components or devices for optimize use of copper clad material.	
4.0		**Implementation of PCB**	**04**
	4.1	Transfer the designed PCB on Copper clad either by using dark room or taking printout on glossy paper, etc (use available suitable method).	
	4.2	Perform Etching and then Soldering.	
5.0		**Detection of Hardware faults and Result verification**	**05**
	5.1	Identify the hardware faults in designed circuit and subsequently rectify it	
	5.2	Now again verify the hardware results by using electronic tools and equipment's like multimeter, CRO, DSO etc.	
6.0		**Understanding the Troubleshooting**	**05**
	6.1	Understand the trouble shooting by removing some wired connection.	
	6.2	Understand the trouble shooting of track. Troubleshoot the faculty components or devices	
		Total	**30**

Text Books:

1. Electronics Project Book, Varun Bansal, Hobby Electronics, 1st Edition.
2. Electronics Project for Dummies E. Boysen, N., Muir John Wiley 1st Edition.
3. 30 Arduino Projects for Evil Genius Simon Monk Mc Graw Hill Professional, 2nd Edition
4. Raspberry Pi Electronics projects for Evil Genius Donald Norris Mc Graw Hill Professional, 1st Edition.
5. Electronics Project for Beginners A K Maini Pustak Mahal 1st Edition.

Reference Books:

1. Printed circuit board R S Khandpur McGraw-Hill Education 1st Edition
2. Complete PCB Design Using OrCAD Capture and PCB Editor Kraig Mitzner Academic Press 2nd Edition.