Bachelor of Technology

(Electronics and Telecommunication Engineering)

Curriculum

S.Y. B. Tech.

(With effect from academic year 2022-23 onwards)

Department of Electronics and Telecommunication Engineering

Government College of Engineering,

Aurangabad

Approved in XXIVth Academic Council,Dated 23/07/2022

Electronics & Telecommunication Engineering Department

Program Educational Objective(s)	
After graduation and few years of graduation, the Electronics & Telecommunication Engineering graduates would	
PEO 1	Core Competency: Graduates will provide engineering solutions with a strong base of science and mathematics, subject domain knowledge for challenging problems in Electronics and allied disciplines.
PEO 2	Career Building: Graduates will fulfill professional responsibilities effectively by synergizing theoretical and practical skills.
PEO 3	Technical Proficiency: Graduates will practice analytical, creative, innovative skills for higher education, research, industrial development.
PEO 4	Managerial Skills: Graduates will perform cohesively in groups using moral, ethical practice, managerial, entrepreneurial skills for welfare of society with global outlook.

Government College of Engineering, Aurangabad
(An Autonomous Institute)
Teaching and Evaluation Scheme from year 2022-23
Second Year - B. Tech. Program in Electronics & Telecommunication Engineering
Semester III

Course				Teaching Scheme			Continuous Evaluation in terms of Marks					
Sr No	Category	Course Code	Course Name	TH	T	PR	Credits	ISE I	ISEII	ISEIII	ESE	Total (100)
1	BSC	MABS2004	Engineering Mathematics III	2	1	-	3	15	15	10	60	100
2	PCC	ETPC2001	Electronic Devices & Circuits	3	-	-	3	15	15	10	60	100
3	PCC	ETPC2003	Digital Electronics	3	-	-	3	15	15	10	60	100
4	PCC	ETPC2005	Signals & Systems	3	-	-	3	15	15	10	60	100
5	PCC	ETPC2007	Network Theory	3	-	-	3	15	15	10	60	100
6	ESC	ETES2001	Instrumentation & Measurement (I&M)	2	-	-	2	15	15	20	00	50
7	PCC	ETPC2002	Lab-Electronic Devices & Circuits	-	-	2	1	-	-	25	25	50
8	PCC	ETPC2004	Lab Digital Electronics	-	-	2	1	-	-	25	25	50
9	PCC	ETPC2006	Lab Signals & Systems	-	-	2	1	-	-	25	25	50
10	PCC	ETPC2008	Lab Network Theory	-	-	2	1	-	-	25	25	50
11	ESC	ETES2002	Lab (I & M)	-	-	2	1	-	-	25	-	25
			Total	**16**	**1**	**10**	**22**	**90**	**90**	**195**	**430**	**775**

Semester IV

Sr No	Category	Course Code	Course Name	TH	T	PR	Credits	ISE I	ISEII	ISEIII	ESE	Total (100)
1	BSC	MABS2011	Engineering Mathematics IV	3	1	-	4	15	15	10	60	100
2	PCC	ETPC2009	Linear Integrated Circuits	3	-	-	3	15	15	10	60	100
3	PCC	ETPC2011	Analog Communication	3	-	-	3	15	15	10	60	100
4	PCC	ETPC2013	Microprocessor & Microcontrollers	3	-	-	3	15	15	10	60	100
5	PCC	ETPC2015	Control Systems	3	-	-	3	15	15	10	60	100
6	PCC	ETPC2010	Lab Linear Integrated Circuits	-	-	2	1	-		25	25	50
7	PCC	ETPC2012	Lab Analog Communication	-	-	2	1	-		25	25	50
8	PCC	ETPC2014	Lab Microprocessor & Microcontrollers	-	-	2	1	-		25	25	50
9	PCC	ETPC2016	Lab Control Systems	-	-	2	1	-		25	25	50
10	OEC I		Open Elective -I	3	-	-	3	15	15	10	60	100
11	Mandatory course	INMC2010	Environmental Studies	3	-	-	-	15	15	10	60	100
			Total	**21**	**1**	**8**	**23**	**105**	**105**	**170**	**520**	**900**

Industrial training of 4 weeks may be completed after second/third year.
Activities from Group I and Group II may be completed this year.

TH-Theory Lectures, T-Tutorials, PR-Practical, ISE I, II, III – In Semester Evaluations, ESE-End Semester Examination

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MABS 2004: Engineering Mathematics-III (For E&TC/CSE)		
Teaching Scheme	**Examination Scheme**	
Lectures: 02 hrs/ week	**ISE I**	**15 Marks**
Tutorial: 01 hrs/ week	**ISE II**	**15 Marks**
Total Credits: 03	**ISE III**	**10 Marks**
	End Semester Evaluation	**60 Marks**

Perquisites: Nil

Course Description:

MABS 2004: Engineering Mathematics-III is a compulsory course to Second Year engineering students of E&TC and CSE of the institute in the Semester –III and is a continuation of previous year courses viz. MABS1001: Engineering Mathematics-I and MABS1002: Engineering Mathematics-II. The course aims to equip the students with statistical tools and concepts that help in decision-making. This course is intended to provide Engineering students a coherent and balanced account of probability and statistics that form the basis of many engineering analytical tools.

Course objectives:

1. To create interest in students in statistical thinking.
2. To understand, analyze, and solve problems on random variables statistics, significance testing and goodness of fit tests for probability distributions.

Course Outcomes:

After completing the course, students will be able to

CO1	Define the basic concepts of probability distributions, random variable and sampling
CO2	Explain the concepts of random variable, probability distributions and population parameters of large or small size sample
CO3	Apply the regression techniques (least square method) and correlation techniques to the sample data, testing hypothesis for small and large samples
CO4	Compute and interpret the results of Bi-variate regression and correlation analysis, for forecasting
CO5	To apply non-parametric tests for significance testing and goodness of fit of the probability distribution

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Programme Outcomes Engineering Graduates will be able to:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program specific outcomes

1. Graduates will be able to apply subject domain knowledge to design and develop Electronics Circuits and Systems for Industrial Solutions
2. Graduates will be able to design and analyses various types of Communication Systems
3. Graduates will be able to apply concepts of Signal Processing and algorithm to develop diversified application

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Mapping of PEOs and POs

Program Educational Objective(s)		Mapped Programme Outcomes
PEO 1	Core Competency: Graduates will provide engineering solutions with strong base of science and mathematics, subject domain knowledge for challenging problems in Electronics and allied disciplines.	1,2,3,4,5,6
PEO 2	Career Building: Graduates will fulfill professional responsibilities effectively by synergizing theoretical and practical skills.	6,7,8,9,10,11,12
PEO 3	Technical Proficiency: Graduates will practice analytical, creative, innovative skills for higher education, research, industrial development.	1,2,3,4,5,6,9,11
PEO 4	Managerial Skills: Graduates will perform cohesively in group using moral, ethical practice, managerial, entrepreneurial skills for welfare of society with global outlook.	7,8,9,10,11,12

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Detailed Syllabus:

Unit-I	**Basic Statistics:** Measures of central tendency, dispersion, moments, skewness and kurtosis, correlation coefficient, lines of regression, curve fitting, method of least square, straight lines, second degree parabola, exponential and power curves.
Unit-II	**Random Variables:** Random variable, discrete random variables, continuous random variables, definition of distribution and types of distribution: p.d.f, p.m.f, c.d.f. of random variables, characteristic function of random variables, univariate and bivariate distribution and its marginal distribution.
Unit-III	**Mathematical Expectations:** Mathematical expectation: definition and properties, mean, variance, standard deviation in terms of expectations, moment generating function, characteristics function.
Unit-IV	**Probability distribution:** Binomial distribution, Poisson distribution, Normal distribution, Chi-square distribution and Student's t distribution.
Unit-V	**Sampling and Tests of Significance**: Basic concepts sampling and its type (simple random, stratified and cluster), its needs; types of hypothesis, types of error, critical region; level of significance. procedure of testing hypothesis, test of significance: large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations, test for single mean, difference of means and correlation coefficients, test for ratio of variances - Chi-square test for goodness of fit and independence of attributes.

Text and Reference Books :

1. S.C. Gupta and V.K. Kapoor, *Fundamentals of Mathematical Statistics*, 10th edition, New Delhi, S. Chand & Sons Publications, 2002.
2. S.C. Gupta , *Fundamentals of Statistics*, 7th edition, New Delhi, Himalaya Publishing House, 2021.
3. E. Kreyszig, *Advanced Engineering Mathematics*, 9th edition, New Delhi, John Willey Eastern Ltd. 2006.
4. B.S. Grewal, *Higher Engineering Mathematics* 44th edition, New Delhi, Khanna publication, 2017.
5. N.P. Bali and M. Goyal, *A textbook of Engineering Mathematics*, 9th edition, New Delhi, Laxmi Publications pvt. ltd, 2014.
6. Ross, S.M., *Introduction to Probability and Statistics for Engineers and Scientists*, 5th edition, New Delhi, Elsevier Publication, 2004.

Mapping of Course outcome with Program Outcomes
(Electronics and Telecommunication Engineering & Computer Science Engineering)

Course Outcome	PO 1	PO 2	PO3	PO 4	PO5	PO 6	PO7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
CO1	3	2		2								1
CO2	3	2		2								1
CO3	3	2		2	2							1
CO4	3	3		3								1
CO5	3	3		3								1

3 – High, 2 – Medium, 1 – Low

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Teaching Strategies:

The teaching strategy planned through the lectures, and team based home works. Exercises assigned weekly to stimulate the students to actively use and revise the learned concepts, which also help the students to express their way of solving the problems fluently in written form. Most critical concepts and mistakes emphasized

Assessment: ISE-I, ISE-II, ISE-III (Class Test-1, Class Test-2, TA) & ESE

TA: Students will perform one or more of the following activities

1. Surprise Test
2. Assignment using Mathematical tools like Mathematica / MatLab or similar.
3. Quiz
4. Any other activity suggested by course coordinator

Assessment Pattern:

Assessment Pattern Level No.	**Knowledge Level**	**ISE I (Class Test-1)**	**ISE II (Class Test-2)**	**ISE III (TA + Surprise Test)**	**End Semester Examination**	**Total**
K1	Remember	03	03			06
K2	Understand	08	12	10	40	70
K3	Apply	04			20	24
K4	Analyze					
K5	Evaluate					
K6	Create					
Total Marks 100		15	15	10	60	**100**

Assessment table:

Assessment Tool	K1	K2	K3	K2	K3	Total
	CO1	CO2	CO3	CO4	CO5	
ISE I (15 Marks)	03	04	04	04		15
ISE II (15 Marks)	03	12				15
ISE III (10 Marks)		04		06		10
ESE Assessment (60 Marks)	14	04	16	10	16	60
Total Marks 100	20	24	20	20	16	**100**

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ETPC2001 : Electronic Devices and Circuits	
Teaching Scheme **Lectures: 3 Hrs/Week** **Credits: 03**	**Examination Scheme** **ISE I : 15 Marks** **ISE II : 15 Marks** **ISE III : 10 Marks** **End Semester Examination : 60 Marks**

Prerequisites: Knowledge of Physics and Mathematics

Course Description:

After the completion of this course, students will be able to understand working principles of the semiconductor devices and their applications with frequency analysis response. This will help students in learning dependent core courses.

Course Objectives:

- To acquaint the students with construction, theory and characteristics of various Semiconductor devices
- To lay a strong fundamental base of electronics.
- To develop capacity to interpret and analyze different electronics circuits

Course Outcomes

After completing the course, students will able to:

CO1	Know the basics principles and construction of the semiconductor devices.
CO2	Understand the working of semiconductor devices and their characteristics
CO3	Describe various applications of semiconductor devices
CO4	Explain the working of amplifiers
CO5	Explore the feedback amplifiers
CO6	Illustrate the types of oscillators

Detailed Syllabus:

Unit 1	**Semiconductor and Diode Applications** Energy Band Diagram, mobility, types of semiconductors, drift and diffusion mechanism, current density, drift current density, diffusion current density, direct and indirect bandgap semiconductors Review of the device construction, operation, characteristics, voltage and current equations for PN junction diode. Half Wave, Full Wave and Bridge Rectifiers, Clippers and Clampers, Over-voltage protection circuits
Unit 2	**BJT (Bipolar Junction Transistor)** Device structure and symbol, basic operation, Input and Output Characteristics, Transistor configurations, BJT biasing, Stability factor, h-parameters, transistor amplifier, Hybrid – π parameter.
Unit 3	**FET (Field Effect Transistor)** Structure, symbol, basic operation, drain and transfer characteristics, biasing arrangements for JFET and MOSFET. Review of device construction, operation, characteristics,voltage & current equations and applications for MOSFET and JFET.
Unit 4	**Feedback Amplifiers and Oscillators** Introduction, The Basic concepts of Feedback, Effect of Negative Feedback, Types of Negative Feedback Connections, Method of Identifying Feedback Topology and Feedback Factor, Stability of Feedback Amplifier. Single stage and multistage and differential amplifiers Barkhausen criteria of stability, Types of oscillators -Wien bridge, Hartley, Colpitts and Crystal oscillators

Unit 5	**Power Amplifiers** Non-switching Amplifiers- Class A, Class B, Class C, Class AB, Class B Push-pull, Cross-over distortion in Class B Push-pull. etc.

Text and Reference Books

1. Boylestad & Nashelsky, *Electronics Devices & Circuits*, 10th edition, Pearson Education 2009
2. Millman & Halkias, *Electronic Devices & Circuits*, 4th edition, McGraw Hill Education, 2015
3. D. A. Neamen, *Electronic circuit analysis and design*, 2nd edition, Irwin Professional Publishing, 1996
4. S.Salivahanan, N Sureshkumar, *"Electronic Devices and Circuits"*, 3rd edition, McGraw Hill Publication 2012
5. J.B. Gupta, *"Electronic Devices and Circuits"*, 6th Edition, Katson Education Series 2009

Mapping of Course outcome with Program Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	2	1								2			2		
CO2	2	1								2			2	1	
CO3	2	2	2	1	2				1	2			2	1	
CO4	1	3	2	2	2	1	1	1		2			2	2	1
CO5	3									2			2	1	1
CO6	3	3	1		3					2			2	1	1

3 – High 2 – Medium 1 - Low

Assessment:

ISE I:	Shall be on the basis of Class Tests/ Assignments/ Quizzes/ Field visits/ Presentations/ Course Projects
ISE II:	Shall be based on class test
ISE III:	Shall be on the basis of Class Tests/ Assignments/ Quizzes/ Field visits/ Presentations/ Course Projects

Assessment Pattern:

Assessment Pattern Level No.	Knowledge Level	ISE I	ISE II	ISE III	End Semester Examination
K1	Remember	05	00	02	10
K2	Understand	10	05	03	30
K3	Apply	00	10	05	20
K4	Analyze	00	00	00	00
K5	Evaluate	00	00	00	00
K6	Create	00	00	00	00
Total Marks 100		15	15	10	60

Assessment Table:

Assessment Tool	K1	K2	K2	K2	K3	K3
	CO1	CO2	CO3	CO4	CO5	CO6
ISE I (15 Marks)	05	05	05	00	00	00
ISE II (15 Marks)	00	00	00	05	05	05
ISE III (10 Marks)	02	0	03	00	02	03
ESE Assessment (60 Marks)	10	10	10	10	10	10

ETPC2002: Lab-Electronic Devices and Circuits	
Teaching Scheme **Practical: 2Hrs/Week** **Credits: 01**	**Examination Scheme** **ISE III : 25 Marks** **End Semester Examination : 25 Marks**

Laboratory Course Outcomes

As an outcome of completing the Laboratory course, students will able to:

CO1	Know the testing of components
CO2	Understand of electrical circuits in practical applications
CO3	To analyze and design amplifier circuits, oscillators and filter circuits employing BJT, FET devices
CO4	Implement a hardwired circuit to test performance and application for what it is being designed.

List of Experiments

Sr. No.	Details
1	To Test various Electronics components and equipment.
2	To calculate Efficiency and Ripple Factor in case of Half Wave, Full Wave & Bridge Rectifier and to observe the effect of load and filters.
3	To study of Series Positive Clipper, Series Negative Clipper, Shunt Positive Clipper and Shunt Negative Clipper Circuits
4	To analyze the Drain and Transfer Characteristics of N- channel MOSFET
5	To evaluate Input resistance, Output resistance and Current gain of NPN and PNP Transistor in CB, CC and CE Configuration also plot their characteristics
6	To evaluate DC Drain resistance, Transconductance, Amplification factor and plot the V-I characteristics of JFET
7	To plot the Frequency response of RC–Coupled amplifier
8	To plot the Frequency response of a FET amplifier.
9	To design and functioning of Hartley Oscillator ,Colpitt Oscillator and Wein Bridge Oscillator
10	To design Class A, Class B and Class AB Push-pull Amplifier
11	To Study of the working principle of class C Amplifier , Differential amplifier and its operation at tuned frequency

Mapping of Course outcome with Program Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	3	3		2	2	1	2	2	2	2		1			
CO2	2	3		2					2	2		1			
CO3	1	2	3	2	2					2	1	1	2	2	2
CO4			3	3	2	1							2	2	2

3 – High 2 – Medium 1 – Low

Assessment: ISE III: Shall be based on the assessment of submission work and interaction with students till the end of the term.

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Assessment Pattern

Assessment Pattern Level No.	Knowledge Level	ISE III	ESE
S1	Imitation	05	05
S2	Manipulation	15	15
S3	Precision	05	05
S4	Articulation	00	00
S5	Naturalization	00	00
		25	25

Assessment table

Assessment Tool	S1	S2	S2	S3
	CO1	CO2	CO3	CO4
ISE III (25 Marks)	05	05	10	05
ESE (25 Marks)	05	05	10	05

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ETPC2003: Digital Electronics		
Teaching Scheme	**Examination Scheme**	
Lectures: 03 hrs/ week	**ISE I**	**15 Marks**
Credits: 03	**ISE II**	**15 Marks**
	ISE III	**10 Marks**
	End Semester Examination	**60 Marks**

Prerequisites: Nil

Course description: After completing this course, students will have a clear and fundamental understanding of Digital systems. Topics range from an overview of Basics of Digital Electronics, Types of digital logics, different logic families and Finite State Machine

Course Objectives:

- To introduce basic postulates of Boolean algebra and show the correlation between Boolean expressions.
- To introduce the methods for simplifying Boolean expressions.
- To present the Digital fundamentals, Boolean algebra and its applications in digital systems
- To learn the procedures for the analysis and design of combinational circuits.
- To outline the formal procedures for the analysis and design of sequential circuits.
- To introduce the concept of memories and programmable logic devices.
- To introduce the concept of synchronous and asynchronous sequential circuits and to design Combinational and Sequential circuits to solve real world problem

Course Outcomes:

Students will be able to:

CO1	Understand Boolean algebraic theorems and different minimization techniques
CO2	Apply the knowledge of digital circuit concepts to optimize a digital circuit.
CO3	Develop a digital logic and apply it to solve real life problems.
CO4	Design and implement Combinational circuits that solve binary logical tasks
CO5	Design and implement synchronous and asynchronous sequential circuits.
CO6	Summarize different logic devices and logic families

Detailed Syllabus

UNIT 1	**Minimization Techniques and Logic Gates** Boolean postulates and laws, De-Morgan's Theorem, Principle of Duality, Boolean expression, Minimization of Boolean expressions, Minterm, Maxterm, Sum of Products (SOP), Product of Sums (POS), Karnaugh map Minimization, Don't care conditions, Quine-McCluskey method of minimization. Conversion of basic logics gates to universal logic gates, Implementations of Logic Functions using gates, NAND–NOR implementations, Multi level gate implementations, Multi output gate implementations. Introduction to CAD tools and VHDL

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UNIT 2	**Combinational Circuits** Design procedure, Half adder, Full Adder, Half subtractor, Full subtractor, Parallel binary adder, parallel binary Subtractor, Fast Adder, Carry Look Ahead adder, Serial Adder/Subtractor, BCD adder, Binary Multiplier, Binary Divider, Multiplexer/ Demultiplexer, decoder, encoder, parity checker, parity generators, code converters, Magnitude Comparator.
UNIT 3	**Sequential Circuits** Latches, Flip-flops, SR, JK, D, T, and Master-Slave, Characteristic table and equation, Application table, Edge triggering, Level Triggering, Realization of one flip flop using other flip flops, serial adder/subtractor, Counters, Asynchronous and Synchronous counters, Ring Counter, Johnson counter, Registers, shift registers, VHDL code for Flipflop and counter.
UNIT 4	**Memory Devices And Digital Integrated Circuits** Basic memory structure: ROM,PROM, EPROM, EEPROM, EAPROM, RAM, Static and dynamic RAM, Programmable Logic Devices, PLA, PAL, FPGA, combinational logic circuits using PLA, PAL. logic families and their characteristics-RTL, TTL, ECL, CMOS, Tristate gates, Logic levels, propagation delay, power dissipation, fan-out and fan-in, noise margin,
UNIT 5	**Sequential Circuits Design** Synchronous Sequential Circuits: Basic design steps. Mealy and Moore state models, state minimization. Design of counter using sequential circuit approach. Algorithmic State Machine (ASM) charts. Asynchronous Sequential Circuits: Behavior, Analysis, Synthesis, State reduction, state assignments, Examples. Hazards

TEXT AND REFERENCE BOOKS

1. M. Morris Mano, *Digital Design*, 4th Edition, Prentice Hall of India Pvt. Ltd., 2008
2. W.H. Gothman, *Digital Electronics-An introduction to theory and practice*, PHI, 2016
3. A.P.Malvino, D.P.Leach, *Digital Principles and Applications*, 4th Edition,MGH, 2018
4. R.P.Jain, *Modern Digital Electronics*, 4th Edition, Tata McGraw Hill, 2009
5. Charles H Roth, *Digital Systems Design using VHDL*, Thomson Learning, 1998
6. H.Taub, D. Schilling, *Digital Integrated Electronics*, McGraw Hill, 2017
7. D.A. Hodges, H.G. Jackson, *Analysis and Design of Digital Integrated Circuits*, 3rd Edition, International Student Edition, McGraw Hill, 2005

Mapping of Course Outcome with PO and PSO

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	2												1		
CO2		2	3	2	2								1	2	
CO3		2	3	2	2								1	2	
CO4		2	3	2	2								1	2	
CO5		2	3	2	2								1	2	
CO6				2	3								1	2	

3 – High 2 – Medium 1 – Low

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Assessment:

ISE I:	Shall be on the basis of Class Tests/ Assignments/ Quizzes/ Field visits/ Presentations/ Course Projects
ISE II:	Shall be based on class test
ISE III:	Shall be on the basis of Class Tests/ Assignments/ Quizzes/ Field visits/ Presentations/ Course Projects

Assessment Pattern

Assessment Pattern Level No.	**Knowledge Level**	**ISE 1**	**ISE II**	**ISE III**	**End Semester Examination**
K1	Remember	05	05	-	12
K2	Understand	05	05	05	30
K3	Apply	05	05	05	18
K4	Analyze	-	-	-	-
K5	Evaluate	-	-	-	-
K6	Create	-	-	-	-
		15	15	10	60

Assessment table

Assessment Tool	K1,K2,K3	K1,K2,K3	K1,K2	K1,K2	K1,K2,K3	K3
	CO1	CO2	CO3	CO4	CO5	CO6
ISE I (15 Marks)	04	05	06	-	-	-
ISE II (15 Marks)	-	-	-	05	05	05
ISE III (10 Marks)	-	-	-	05	05	-
ESE Assessment (60 Marks)	12	10	10	08	15	05

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ETPC2004: Lab Digital Electronics		
Teaching Scheme	**Examination Scheme**	
Practical: 2 Hrs/Week	**ISE III**	**25 Marks**
Credits :01	**End Semester Examination**	**25 Marks**

Laboratory Course Outcomes
As an outcome of completing the Laboratory course, students will able to:

CO1	Implement logical operations using basic and universal logic gates
CO2	Perform and realize arithmetic, logic circuits using ICs
CO3	Execute and realize the combinational logic circuits using gates and ICs
CO4	Perform and realize sequential logic, circuits using ICs.

List of Experiments (Note: At least 10 Practical should be performed)

Sr. No.	Details
1	To verify of logic gates such as AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR
2	To realize logic operations using NAND /NOR
3	To reduce Karnaugh Map (SOP/POS) • Realize a code converter binary to gray • Realize a circuit to detect prime numbers in a 4-bit binary numbers • Realize a circuit to detect the numbers divisible by 03 in 4-bit binary numbers
4	To develop Adder/ Subtractor Study of 4-bit adder using IC7483
5	Multiplexer- Demultiplexer Study of 4-bit Adder using 4:1 MUX
6	To study Encoder 8:3, 16:4, Decoder 3:8, 4:16
7	To study comparators Ic 7485
8	To study Flip-flops D, R-S, J-K Realize conversion of JK to T, JK to D flip flop
9	To design Asynchronous counter using J-K Flip-flops
10	To study Shift Register and their application using ICs 7476,7495
11	To study Decade counter/Ring counter
12	To design Synchronous Counter using J-K Flip –flops
13	Realization of 3 bit counter as sequential circuit and Mod-N counter design (7476,7490,74192,74193)
14	Introduction to Hardware Description Language

Mapping of Course outcome with Program Outcomes and Program Specific Outcomes

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	2	3	3	3	3							3			
CO2	2	2	3	1	3							2			
CO3	2	2	3	2	2							3			
CO4	2	3	3									3			

Assessment: ISE III: Shall be based on the assessment of submission work and interaction with students till the end of the term.

Approved in XXIVth Academic Council,Dated 23/07/2022

Assessment Pattern

Assessment Pattern Level No.	Knowledge Level	ISE III	ESE
S1	Imitation	05	05
S2	Manipulation	15	15
S3	Precision	05	05
S4	Articulation	00	00
S5	Naturalization	00	00
		25	25

Assessment table

Assessment Tool	S1	S2	S3	S2
	CO1	CO2	CO3	CO4
ISE III (25 Marks)	05	05	10	05
ESE (25 Marks)	05	05	10	05

Approved in XXIVth Academic Council,Dated 23/07/2022

ETPC2005: Signals & Systems		
Teaching Scheme	**Examination Scheme**	
Lectures: 03 hrs/ week	**ISE I**	**15 Marks**
Credits: 03	**ISE II**	**15 Marks**
	ISE III	**10 Marks**
	End Semester Examination	**60 Marks**

Prerequisites: Knowledge of Mathematics, electrical circuits and networks.

Course Description:

The course will provide a strong foundation on signals and systems which will be useful for creating the foundation of communication and signal processing. The students will learn basic continuous time and discrete time signals and systems. Students will understand the application of various transforms for analysis of signals and systems both continuous time and discrete time. Students will also explore power and energy signals and spectrum.

Course Outcomes

After completing the course, students will be able to:

CO1	Recognize different signals, systems and transforms
CO2	Understand the characteristics of signals and systems and study basic operations of signals
CO3	Evaluate time domain response of LTI systems
CO4	Infer steps of finding the transforms
CO5	Interpret properties of transform
CO6	Apply transform to analyze the system variables

Detailed Syllabus:

Unit 1	Basic definitions, Classification of signals and systems. Signal operations and properties, Basic continuous time signals, signal sampling and reconstruction, Basic system properties
Unit 2	Continuous and discrete time: Impulse response characterization and convolution integral for LTI system, signal responses to LTI system, properties of convolution, LTI system response properties
Unit 3	Fourier Analysis of Continuous Time Signals and Systems, Fourier Series, Fourier Transform and properties and applications, Fourier Analysis of Discrete Time Signals and Systems, Discrete Time Fourier series, Discrete Fourier Transform and properties.
Unit 4	Laplace Transform and its properties, Inverse Laplace Transform Application of Laplace transforms
Unit 5	The Z-Transform, Convergence of Z-Transform, Basic Z-Transform, Properties of Z- Transform, Inverse Z-Transform and Solving difference equation using Z-Transform

TEXT AND REFERENCE BOOKS

1. Alan V. Oppenheim, Alan S. Wilsky, S.H. Nawab, *Signals and Systems*, 2nd ed., Prentice Hall, 2018
2. K. Gopalan, *Signals and Systems,* 1st ed., Cengage Learning (India Edition), 2010
3. Michal J. Roberts, Govind Sharma, *Fundamentals of Signals and Systems,* 2nd ed., Tata Mc-Graw Hill Publications, 2012
4. Simon Haykin, Bary Van Veen, *Signals and Systems* 2nd ed., by Wiley- India Publications, 2007
5. B.P.Lathi, *Linear Systems and Signals* 3rd ed., Oxford University Press
6. Charles L. Philips, J. M. Parr and E. A. Riskin, 4th ed., *Signal, Systems and Transforms* by Pearson Education, 2008
7. Li Tan, *Digital Signal Processing: Fundamentals and Applications*, Elsevier, Academic Press, 2008
8. Signal and Systems By Anand Kumar, 3rd Edition, PHI

Mapping of Course outcome with Program Outcomes and Program Specific Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	-	-	-	-	-	-	2	2	-	1	2	2	3
CO2	2	2	1	-	-	-	-	-	2	2	-	1	2	3	3
CO3	2	2	1	1	-	-	-	-	2	2	-	1	-	3	3
CO4	2	2	1	-	-	-	-	-	2	2	-	1	2	3	3
CO5	2	1	1	1	1	-	-	-	2	2	-	1	-	2	3
CO6	3	2	1	1	1	-	-	-	2	2	-	1	-	2	-

3 – High 2 – Medium 1 – Low

Assessment:

ISE I:	Shall be on the basis of Class Tests/ Assignments/ Quizzes/ Field visits/ Presentations/ Course Projects
ISE II:	Shall be based on class test
ISE III:	Shall be on the basis of Class Tests/ Assignments/ Quizzes/ Field visits/ Presentations/ Course Projects

Assessment Pattern

Assessment Pattern Level No.	Knowledge Level	ISE I	ISE II	ISE III	End Semester Examination
K1	Remember	05	-	-	05
K2	Understand	10	10	05	50
K3	Apply	-	05	05	05
K4	Analyze	-	-	-	-
K5	Evaluate	-	-	-	-
K6	Create	-	-	-	-
Total Marks 100		15	15	10	60

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Assessment table

Assessment Tool	K1	K2	K2	K2	K2	K3
	CO1	CO2	CO3	CO4	CO5	CO6
ISE I(15 Marks)	05	05	05	-	-	-
ISE II (15 Marks)	-	-	-	05	05	05
ISE-III (10 Marks)	-	-	05	-	-	05
ESE Assessment (60 Marks)	05	15	05	15	15	05

Approved in XXIVth Academic Council,Dated 23/07/2022

ETPC2006: Lab - Signals & Systems		
Teaching Scheme	**Examination Scheme**	
Practical: 2 Hrs/Week	**ISE III**	**25 Marks**
Credits :01	**End Semester Examination**	**25 Marks**

Laboratory Course Outcomes

As an outcome of completing the Laboratory course using MATLAB/CCS/IDE, students will able to:

CO1	Write the programs for signal generation, operations, transformation.
CO2	Use simulation tools for signal generation, operations, and transformation.
CO3	Understand the time and frequency domain representation of discrete time signals through simulation.
CO4	Prove properties of transforms.

Lists of Experiments

1	Understand basic Matlab functions and its IDE and learn and understand Simulink toolbox.
2	Write a program to generate the discrete sequences (i) unit step (ii) unit impulse (iii) ramp (iv)periodic sinusoidal sequences. Plot all the sequences. Using Function generators and CRO observe these signals in a continuous time domain. Also vary and measure their amplitude and frequency. Generate these signals using the Simulink toolbox.
3	Generate a discrete time sequence by sampling a continuous time signal. Show that with sampling rates less than Nyquist rate, aliasing occurs while reconstructing the signal.
4	Perform basic operations like addition, subtraction, folding, shifting on signals.
5	Extraction of odd and even parts of 5 different signals and compare with the theoretical results.
6	Write a program to convolve any two discrete time sequences. Plot all the sequences. Verify the result by analytical calculation. Convolve the two x1(n), x2(n) signals. Convolve x1(n) with x3(n), x4(n) and compare the results of each convolution. Try the same for x2(n) also.
7	Find the Fourier transform of a square pulse, sinusoidal signal, exponential signal Plot their amplitude and phase spectrum. Compare the results with mathematical solutions. Also find the inverse Fourier transform.
8	Find the Laplace and inverse Laplace transform of the given functions. Verify the result by analytical calculation. Plot the characteristics. Find the Z transform and inverse Z transform of the given functions. Verify the result by analytical calculation.
9	Write a program to prove the time shifting property of Laplace, Z and Fourier transform.
10	Implement signal transforms using Simulink.

Mapping of Course outcome with Program Outcomes and Program Specific Outcomes

CO No.	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02	PSO 03
01	1	-	-	1	2	-	-	-	-	1		-	1	2	2
02	1	1	1	1	2	-	-	-	-	1		3	2	2	2
03	1	1	1	1	2	-	-	-	-	1		3	2	2	2
04	1	-	-	1	2	-	-	-	-	1		3	2	2	2

3- High 2-Medium 1-Low

Assessment: ISE III: Shall be based on the assessment of submission work and interaction with students till the end of the term.

Assessment Table

Assessment Tool	S2 CO1	S2 CO2	S2 CO3	S2 CO4
ISE III (25 Marks)	10	05	05	05
ESE (25 Marks)	10	05	05	05

Assessment Pattern

Level	Skill	ISE III	Practical Examination & Viva voce
S1	Imitation	05	05
S2	Manipulation	20	20
S3	Precision	-	-
S4	Articulation	-	-
S5	Naturalization	-	-
Total		**25**	**25**

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ETPC2007 : Network Theory		
Teaching Scheme	**Examination Scheme**	
Lectures: 03 hrs/ week	**ISE I**	**15 Marks**
Credits: 03	**ISE II**	**15 Marks**
	ISE III	**10 Marks**
	End Semester Examination	**60 Marks**

Course description: On completion of this course, students will have a basic and comprehensive understanding of network analysis and synthesis methods. It includes the network analysis methods, resonance, transient analysis, properties of symmetric and asymmetric network, passive filter design, attenuator, network functions and two port parameters.

Course Objectives:

1. To offer basic understanding for solving circuits using network theorems.
2. To explain resonance circuits, properties of symmetric and asymmetric passive network, passive filters and attenuators.
3. To give knowledge about two port parameters, network functions, stability and transient analysis of basic circuits.

Course Outcomes

After completing the course, students will able to:

CO1	Define basic terms in concern with different networks.
CO2	Simplify network using different network analysis methods
CO3	Estimate transient analysis of networks.
CO4	Perform AC analysis of networks.
CO5	Determine two port network parameters, driving point functions and transfer functions
CO6	Apply the knowledge of network analysis to solve given problem.

Detailed Syllabus:

Unit 1	**Network Analysis:** Mesh, Super mesh, Node and Super Node analysis, Superposition, Thevenin's, Norton's and Maximum Power Transfer Theorems, Milaman's Theorem. Electromagnetic induction, **Graph Theory:** Network graph, tree, co-tree, and loops. Incidence matrix, tie-set, cut-set matrix. Formulation of equilibrium equations in matrix form
Unit 2	**Transient Analysis of Basic RC, RL and RLC Circuits** Initial conditions, source free RL and RC circuits, properties of exponential response, Driven RL and RC circuits, Natural and Forced response of RL and RC circuits. Introduction to Source free and driven series RLC circuit. Over damped and Under damped series RLC circuit.
Unit 3	**Resonance** **AC Circuits: R, L, C, RL, RC, RLC (series and parallel AC circuits)** **Series Resonance:** Impedance, Phase angle variations with frequency, Voltage and current variation with frequency, Bandwidth, Selectivity. **Parallel resonance:** Resonant frequency and admittance variation with frequency Bandwidth and selectivity. General case: Resistance present in both branches. Comparison and applications of series and parallel resonant circuits.

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Unit 4	**Filters and Attenuators** **Classifications:** Symmetrical networks, asymmetrical networks, properties of symmetrical and asymmetrical networks. **Filters:** Filter fundamentals, Constant K-LPF, HPF, BPF and BSF, introduction to concept of m derived LPF and HPF, Terminating half sections, and composite filters. **Attenuators:** Introduction to Neper and Decibel. Symmetrical T and type attenuators.
Unit 5	**Two Port Network Parameters and Functions** Terminal characteristics of network: Z, Y, h, ABCD Parameters; Reciprocity and Symmetry conditions, Applications of the parameters. Application of Laplace Transforms to circuit analysis. Network functions for one port and two port networks, Pole-zeros of network functions and network stability.

TEXT AND REFERENCE BOOKS

1. Franklin F. Kuo, *Network Analysis and Synthesis*, 2nd ed., Wiley Publications, 2006.
2. M.E. Van Valkanburg, *Network Analysis*, 3rd ed., PHI Publications, 2010.
3. M.E. Van Valkanburg, *Introduction to Modern Network Synthesis*, Wiley Publications, 1960.
4. L. Wadhawa, *Network Analysis and Synthesis,* 3rd ed., New Age International Publications, 2006.
5. Roy Chaudhary, *Networks and Systems*, 2nd ed., New Age International Publications, 2013.
6. John D Ryder, Network Lines and Fields, 2nd ed., PHI, New Delhi, 2015.
7. A. K. Chakarvorty, *Network Filters and Transmission Lines*, 2nd ed., Dhanpat Rai and Co. Publication, 2013.

Mapping of Course outcome with Program Outcomes

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	1	2	2	3				1	1		1	1	2	3
CO2	3	2	2	1	3				1	1		1	2	2	2
CO3	3	2	2	2	3				1	1		1	2	2	2
CO4	3	2	2	2	3				1	1		1	2	2	2
CO5	3	2	2	1	3				1	1		1	2	2	2
CO6	3	2	1	1	3				1	1		1	2	2	2

3- High 2-Medium 1-Low

Assessment: **ISE I**: Shall be on the basis of Class Tests/ Assignments/ Quizzes/ Field visits/ Presentations/ Course Projects

ISE II: Shall be based on class test

ISE III: Shall be on the basis of Class Tests/ Assignments/ Quizzes/ Field visits/ Presentations/ Course Projects

Assessment Pattern

Assessment Pattern Level No.	Knowledge Level	ISE I	ISE II	ISE III	End Semester Examination
K1	Remember	03	03	00	04
K2	Understand	12	12	00	50
K3	Apply	00	00	10	06
K4	Analyze	00	00	00	00
K5	Evaluate	00	00	00	00
K6	Create	00	00	00	00
Total Marks 100		15	15	10	60

Assessment table

Assessment Tool	K1	K2	K2	K2	K2	K3
	CO1	CO2	CO3	CO4	CO5	CO6
ISE-I (15 Marks)	03	06	00	06	00	00
ISE-II (15 Marks)	03	00	06	00	06	00
ISE-III (10 Marks)	00	00	00	00	00	10
ESE Assessment (60 Marks)	04	10	12	16	12	06

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ETPC2008: Lab Network Theory		
Teaching Scheme	**Examination Scheme**	
Practical: 2 Hrs/Week	**ISE III**	**25 Marks**
Credits :01	**End Semester Examination**	**25 Marks**

Laboratory Course Outcomes

As an outcome of completing the Laboratory course, students will able to:

CO1	Experiment for verification of network theorems.
CO2	Plot transient response of RL and RC circuits.
CO3	Measurement of two port parameters for a given circuit.
CO4	Plot frequency response of passive networks.

List of Experiments

Sr. No.	List of Experiments
1	To verify i. Thevenin's theorem. ii. Maximum power transfer theorem iii. Superposition theorem. iv. Norton's Theorem
2	To find transient response of RL and RC circuits
3	To measure the 'Z' and 'Y' parameters of two port network.
4	To measure the 'h' and ABCD parameters of two port network.
5	To simulate R, L, C, RL, RC and RLC series AC circuits.
6	i. To find resonance frequency and bandwidth of series and parallel RLC circuit. ii. To Simulate parallel resonance circuit in which resistance present in both branches
7	To plot frequency response of low pass and high pass filter. Also find out cutoff frequency.
8	To plot frequency response of band pass and band stops filter.
9	To plot frequency response of m derived low pass and high pass filter.
10	Write MATLAB program to draw pole-zero plot of a transfer function. Comment on stability.

Mapping of Course outcome with Program Outcomes

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	2	2	1				1	1		1	2	2	1
CO2	3	2	2	2	2				1	1		1	2	2	1
CO3	3	2	2	2	1				1	1		1	2	2	1
CO4	3	2	2	2	2				1	1		1	2	2	1

3- High 2-Medium 1-Low

Assessment: ISE III: Shall be based on the assessment of submission work and interaction with students till the end of the term.

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Assessment Table

Assessment Tool				
	CO1	CO2	CO3	CO4
Term Work (25 Marks)	05	05	05	10
Practical Examination & Viva Voce (25 Marks)	05	05	05	10

Assessment Pattern

Assessment Pattern Level No.	Skill Level	ISE III	Practical Examination & viva voce
S1	Imitation	00	00
S2	Manipulation	25	25
S3	Precision	00	00
S4	Articulation	00	00
S5	Naturalization	00	00
Total		25	25

Approved in XXIVth Academic Council,Dated 23/07/2022

ETES2001: Instrumentation and Measurement		
Teaching Scheme	**Examination Scheme**	
Lectures: 02 hrs/ week	**ISE I**	**15 Marks**
Credits : 2	**ISE II**	**15 Marks**
	ISE III	**20 Marks**

Prerequisites: Knowledge of basic Electronics

Course description:

This course is electronics - based course dealing with measurements and instrumentation designed for students in Electronics Engineering. It is a theory course based on the use of electrical and electronics instruments for measurements. The course deals with topics such as Principle of measurements, Errors, Accuracy, Units of measurements and electrical standards, Q- meters, Watt-meters, Digital voltmeters, recorders, the principles of operation of transducers used for measurement.

Course Objectives:

- To understand the operation of different instruments
- To familiarize with various measurement methods and electronic measurement equipment's
- To analyze the signals using different analyzers
- To introduce transduction methods

Course Outcomes

After completing the course, students will be able to:

CO1	Identify elements of setup for measurement of physical quantities and parameter.
CO2	Understand the various techniques for parameter measurement & study of signals.
CO3	Apply the complete knowledge of various electronics instruments/transducers to measure the physical quantities in the field of science, engineering and technology.

Detailed Syllabus:

Unit 1	**Instrumentation Basics and bridge measurement** Introduction to measurements, Units and standards of measurement and their classification, Sensing and Transduction, Block diagram of Instrumentation system, Errors in measurements, Probability of errors, Static and Dynamic performance characteristics of measuring Transducer. Bridge measurement: Measurement of Voltage, Current, AC /DC Bridges such as Wheatstone, Kelvin, Maxwell, Hay, Schering, Wein bridge and their application.
Unit 2	**Transducer** Definition, classification, selection criterion, Resistive, Capacitive and Inductive Transducers, Hall Effect Transducer, Thermocouple ,strain gauge, Transducers for measurement of Flow, Viscosity, Humidity, Pressure and necessary signal conditioning.
Unit 3	**Basic Parameter Measurement and analysis by Electronic Instrumentation** AC voltmeters using rectifiers, True RMS voltmeter, Vector voltmeter, Digital voltmeter, Electronic multimeter, Sound level meter, RF Voltage/ power measurement, Recorders. Wave analyzers, Harmonic distortion analyzer, DSO, Spectrum analyzer, logic analyzer, Network Analyzer.

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Text and Reference Books

1. W.D.Cooper, A.D.Helfrick, *Modern Electronic Instrumentation and Measurements*, 3rd Edition, Prentice-Hall of India, 1985
2. H.S.Kalsi, *Electronic Instrumentation and Measurements*,4th Edition, TMH,2019
3. B.Oliver, J.Cage, *Electronic Measurements and Instrumentation*, McGraw Hill, 2017
4. J.J. Carr, *Elements of Electronics Instrumentation and Measurement Handbook*, 3rd Edition,Pearson Education, 2002
5. B.C. Nakra, K.K. Chaudhary, *Instrumentation Measurement and Analysis*, 2nd Edition, Tata McGraw Hill

Mapping of Course outcome with Program Outcomes

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO1	2	2	-	-		-	-	-	-	-	-	-	1	-	1
CO2	2	2	-	-	2	-	-	-	-	-	-	-	2	-	1
CO3	3	2	-	-		1	1	-	-	-	-	-	2	-	1

3 – High **2 – Medium** **1 - Low**

Assessment:

ISE I:	Shall be on the basis of Class Tests/ Assignments/ Quizzes/ Field visits/ Presentations/ Course Projects
ISE II:	Shall be based on class test
ISE III:	Shall be on the basis of Class Tests/ Assignments/ Quizzes/ Field visits/ Presentations/ Course Projects

Assessment Pattern

Assessment Pattern Level No.	Knowledge Level	ISE 1	ISE II	ISE III
K1	Remember	05	05	08
K2	Understand	10	05	06
K3	Apply	-	05	06
K4	Analyze	-	-	-
K5	Evaluate	-	-	-
K6	Create	-	-	-
Total Marks 50		15	15	20

Assessment table

Assessment Tool	K1	K2	K3
	C01	C02	C03
ISE I (15 Marks)	05	10	-
ISE II (15 Marks)	05	05	05
ISE-III (20 Marks)	08	06	06

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ETES2002: Lab Instrumentation & Measurement		
Teaching Scheme	**Examination Scheme**	
Practical: 02 hrs/week	**ISE III**	**25 Marks**
Credits : 01		

Laboratory Course Outcomes

As an outcome of completing the Laboratory course, students will be able to:

CO1	Implement the setup for obtaining characteristics of various transducer.
CO2	Perform experiments for parameter measurements by different instruments.
CO3	To learn how to visualize and work on multidisciplinary tasks.
CO4	Use simulation tools.

List of Experiments

1	Study of Error measurement.
2	Measurement of a. Resistance using Wheatstone bridge b. Capacitance using Schering bridge c. Inductance using Maxwell bridge
3	Measurement of Temperature using a. Thermocouple b. RTD(PT100)
4	Measurement of Strain a. Using strain gauges b. Determine linear range of operation c. Sensitivity
5	Characteristics of a. Photovoltaic cell b. Photoconductive cell c. PIN photodiode d. Phototransistor
6	Study of a. Input output characteristics of LVDT b. Linear range of operation c. Sensitivity
7	Study Pressure transducer characteristics
8	Measurement of Signal Frequency using Digital Oscilloscope
9	Study of Flow Measurement
10	Study of Spectrum Analyzer

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Mapping of Course outcome with Program Outcomes

Course Outcome	PO 1	PO 2	PO3	PO4	PO5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO3
CO1	1		-	3	-	-	-	-	-	-	-	-	-	1	
CO2	1		-	3	-	-	-	-	-	-	-	-	-	1	
CO3	-	2	-	2	-	-	-	-	2	-	-	-	2	1	
CO4	-		-		3	-	-	-	1	1	-	1	-	-	-

3 – High 2 – Medium 1- Low

Assessment: **ISE III:** Shall be based on the assessment of submission work and interaction with students till the end of the term.

Approved in XXIVth Academic Council,Dated 23/07/2022

MABS 2011: Engineering Mathematics IV		
Teaching Scheme	**Examination Scheme**	
Lectures: 03 hrs/ week	**ISE I**	**15 Marks**
Tutorial: 01hr /Week	**ISE II**	**15 Marks**
Total Credits : 4	**ISE III**	**10 Marks**
	End Semester Evaluation	**60 Marks**

Course description:
MABS 2011 Engineering Mathematics IV is a compulsory course to second year engineering students of E&TC of the institute in the Semester IV. This course intends to provide engineering students a coherent and balanced account of major mathematical techniques and tools.

Course Objective:
This course intends to provide an overview of analytical and numerical techniques to solve ordinary and partial differential equations, to introduce and develop the concept of functions of complex variables and the methods of vector analysis, to understand vector spaces, concepts of linear mapping and concepts of orthogonality.

Course Outcomes:

After completing the course, students will be able to:

CO1	Define linear differential equations (LDE), Cauchy's and Legendre's differential equations, first order partial differential equations, Lagrange's equation, analytic function, harmonic function, singularities, residues, vector spaces, subspaces, basis, linear transformation, eigen values, eigenvectors.
CO2	Summaries the solution of LDE with constant and variable coefficients, solution of homogeneous and non-homogeneous PDE, differentiation and integration of vector point functions, complex derivatives.
CO3	Identify Analytic function, harmonic function, Cauchy-Riemann Equations.
CO4	Find line integral, surface integral, volume integral and residues, matrix associated with a linear map, range and kernel of LT, inverse of LT. symmetric, skew-symmetric, and orthogonal matrices, orthogonal basis by using Gram-Schmidt orthogonalization.
CO5	Solve linear differential equations with constant and variable coefficients, first order linear and non linear partial differential equations, second order homogeneous and non homogeneous linear partial differential equations, complex integrals by using Cauchy's integral formula and residue theorem.

Detailed Syllabus:

Unit-I	**Linear Differential Equations (LDE)** Linear differential equations (LDE)with constant coefficients, method of variation of parameters, second order linear differential equations with variable coefficients, Cauchy's and Legendre's differential equations.	06 L+ 02T

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Unit-II	**Partial Differential Equations (PDE)** First order linear/nonlinear partial differential equation, Lagrange's equation, solution to homogeneous and non-homogeneous linear partial differential equations of second and higher order by complementary function and particular integral method.	06 L+ 02T
Unit-III	**Vector Integral Calculus** Review of vector differentiation, line integral, work done in a force field, surface integral, volume integral, Green's theorem, Stoke's theorem, Gauss-Divergence theorem.	06 L+ 02T
Unit-IV	**Functions of Complex Variable** Limit Continuity and differentiation of complex variables, analytic function, harmonic function, Cauchy-Reimann equations, Cauchy's integral theorem, Cauchy's integral formula, singularities, residues, residue theorem.	06 L+ 02T
Unit-V	**Linear Algebra** Vector space, linear dependence of vectors, basis, dimension; linear transformations (maps), range and kernel of a linear map, rank and nullity, inverse of a linear transformation, rank-nullity theorem, composition of linear maps, matrix associated with a linear map, eigen values, eigenvectors, symmetric, skew-symmetric, and orthogonal matrices, eigen bases, Diagonalization; inner product spaces, Gram-Schmidt orthogonalization.	12L + 4T

Text and Reference Books

1. Erwin Kreyszig, *Advanced Engineering Mathematics*, Wiley Eastern Ltd. Mumbai.
2. B. S. Grewal, *Higher Engineering Mathematics*, Khanna publication, New Delhi.
3. N.P. Bali and Manish Goyal, *A TextBook of Engineering Mathematics,* Lakshmi Publications, Reprint 2009.
4. B.V. Ramana, *Higher Engineering Mathematics*, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
5. H. K. Dass, *Advanced Engineering Mathematics,* S. Chand and Sons.
6. Ravish R Singh, Mukul Bhatt, *Engineering Mathematics-A Tutorial Approach*
7. Boyce & DiPrima, *Elementary Differential Equations and Boundary Value Problems*

Mapping of Course outcome with Program Outcomes (Electronics and Telecommunication Engineering)

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2		2								2
CO2	3	2		2								2
CO3	3	2		2								2
CO4	3	2	2	2								2
CO5	3	2	2	2								2

3 – High, 2 – Medium, 1 - Low

Teaching Strategies:

The teaching strategy planned through the lectures, and team based home works. Exercises assigned weekly to stimulate the students to actively use and revise the learned concepts, which also help the students to express their way of solving the problems fluently in written form. Most critical concepts and mistakes emphasized

Teacher's Assessment: Teacher's assessment of 10 marks based on the following.

1) Home assignments
2) Surprise tests with multiple choice questions

Assessment: **ISE I**: Shall be on the basis of Class Tests/ Assignments/ Quizzes/ Field visits/ Presentations/ Course Projects on First and Second unit

ISE II: Shall be based on class test on third and fourth units

ISE III: Shall be on the basis of Class Tests/ Assignments/ Quizzes/ Field visits/ Presentations/ Course Projects on Fifth unit

Assessment Pattern:

Assessment Pattern Level No.	**Knowledge Level**	**ISE I (Class Test-1)**	**ISE II (Class Test-2)**	**ISE III (TA + Surprise Test)**	**End Semester Examination**
K1	Remember	3	3		
K2	Understand	12	12	10	60
K3	Apply				
K4	Analyze				
K5	Evaluate				
K6	Create				
Total Marks	**100**	15	15	10	60

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ETPC2009 : Linear Integrated Circuits		
Teaching Scheme	**Examination Scheme**	
Lectures: 03 hrs/ week	**ISE I**	**15 Marks**
Credits: 03	**ISE II**	**15 Marks**
	ISE III	**10 Marks**
	End Semester Examination	**60 Marks**

Prerequisites: Knowledge of Electronic Devices and Circuits

Course description: This course covers fundamentals of Linear Integrated Circuits. It deals with characteristics of Operational amplifiers. It covers applications such as summing, precision rectifying, filtering as well as timer, PLL *etc.*

Course Objectives:

- To impart knowledge of working principles of Op-Amp & its applications
- To emphasize the features and advantages of integrated circuits
- To introduce the theoretical concepts and applications of analog multipliers & PLL
- To design simple filter circuits for particular application

Course Outcomes: After completing the course, students will able to:

CO1	Define the basic terminology related to Op-Amp.
CO2	Describe the working of op-amp based circuits.
CO3	Illustrate the use of linear ICs.
CO4	Understand op-amp based specific circuits like data converters, active filters, multivibrators.
CO5	Implement the linear/non-linear circuits for signal processing and communications.
CO6	Apply linear circuits for real life situations.

Detailed Syllabus:

Unit 1	**Op-Amp Fundamentals** Block diagram of Op-Amp. An overview of different types of OPAMP, their peculiarities and application areas. Op-Amp parameters, Frequency response, inverting, and non-inverting configurations.
Unit 2	**Op-Amp Applications** Summing amplifier, Difference amplifier, Instrumentation amplifier and applications, Integrator, Differentiator and applications. V to I and I to V converter, Comparators, Limitations of Op-amp as Comparator, Schmitt trigger, Comparator IC LM339, Precision rectifiers, Peak detector.
Unit 3	**Signal Generators** Square wave generators, Triangular wave generators, Saw tooth generators, V to F and F to V converters, function generator IC 8038 , Multi vibrators using IC 555, D-A and A-D converters.
Unit 4	**Active Filter Design** All types of filter responses, First and second order active filters LP and HP, BPF, band reject and bi quad filters, sensitivity analysis.
Unit 5	**Non-linear Applications and Phase Locked Loops** Log and Antilog amplifiers, Analog multipliers, Block diagram of PLL, free running frequency, lock range, capture range, Transfer characteristics of PLL, Block diagram of PLL IC 565, Applications of PLL - Frequency synthesizer, FM demodulator, AM demodulator, FSK demodulator

Text and Reference Books

1.D. Roy Choudhary, Shail Jain, *Linear Integrated Circuits*, 4th Edition, New Age International Pvt. Ltd, 2017.

2.Jacob Miliman, Christos Halkias, *Integrated Circuits,* 2nd Edition New York , Tata Mc Graw-Hill 2017.

3.Ramakant A. Gaikwad, *Op-Amps and Linear Integrated Circuits*,4th Edition, Prentice Hall / Pearson Education, 2015.

4.Robert F.Coughlin, Frederick F.Driscoll, *Operational Amplifiers and Linear Integrated Circuits*,Sixth Edition, PHI, 2001.

5.B.S.Sonde, *System design using Integrated Circuits* , 2nd Edition, New Age Publication, 2001.

6.Gray and Meyer, *Analysis and Design of Analog Integrated Circuits*,5th Edition, Wiley International, 2009.

7.S.Salivahanan & V.S. Kanchana Bhaskaran, *Linear Integrated Circuits*, 2nd Edition ,TMH, 4 th Reprint, 2016.

8.William D.Stanley, *Operational Amplifiers with Linear Integrated Circuits*, 4th Edition Pearson Education, 2001.

Mapping of Course outcome with Program Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1												2		
CO2	2		1										1	2	
CO3	2	2											2		
CO4	2	2	2								1		1	2	
CO5	1	1	1								1		3		
CO6	1		1								1		2		

3 – High 2 – Medium 1-Low

Assessment: ISE I: Shall be on the basis of Class Tests/ Assignments/ Quizzes/ Field visits/ Presentations/ Course Projects

ISE II: Shall be based on class test

ISE III: Shall be on the basis of Assignments / Quizzes / Field visits / Presentations / Course Projects

Assessment Pattern

Assessment Pattern Level No.	Knowledge Level	ISE I	ISE II	ISE III	ESE
K1	Remember	05	00	00	06
K2	Understand	10	15	10	48
K3	Apply	00	00	00	06
K4	Analyze	00	00	00	00
K5	Evaluate	00	00	00	00
K6	Create	00	00	00	00
Total Marks 100		15	15	10	60

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Assessment table

Assessment Tool	K1	K2	K2	K2	K2	K3
	CO1	CO2	CO3	CO4	CO5	CO6
ISE I (15 Marks)	05	05	05	00	00	00
ISE II (15 Marks)	00	00	05	05	05	00
ISE III (10 Marks)	00	05	05	00	00	00
ESE Assessment (60 Marks)	06	12	12	12	12	06

ETPC2010 : Lab Linear Integrated Circuits		
Teaching Scheme	**Examination Scheme**	
Practical: 02 hrs/week	**ISE III**	**25 Marks**
Credits : 01	**End Semester Examination**	**25 Marks**

Laboratory Course Outcomes

As an outcome of completing the Laboratory course, students will able to:

CO1	Conduct the measurement process for Op-Amp parameters.
CO2	Implement wave generator circuits.
CO3	Implement signal processing and wave shaping circuits.
CO4	Demonstrate the applications using linear ICs.

List of Experiments

Sr. No.	List of Experiments
1	Measure operational amplifiers parameters.
2	Implement non inverting amplifiers and to study Op-Amp as unity gain buffer.
3	Implement inverting amplifiers and to study Op-Amps as inverters (sign changer).
4	Implement adder/ subtractor amplifier circuit.
5	Plot output response of Integrator for square and sinusoidal inputs.
6	Plot output response of Differentiator for square and sinusoidal inputs.
7	Plot Frequency response of low pass Butterworth's 2^{nd} order active filter.
8	Plot Frequency response of high pass Butterworth's 2^{nd} order active filter.
9	Assemble Zero crossing detector and observe the input-output waveforms.
10	Implement and plot the output waveform for astable multivibrator using IC 555.

Mapping of Course outcome with Program Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1			2	1								2		
CO2	1		2	2	1								1	2	
CO3	1			2	1								2		
CO4	1		2	2	1								1	1	

3 – High 2 – Medium 1 - Low

Assessment: ISE III: Shall be based on the assessment of submission work and interaction with students till the end of the term.

Assessment Table:

Assessment Tool	S1	S2	S2	S2
	CO1	CO2	CO3	CO4
ISE III (25 Marks)	05	05	05	10
ESE (25 Marks)	05	05	05	05

Assessment Pattern:

Assessment Pattern / Level No.	**Skill Level**	**ISE III**	**ESE**
S1	Imitation	05	05
S2	Manipulation	20	20
S3	Precision	00	00
S4	Articulation	00	00
S5	Naturalization	00	00
Total		25	25

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ETPC2011: Analog Communication		
Teaching Scheme	**Examination Scheme**	
Lectures: 03 hrs/ week	**ISE I**	**15 Marks**
Credits: 03	**ISE II**	**15 Marks**
	ISE III	**10 Marks**
	End Semester Examination	**60 Marks**

Prerequisites: Nil

Course description: After completing this course, students will have a clear and fundamental understanding of Communication theory. Topics range from an overview of types of modulation. Effect of noise in communication is also covered. Subject develops the understanding of students to treat the modulation in time and frequency domain.

Course Objectives:

- To provide students with basics of Analog Communication principles
- To emphasize Analog modulation and demodulation techniques.
- To emphasize Performance of communication circuits in presence of noise
- To emphasize Modern trends in communication systems and transmitter/receiver circuits.

Course Outcomes

After completing the course, students will able to:

CO1	Summarize basic concepts involved in electronic communication
CO2	Elaborate various modulation and demodulation techniques and noise
CO3	Solve equations to obtain different parameters in analog communications
CO4	Explain effect of noise and applications of modulation and demodulation
CO5	Comprehend modulations in time and frequency domain
CO6	Compare different techniques of modulation and demodulation

Detailed Syllabus:

Unit 1	**Amplitude Modulation** Introduction to communication system, Need for modulation, Frequency Division Multiplexing, Amplitude Modulation, Definition, Time domain and frequency domain description, single tone modulation, power relations in AM waves, Generation of AM waves, Switching modulator, Detection of AM Waves; Square law detector, Envelope detector, Double side band suppressed carrier modulators, time domain and frequency domain description, Generation of DSB-SC Waves, Balanced Modulators, Ring Modulator
Unit 2	**SSB Modulation** Frequency domain description, Frequency discrimination method for generation of AM SSB Modulated Wave, Time domain description, Phase discrimination method for generating AM SSB Modulated waves. Demodulation of SSB Waves, Vestigial sideband modulation: Frequency description, Generation of VSB Modulated wave, Time domain description, Envelope detection of a VSB Wave pulse Carrier, Comparison of AM Techniques.

Unit 3	**Angle Modulations** Basic concepts, Frequency Modulation: Single tone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave, Narrow band FM, Wide band FM, Constant Average Power, Transmission bandwidth of FM Wave - Generation of FM Waves, Direct FM, Detection of FM Waves: Balanced Frequency discriminator, Zero crossing detector, Comparison of FM and AM.
Unit 4	**Noise in Analog Modulation** Definition, classification, Noise in Analog communication System, Noise in DSB and SSB System, Noise in AM System, Noise in Angle Modulation System, Threshold effect in Angle Modulation System, Pre-emphasis and de-emphasis.
Unit 5	**Pulse Modulation and Radio Transmitters & Receivers** Types of Pulse modulation, PAM (Single polarity, double polarity) PWM: Generation and demodulation of PWM, PPM, Generation and demodulation of PPM, Time Division Multiplexing. Receiver Types - Tuned radio frequency receiver, Super-heterodyne receiver, RF section and Characteristics - Frequency changing and tracking, Intermediate frequency, AGC, FM Receiver, Comparison with AM Receiver, Amplitude limiting.

Text and Reference Books

1. Simon Haykin, *Introduction to Analog and Digital Communications*, 2nd ed., John Wiley, 2012
2. George F. Kennedy, Davis, *Electronic Communication System*, 4th ed., Tata McGraw Hill
3. F.E.Terman, *Electronics and Radio Engineering*, Mc- Graw Hill.
4. Dennis Roddy, John Coolen, *Electronic Communications,* 4th ed., Pearson, 2008
5. K. Sam Shanmugam , *Digital & Analog and Digital Communication Systems*, Wiley India ed., Wiley,2006
6. Wayne Tomasi, *Electronics Communication Systems-Fundamentals through Advanced*, 5th ed., Pearson, 2013

Mapping of Course outcome with Program Outcomes

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	2	1												2	
CO2	2	2	1								2			1	
CO3	2	2	1								2			1	1
CO4	2	2	2								1			2	1
CO5	2	2	2								1			2	1
CO6	2	2	1											1	1

3 – High, 2 – Medium, 1 - Low

Assessment:

ISE I:	Shall be on the basis of Class Tests/ Assignments/ Quizzes/ Field visits/ Presentations/ Course Projects
ISE II:	Shall be based on class test
ISE III:	Shall be on the basis of Class Tests/ Assignments/ Quizzes/ Field visits/ Presentations/ Course Projects

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Assessment Pattern

Assessment Pattern Level No.	Knowledge Level	ISE I	ISE II	ISE-III	End Semester Examination
K1	Remember	5	00	00	10
K2	Understand	10	15	10	50
K3	Apply				
K4	Analyze				
K5	Evaluate				
K6	Create				
Total Marks 100		15	15	10	60

Assessment table

Assessment Tool	K1	K2	K2	K2	K2	K2
	CO1	CO2	CO3	CO4	CO5	CO6
ISE I (15 Marks)	5	5	5	-	-	-
ISE II (15 Marks)			-	5	5	5
ISE-III (10 Marks)		--	5	-	5	-
ESE Assessment (60 Marks)	10	15	5	15	10	5

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ETPC2012: Lab - Analog Communication		
Teaching Scheme	**Examination Scheme**	
Practical: 2Hrs/Week	**ISE III**	**25 Marks**
Credits : 01	**End Semester Examination**	**25 Marks**

Laboratory Course Outcomes

As an outcome of completing the Laboratory course, students will able to:

CO1	Implement and realize circuits for different modulation techniques
CO2	Implement and realize circuits for different demodulation techniques
CO3	Build and test the basic digital communication circuits
CO4	Write programs for generation and detection of different modulations and demodulation

List of Experiments

Sr. No.	Details
1	Implement the circuit for Amplitude Modulation and Demodulation. Perform this using simulation software (Proteus or similar)
2	Determine modulation index with trapezoidal method and the observed results with the theoretical values
3	Perform the experiment for DSB SC Modulation and Demodulation. Observe the waveforms
4	Perform the experiment for SSB SC Modulation and Demodulation. Observe the waveforms
5	Using the setup for Diode Detector observe the detection of modulated signals
6	Perform the experiment for Frequency Modulation and Demodulation
7	Perform the experiment for PAM generation and Reconstruction
8	Study the setup and output of PWM and PPM: Generation and Reconstruction
9	Build the circuits for Pre Emphasis - De Emphasis Circuits and perform the experiment
10	Perform the experiment AGC Characteristics

Mapping of Course outcome with Program Outcomes

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1				2	1						-	-	1	1	-
CO2				3	2						1	-	1	1	-
CO3				2	1						-	-	-	1	-
CO4				2	1						1	-	-	1	-

3 – High 2 – Medium 1 – Low

Assessment: ISE III: Shall be based on the assessment of submission work and interaction with students till the end of the term.

Assessment Table

Assessment Tool				
	CO1	**CO2**	**CO3**	**CO4**
ISE III (25 Marks)	06	05	04	10
ESE (25 Marks)	06	05	04	10

Assessment Pattern

Assessment Pattern Level No.	Skill Level	ISE III	Practical Examination & viva voce
S1	Imitation	05	05
S2	Manipulation	20	20
S3	Precision	00	00
S4	Articulation	00	00
S5	Naturalization	00	00
Total		25	25

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ETPC2013: Microprocessor & Microcontrollers		
Teaching Scheme	**Examination Scheme**	
Lectures: 03 hrs/ week	**ISE I**	**15 Marks**
Credits: 03	**ISE II**	**15 Marks**
	ISE III	**10 Marks**
	End Semester Examination	**60 Marks**

Prerequisites: Knowledge of Digital Electronics

Course Description: This course deals with the basics of 8086 processor, 8051 microcontroller, architectures, internal organization and their functions. It also caters to interfacing of peripherals to 8051. Study of open source hardware like Arduino boards and Raspberry Pi will also be discussed. Class should be divided preferably into groups consisting of 3-5 students per team to build a microcontroller-based system.

Course Objectives:

- To get acquainted with the architecture of microprocessors and microcontrollers.
- To understand the addressing modes & instruction set of 8085 & 8051 and concepts of Assembly and 'C' Language Programming.
- To develop understanding of interrupt structure and serial I/O section.
- To understand interfacing of different peripherals and develop systems using the same
- To study various open source microcontroller hardware such as Raspberry Pi, Arduino or similar

Course Outcomes: After completing the course, students will be able to:

CO1	State functions of microprocessors, microcontrollers, allied blocks.
CO2	Describe the architecture, instruction sets of microprocessors and microcontrollers.
CO3	Write programs in assembly language and embedded 'C'.
CO4	Understand timers, interrupts and serial communication.
CO5	Implement interfacing applications with microcontrollers and peripherals.
CO6	Design systems using microcontrollers.

Detailed Syllabus:

Unit 1	**8086 Microprocessor** Programmers Model, Memory segmentation, Addressing Modes, Instruction Set, Assembly Programming.
Unit 2	**Introduction to 8051** Differentiation between Microprocessors and Microcontrollers, Functional block diagram, architecture, pin configuration, SFRs special function registers, stack and stack pointer, Internal memory organization, I/O ports, addressing modes, instruction set and simple programs using Assembly Language.
Unit 3	**Peripherals of 8051** Counters and Timers, Serial data input and output, Interrupts, Power saving modes, Interfacing LED, 7-segment LED, LCD, relay, optocoupler, ADC, DAC, Applications of 8051.
Unit 4	**Introduction to Open Source Microcontroller Hardware** Introduction to Arduino family, features, architecture and to Open Source hardware boards like Raspberry Pi.
Unit 5	**Design of microcontroller based systems** Design of industrial projects based on real time problems using microcontroller from 8051 family, Raspberry Pi, Arduino or suitable controllers

Text books, Reference Books and web resources

1. Ramesh Gaonkar, *Microprocessor Architecture, Programming and Applications with 8085/8085A*, 6th ed., Penram International Publishing
2. A.K. Ray and K.M. Bhurchandi, *Advanced Microprocessors and Peripherals*, 3rd ed, McGraw Hill Education.
3. D. V. Hall, SSSP Rao, *Microprocessor and Interfacing*, 3rd ed, McGraw Hill Education
4. Y.C. Liu and A. Gibson, *Microcomputer systems-The 8086/8088 Family:Architecture, Programming and Design*, 2nd ed, Prentice Hall India Learning Private Limited
5. B. B. Brey, *The Intel Microprocessor, Architecture, Programming and Interfacing*, 6th ed, Pearson Education
6. M.A. Mazidi, J. G. Mazidi and R. D. McKinlay, "T*he Microcontroller and Embedded Systems*", 2nd ed, Prentice Hall India Learning Private Limited
7. K. J. Ayala, "*8051 Microcontroller: Architecture, Programming and applications*", 2nd ed, Delmar Cengage Learning
8. M. Predko, *Programming and customizing the 8051 Microcontroller*, McGraw Hill Education
9. M. Margolis, *Arduino Cookbook*, O'Reilly Media Inc, 2nd ed (ebook), https://juniorfall.files.wordpress.com/2011/11/arduino-cookbook.pdf
10. J. Purdum, *Beginning C for Arduino* (ebook), 1st Apress https://www.mica.edu.vn/perso/Vu-Hai/EE3490/Ref/Beginning.C.for.Arduino.Dec.2012.pdf
11. E. Upton and G. Halfacreene, *Raspberry Pi user guide*, 4th ed, Wiley, (ebook), https://dn.odroid.com/IoT/other_doc.pdf

Mapping of Course outcome with Program Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1							1	1	1		3		
CO2	2	2	1						1	1	1	1	3	1	1
CO3	2	2	1	1	1				1	1	1	1	3	1	1
CO4	2	2	1	1	1				1	1	1	1	3	1	1
CO5	2	2	2	2	2				1	1	2	1	3	1	1
CO6	2	2	2	2	2				2	2	3	2	3	2	2

3– High **2 – Medium** **1 - Low**

Assessment: **ISE I**: Shall be on the basis of Class Tests/ Assignments/ Quizzes/ Field visits/ Presentations/ Course Projects

ISE II: Shall be based on class test

ISE III: Shall be on the basis of Class Tests/ Assignments/ Quizzes/ Field visits/ Presentations/ Course Projects

Assessment Pattern

Assessment Pattern Level No.	Knowledge Level	ISE I	ISE II	ISE III	ESE
K1	Remember	05	00	00	06
K2	Understand	10	15	00	42
K3	Apply	00	00	10	12
K4	Analyze	00	00	00	00
K5	Evaluate	00	00	00	00
K6	Create	00	00	00	00
Total Marks 100		15	15	10	60

Assessment table

Assessment Tool	K1	K2	K2	K2	K3	K3
	CO1	CO2	CO3	CO4	CO5	CO6
ISE I (15 Marks)	05	05	05	00	00	00
ISE II (15 Marks)	00	05	10	00	00	00
ISE III (10 Marks)	00	00	00	00	00	10
ESE (60 Marks)	06	18	12	12	12	00
Total Marks 100	**11**	**28**	**27**	**12**	**12**	**10**

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ETPC2014: Lab Microprocessor and Microcontrollers	
Teaching Scheme **Practical: 2 Hrs/Week** **Credits: 1**	**Examination Scheme** **ISE III : 25 Marks** **End Semester Examination : 25 Marks**

Laboratory Course Outcomes

As an outcome of completing the Laboratory course, students will be able to:

CO1	Write algorithms and assembly language programs.
CO2	Write programs with DOS and BIOS function calls and embedded C.
CO3	Design and implement 8051 based systems with simple I/O devices.
CO4	Design systems with Stepper motor, DAC, LCD to 8051.

List of Experiments (Any 10)

Sr. No.	Title of the Experiments
1	Study of 8086 microprocessor trainer/ debug tool to enter, edit and execute program with simple programs
2	Write and execute ALP for (any three) like addition, subtraction, 16-bit addition
3	Write and execute ALP for (any three) like Logical operations, Multiplication, Division
4	Write and execute ALP for- • Block transfer of N bytes of data • Smallest/Largest number from an array • Count '0s', '1s' in a byte
5	Identification and displaying the activated key, output char/string on display using DOS and BIOS function calls.
6	Practice IDE software and universal programmer to program 8051.
7	Write and execute ALP for addition, subtraction, block transfer • Addition of two 8-bit no's stored in internal RAM • Subtraction of two 8-bit no's stored in external RAM • Block transfer of N bytes of data • Bit manipulation programs
8	Write an embedded 'C' program to interface LED, keys and relay Generate various patterns on LEDs (flash, alternate flash, n-bit counter, ring counter) Display status of keys on LEDs
9	Write an embedded 'C' program to interface relay, buzzer, optocoupler
10	Write a program to Interface 7 segment display
11	Write a program to Interface LCD and display messages
12	Write programs and execute to interface stepper motor and rotate it in clockwise, anticlockwise directions, rotate motor by 'N' steps
13	Write program and execute to interface DAC to generate various waveforms like square, ramp, staircase, triangular waveforms

Mapping of Course Outcome with Program Outcomes

Course Outcome	PO1	PO2	PO3	PO 4	PO 5	PO6	PO7	PO8	PO9	PO10	PO1 1	PO12	PSO1	PSO2	PSO3
CO1	1	1		1	2					1			2		
CO2	1	1		1	2					1			3		
CO3	2	2		2	2					2			3	1	1
CO4	2	2		2	2					2			3	1	1

3 – High 2 – Medium 1- Low

Assessment: ISE III: Shall be based on the assessment of submission work and interaction with students till the end of the term.

Assessment Table

Assessment Tool	S1	S2	S2	S3
	CO1	CO2	CO3	CO4
ISE III (25 Marks)	05	06	07	07
ESE(25 Marks)	07	06	06	06

Assessment Pattern

Assessment Pattern / Level No.	**Skill Level**	**ISE III**	**ESE**
S1	Imitation	05	07
S2	Manipulation	13	12
S3	Precision	07	06
S4	Articulation	00	00
S5	Naturalization	00	00
Total		25	25

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ETPC2015: Control Systems		
Teaching Scheme	**Examination Scheme**	
Lectures: 03 hrs/ week	**ISE I**	**15 Marks**
Credits:03	**ISE II**	**15 Marks**
	ISE III	**10 Marks**
	End Semester Examination	**60 Marks**

Prerequisites: Basic knowledge of Signals and Systems

Course description: After completing this course, students will have a broad and fundamental understanding of the Control System. Topics range from an overview of Basics of Control System, State Space Analysis, Overview of Stability analysis, Frequency and Time Response of System.

Course Objectives:

- To provide a clear view of the Control System.
- To get accustomed with Frequency and Time domain Analysis methods for industrial applications.
- To get familiarized with state space analysis with its Controllability and Observability of the Systems.

Course Outcomes

After completing the course, students will be able to:

CO1	Find types of systems, transfer function and stability.
CO2	Obtain transfer function and mathematical modeling of systems.
CO3	Illustrate steady state error constants, compensation networks and state space representation of a system.
CO4	Describe different techniques to find stability of systems.
CO5	Understand controllers and their applications.
CO6	Apply time domain analysis and frequency domain analysis to systems.

Detailed Syllabus:

Unit 1	**Introduction** History of control systems, Laplace transform review, open loop and closed loop systems, introduction of linear and nonlinear control systems, regenerative feedback, transfer function, block diagrams and reduction techniques including signal flow graphs, deriving transfer function of physical systems like electrical networks, Mechanical system.
Unit 2	**Time response analysis** Standard test signals, time response of first order and second order system, steady state Error constants, design specifications of second order system, control system compensators: lead compensations, lag compensation, lag-lead compensation. Basic concept of state, state variable, and state models, state models for linear continuous time function, transfer matrix, diagonalization of transfer function, controllability, observability.

Unit 3	**Stability Analysis** Concept of stability, condition of stability, characteristic equation, relative stability, Routh-Hurwitz criterion, Nyquist stability criterion, Basic Concept of Root Locus, rules of root locus, application of root locus technique for control system.
Unit 4	**Frequency response Analysis** Bode plots, gain margin, phase margin, effect of addition of poles and zeros on bode plots, performance specifications in frequency domain, compensation and their realization in time and frequency domain.
Unit 5	**Industrial controllers** P,PI,PD,PID, Introduction to PLC,PLC programming and its application development.

Text and Reference Books

1. I.J. Nagrath and M. Gopal, *Control Systems Engineering*, Third Edition, New age International Publishers, India, 2001
2. Norman S. Nise, *Control systems Engineering,* Third Edition, John Wiley and Sons Inc., Singapore, 2001
3. K. Ogata, *Modern Control Engineering*, Fourth edition, Pearson Education India, 2002.
4. M Gopal, *Control System Principle and Design*, T.M.H., Fourth Edition, 2012
5. B.C. Kuo, *Automatic Control Systems*, Seventh Edition, Prentice–Hall of India, 2000
6. R.C. Dorf and R.H. Bishop, *Modern Control Systems*, Eighth edition, Addison- Wesley, 1999.
7. Smarajit Ghosh, *Control Systems-Theory and Applications*, Second Edition, Pearson,2012.

Mapping of Course outcome with Program Outcomes and Program Specific Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO 12	PSO1	PS O2	PS O3
CO1	3	2	3	2	2				1	1			1		2
CO2	3	3	2	2	1				1	1			2		2
CO3	3	2	2	1	2				1	1			3		2
CO4	2	2	2	1	1				1	1			1		2
CO5	2	2	2	2	1				1	1			1		2
CO6	3	2	1	2	1				1	1	1		2		2

3 -High 2 – Medium 1 – Low

Assessment: **ISE I**: Shall be on the basis of Class Tests/ Assignments/ Quizzes/ Field visits/ Presentations/ Course Projects

ISE II: Shall be based on class test

ISE III: Shall be on the basis of Class Tests/ Assignments/ Quizzes/ Field visits/ Presentations/ Course Projects

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Assessment Pattern

Level No.	Knowledge Level	ISE I	ISE II	ISE III	End Semester Examination
K1	Remember	03	03	00	4
K2	Understand	12	12	05	32
K3	Apply	00	00	05	24
K4	Analyze	00	00	00	00
K5	Evaluate	00	00	00	00
K6	Create	00	00	00	00
	Total	15	15	10	60

Assessment Table

Assessment Tool	**K1**	**K2**	**K2**	**K2**	**K2**	**K3**
	CO1	**CO2**	**CO3**	**CO4**	**CO5**	**CO6**
ISE I	03	06	06	00	00	00
ISE II	03	00	00	06	00	06
ISE III	00	00	00	05	00	05
ESE Assessment	4	12	12	10	10	12

Approved in XXIVth Academic Council, Dated 23/07/2022

ETPC2016: Lab Control Systems		
Teaching Scheme	**Examination Scheme**	
Lectures: 02 hrs/ week	**ISE III**	**25 Marks**
Credits:01	**End Semester Examination**	**25 Marks**

Laboratory Course Outcomes:

As an outcome of completing the Laboratory course, students will be able to:

CO1	Perform transient and steady state analysis of a control system.
CO2	Determine stability, state space model and implement compensation networks.
CO3	Build simple systems using PLC.
CO4	Simulate and implement small applications.

List of Experiments
(Any 10 of below experiments are to be conducted which will cover all four course Outcomes)

Sr. No.	Details
1	Obtain transfer function and mathematical modeling of a system.
2	Determine Transient response of first order and second order systems.
3	Determine a)step and impulse response for a type '0', type '1', type '2' systems b)Steady state Errors for a type '0', type '1', type '2' systems
4	Find the effect of addition of zeros and poles to the forward path transfer function of a closed loop system
5	Determine a) state space representation, b) controllability c) observability of a system
6	Analyze stability using a)Routh-Hurwitz criteria b)Root Locus, c)Bode Plot, d) Nyquist plot
7	Obtain magnitude and phase plot of compensation networks.
8	Plot characteristics DC Motor Speed Control System.
9	Determine effect of P, PD, PI, PID controller on second order systems.
10	Plot synchro transmitter-receiver characteristics.
11	Use PLC for solving Boolean equations.
12	Obtain speed-torque characteristics of an AC Servo Motor.
13	Plot characteristics of positional error detector by angular displacement of two servo potentiometer

Mapping of Course outcome with Program Outcomes and Program Specific Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO 12	PSO1	PSO2	PSO3
CO1	3	2	2	2	3					1			1		1
CO2	3	2	2	2	3					1			2		1
CO3	3	2	2	2	3				3	1		3	1		1
CO4	3	2	2	2	2					1			1		1

3 - High 2 – Medium 1 – Low

Assessment: **ISE III:** Shall be based on the assessment of submission work and interaction with students till the end of the term.

Assessment Table

Assessment Tool	S1	S2	S3	S2
	CO1	CO2	CO3	CO4
ISE-II (25 Marks)	05	10	4	06
ESE (25 Marks)	05	10	4	06

Assessment Pattern

Assessment Pattern Level No.	**Skill Level**	**ISE III**	**Practical Examination & viva voce**
S1	Imitation	00	00
S2	Manipulation	25	25
S3	Precision	00	00
S4	Articulation	00	00
S5	Naturalization	00	00
Total		25	25

Approved in XXIVth Academic Council, Dated 29/07/2022

Department of E&TC Engineering

Lists of Open Electives

Open Elective	Code	Title	Semester	Eligibility
OE I	ETOE1010	MATLAB Programming 3-0-0	Even	Other than E & TC students
OE II	ETOE0020	Introduction to Signals and Systems 3-0-0	Odd	Other than E & TC students
OE III	ETOE1030	Microcontroller Applications 3-0-0	Even	Other than E & TC students
OE IV	ETOE0040	Consumer Electronics 3-0-0	Odd	All students
OE V	ETOE0050	Introduction of Internet of Things 3-0-0	Odd	All students

Approved in XXIVth Academic Council, Dated 23/07/2022

ETOE1010: MATLAB Programming	
Teaching Scheme **Lectures: 3 Hrs/Week** **Credits: 3**	**Examination Scheme** **ISE I : 15 Marks** **ISEII : 15 Marks** **ISE III : 10 Marks** **End Semester Exam : 60 Marks**

Course Description: The course provides a gentle introduction to the MATLAB computing environment, and is intended for beginning users and those looking for a review. It is designed to give students a basic understanding of MATLAB, including toolboxes

Course Outcomes

After completing the course, students will be able to:

CO1	Memorize the features of the MATLAB development environment.
CO2	Write simple programs in MATLAB to solve scientific and mathematical problems
CO3	Write functions to find modular solution of problems.
CO4	Describe the MATLAB GUI effectively.
CO5	Use the Simulink to solve engineering problems.
CO6	Apply knowledge of various tool boxes to construct and implement algorithm for a given problem

Detailed Syllabus:

Unit 1	**MATLAB Fundamentals** Brief Introduction, Installation of MATLAB, History, Use of MATLAB, Key features, Command window, Workspace, Command history, Setting directory Working with the MATLAB user interface, Basic commands, Assigning variables, Operations with variables, Character and string, Arrays and vectors, Column vectors, Row vectors, BODMAS Rules, Arithmetic operations, Operators and special characters Mathematical and logical operators, Solving arithmetic equations, Crating rows and columns Matrix, Matrix operations, Finding transpose, determinant and inverse, Solving matrix, Other operations, Trigonometric functions, fractions, Real numbers, Complex numbers
Unit 2	**M files, Plots and GUI** Working with script tools, Writing Script file, Executing script files, The MATLAB Editor Saving m files, Plotting vector and matrix data Plot labeling, curve labeling and editing, 2D plots, Basic Plotting Functions, Creating a Plot Plotting, Multiple Data Sets in One Graph ,Specifying Line Styles and Colors, Graphing Imaginary and Complex Data, Figure Windows Displaying, Multiple Plots in One Figure, Controlling the Axes, 3D plots Creating, Mesh and Surface, About Mesh and Surface Visualizing ,Subplots, GUI Design, Introduction Of Graphical User Interface, GUI Function, Property GUI Component Design ,GUI Container Writing the code of GUI, Callback Dialog Box, Menu Designing Applications
Unit 3	**Introduction of Simulink** Simulink Environment and Interface, Study of Library, Circuit Oriented Design, Equation Oriented Design, Model Subsystem Design ,Connect Call back to subsystem, Application

Unit 4	**Loops, Conditional Statement and functions** Automating commands with scripts ,Writing programs with logic and flow control, Writing functions Control statement, Programming Conditional Statement, Programming Examples, Loops and Conditional Statements, Control Flow Conditional Control — if, else, switch, Loop Control — for, while, continue, break, Program Termination — return, Functions Writing user defined functions, Built in Function, Function calling, Return Value Types of Functions
Unit 5	**Study of different tool boxes** Optimization Toolbox, Fuzzy logic , Simscape Fluids, Robotics System Toolbox, Control system, Power electronics (Simscape Power Systems), Simulink PLC Coder, Simulink 3D Animation, Automated Driving System Toolbox, Image processing, Signal processing, Machine learning, pattern recognition, Artificial intelligence etc.

TEXT AND REFERENCE BOOKS

1. MATLAB Getting Started Guide
2. http://www.mathworks.com/help/pdf_doc/matlab/getstart.pdf Useful references: MATLAB Central (script, toolbox, blog, newsgroup)
3. http://www.mathworks.com/matlabcentral/ MATLAB Newsletters
4. http://www.mathworks.com/company/newsletters/

Mapping of Course outcome with Program Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		1	1	1	1				1			
CO2		2	2	2	2				1			
CO3		1	1	1	3				1			1
CO4					3				1			
CO5	1	1	1	1	2				1			1
CO6	1	1	1	1	1				1			1

3 – High 2 – Medium 1-Low

Assessment:

ISE I: Shall be on the basis of Class Tests/ Assignments/ Quizzes/ Field visits/Presentations/ Course Projects

ISE II: Shall be based on class test

ISE III: Shall be on the basis of Class Tests/ Assignments/ Quizzes/ Field visits/ Presentations/ Course Projects

Assessment Pattern

Assessment Pattern Level No.	Knowledge Level	ISE I	ISE II	ISE III	End Semester Examination
K1	Remember	05	05	00	04
K2	Understand	10	10	00	48
K3	Apply	00	00	10	8
K4	Analyze	00	00	00	00
K5	Evaluate	00	00	00	00
K6	Create	00	00	00	00
Total Marks 100		15	15	10	60

Assessment table

Assessment Tool	K1	K2	K2	K2	K2	K3
	CO1	CO2	CO3	CO4	CO5	CO6
ISE I (15 Marks)	05	5	05	00	00	00
ISE II (15 Marks)	05	00	00	05	05	00
ISE III (10 Marks)	00	00	00	00	00	10
ESE Assessment (60 Marks)	04	12	12	12	12	8

Approved in XXIVth Academic Council,Dated 23/07/2022

ETOE0020 : Introduction to Signals and Systems	
Teaching Scheme **Lectures : 3Hrs/week** **Total credits : 03**	**Examination Scheme** **ISE I : 15 Marks** **ISE II : 15 Marks** **ISE III : 10 Marks** **End Semester Exam : 60 Marks**

Course Objectives:

- To explain the fundamental properties of linear systems.
- To know CT & DT Signals and Systems and their mathematical representation
- To use FT, LT and ZT to understand signal in frequency domain
- To Develop mathematical skill for solving problem

Course Outcomes: After completing the course, students will able to:

CO1	Identify different signals, systems and transforms.
CO2	Understand about various types of signals and systems.
CO3	Understand behavior of signal in time and frequency domain.
CO4	Apply various transforms on signals.

Detailed Syllabus

Unit-I	**Introduction :** Types and Classification of Signals (Continuous time Discrete time), sampling theorem, types of sampling , Elementary operations on Signals ,types of Systems, Basic Properties of the systems
Unit-2	**Linear time invariant systems:** Time Domain Representations of Linear Time Invariant (LTI) Systems, Impulse Response, Convolution, Differential and Difference Equation Representation properties of convolution, block diagram representations of LTI systems, properties of linear time-invariant systems.
Unit-3	Fourier analysis of Continuous Time Signals and , Fourier series, Fourier Transform and properties, Fourier Analysis of Discrete Time Signals, Introduction to DTFT & DFT.
Unit-4	Laplace Transform and its properties, Inverse Laplace Transform Application of Laplace transform
Unit-5	Z-Transform, Convergence of z-Transform, Properties of z- Transform, Inverse z-Transform

TEXT AND REFERENCE BOOKS

1. Simon Haykins and Barry Van Veen, Signals and Systems, 2nd Edition, Wiley India.
2. Ravikumar, Introduction to signals and systems, PHI.
3. B.P. Lathi, Linear Systems and Signals, 2nd Edition, Oxford University Press, 2004.
4. Peyton Peebles, Probability, Random Variable, Random Processes, 4th Edition, Tata McGraw Hill.
5. A.V. Oppenheim, A.S. Willsky and I.T. Young, Signals and Systems, Prentice Hall, 1983.
6. M. J. Roberts, Signals and Systems - Analysis using Transform methods and

MATLAB, Tata McGraw Hill Edition, 2003.

Mapping of Course outcome with Program Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1										
CO2	2	2									1	
CO3	2	2									1	
CO4	3	2									2	

3 – High 2 – Medium 1 – Low

Assessment:

ISE I: Shall be on the basis of Class Tests/ Assignments/ Quizzes/ Field visits/Presentations/ Course Projects

ISE II: Shall be based on class test

ISE III: Shall be on the basis of Class Tests/ Assignments/ Quizzes/ Field visits/ Presentations/ Course Projects

Assessment Pattern

Assessment Pattern Level No.	**Knowledge Level**	**ISE I**	**ISE II**	**ISE III**	**End Semester Examination**
K1	Remember	05	00	00	12
K2	Understand	10	10	05	36
K3	Apply	00	05	05	12
K4	Analyze	00	00	00	00
K5	Evaluate	00	00	00	00
K6	Create	00	00	00	00
Total Marks 100		15	15	10	60

3 – High 2 – Medium 1-Low

Assessment table

Assessment Tool	K1	K2	K2	K3
	CO1	CO2	CO3	CO4
ISE I (15 Marks)	05	10	00	00
ISE II (15 Marks)	00	00	10	05
ISE III (10 Marks)	00	05	05	00
ESE Assessment (60 Marks)	12	18	18	12

ETOE1030: Microcontroller Applications	
Teaching Scheme **Lectures: 3 Hrs/Week** **Credits: 03**	**Examination Scheme** **ISE I : 15 Marks** **ISE II : 15Marks** **ISE III : 10 Marks** **End Semester Exam : 60 Marks**

Course description: The objective of this course is to teach students design and interfacing of microcontroller-based systems. High-level languages are used to interface the microcontrollers to various applications.

Course Objectives:

- To acquaint the students with fundamentals of Micro-processor and Micro-controller
- To emphasis on design of interfacing techniques of 8051 Microcontroller.
- To develop capacity to analyze and interpret applications using modern microcontrollers.

Course Outcomes
After completing the course, students will able to:

CO1	Understand the basic concept of Microprocessor, Microcontroller and its Applications
CO2	Programme the Microcontroller using High Level Language
CO3	Design the system using Open source software.

Detailed Syllabus:

Unit 1	**Introduction.** Overview of Microprocessor and Microcontroller, Architecture, Interfacing and Programming of 8051 microcontroller.
Unit 2	**8051 Microcontroller Applications** Development of industrial/commercial applications using 8051 and its programming using Integrated Development Environment
Unit 3	**Arduino Technology** Architecture, Arduino open source prototyping platform, various boards (USB, Bluetooth, Serial Communication, etc.), open source interfacing boards
Unit 4	**Arduino Applications** Arduino board programming using IDE, Industrial automation applications (RF transmitter module, Relay control, Real time Clock, Mind control Robot etc), Robotics

Text and Reference Books

1. Muhammad Ali Mazidi and Janice Gillispe, The 8051 Microcontroller and embedded systems, Pearson Education Asia, Indian reprint 2002
2. Kenneth J. Ayala, The 8051 Micro-controller– Architecture, Programming & Applications, Third Edition, Cengage Learning, India, 2007.
3. Ajay V Deshmukh, Microcontrollers (Theory and Applications) The McGraw- Hill Companies, 2005.
4. The 8051 Microcontroller & Embedded Systems Using Assembly and C, 1st Edition, Cengage Learning, India, 2010.

Mapping of Course outcome with Program Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO8	PO9	PO10	PO11	PO12
CO1	2	3										
CO2	2	2										
CO3		2			3							

3 – High 2 – Medium 1-Low

Assessment:

ISE I: Shall be on the basis of Class Tests/ Assignments/ Quizzes/ Field visits/Presentations/ Course Projects

ISE II: Shall be based on class test

ISE III: Shall be on the basis of Class Tests/ Assignments/ Quizzes/ Field visits/ Presentations/ Course Projects

Assessment Pattern

Assessment Pattern Level No.	**Knowledge Level**	**ISE I**	**ISE II**	**ISE III**	**End Semester Examination**
K1	Remember	05	05	00	10
K2	Understand	05	05	05	25
K3	Apply	05	05	05	25
K4	Analyze	00	00	00	00
K5	Evaluate	00	00	00	00
K6	Create	00	00	00	00
Total Marks 100		15	15	10	60

Assessment table

Assessment Tool	**K1**	**K2**	**K3**
	C01	**C02**	**C03**
ISE I (15 Marks)	05	05	05
ISE II (15 Marks)	05	05	05
ISE III (10 Marks)	00	05	05
ESE Assessment (60 Marks)	10	25	25

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ETOE0040 : Consumer Electronics (Open elective)	
Teaching Scheme **Lectures : 03Hrs/Week** **Total Credits : 03**	**Examination Scheme** **ISE I : 15 Marks** **ISE II : 15 Marks** **ISE III : 10 Marks** **End Semester Exam : 60 Marks**

Course description: After completing this course, students will have a clear and fundamental understanding of Consumer Electronics. Topics in this course will give an overview of different audio, video, telephone systems, office equipment and home appliances. This course will help students to understand working of electronics equipment and gadgets from block diagram point of view.

Course Objectives:

- To understand working principles of various electronic gadgets and consumer's products.
- To identify blocks in the consumer products and operations.
- To study the various technical specifications and facilities of the equipments used on day to day bases.
- To learn how to select the product by comparing commercially available products.

Course Outcomes
After completing the course, students will able to:

CO1	Learn blocks of audio, video and telephony systems.	K1
CO2	Know the concepts of Radio, TV transmission and reception	K2
CO3	Discuss the principles , working and operation of mobile , audio , video and telephony systems	K2
CO4	Understand the working of television systems, office equipment and domestic appliances.	K2

Detailed Syllabus:

Unit 1	**Audio Video systems** Microphones, Amplifier, Loudspeakers, Home Theatres, Public address system, Radio Receivers-AM/FM, Dolby Digital systems, DVD Players, Blu-ray Players, MP4 Players, Set Top Box, Dish.
Unit 2	**Television** Introduction, Radio and TV transmission & reception, Block Diagram of TV transmitter, Television studies and Equipment, Antenna for TV transmitter, Block Diagram of TV receiver, Color Television-Standards, HDTV, LCD, Plasma and LED TV, Smart TV, Projectors.
Unit 3	**Mobile and Telephony Devices** Basic landline equipment-CLI, Intercom/EPABX system, Mobile Phones-GPRS & Bluetooth, GPS Navigation system, Video Telephone, Video conferencing.

Unit 4	**Office Equipment's** Scanners, Printers, Photocopier, Multifunction units (Print, scan, fax, copy)
Unit 5	**Electronic Gadgets and Domestic Appliances** Digital Clock, Digital camera, Handicam, Home security system, CCTV, Air conditioners, refrigerators, Washing machine, Dish washer, Microwave Oven, Vacuum Cleaners, UPS, Inverter, Decorative lighting, barcodes, RFID, Treadmill's, Smart devices: Fitbit, Smart watches

Text and Reference Books

1. R.P.Bali, Consumer Electronics, Pearson Education (2008)
2. R.G.Gupta, Audio and video System, Tata McGraw Hill(2008)

Mapping of Course outcome with Program Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		2							3			
CO2		2							3			
CO3		2				2			3			
CO4		2				2			3			

3 – High 2 – Medium 1-Low

Assessment:

ISE I: Shall be on the basis of Class Tests/ Assignments/ Quizzes/ Field visits/Presentations/ Course Projects

ISE II: Shall be based on class test

ISE III: Shall be on the basis of Class Tests/ Assignments/ Quizzes/ Field visits/ Presentations/ Course Projects

Assessment Pattern

Assessment Pattern Level No.	Knowledge Level	ISE I	ISE II	ISE III	End Semester Examination
K1	Remember	05	00	00	06
K2	Understand	10	15	10	54
K3	Apply	00	00	00	00
K4	Analyze	00	00	00	00
K5	Evaluate	00	00	00	00
K6	Create	00	00	00	00
Total Marks 100		15	15	10	60

Assessment table

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Assessment Tool	K1	K2	K2	K2
	CO1	CO2	CO3	CO4
ISE I (15 Marks)	05	10	00	00
ISE II (15 Marks)	00	05	10	00
ISE III (10 Marks)	00	00	00	10
ESE Assessment (60 Marks)	06	12	18	24

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ETOE0050: Introduction of Internet of Things	
Teaching Scheme **Lectures: 3 Hrs/Week** **Total Credits: 03**	**Examination Scheme** **ISE I : 15 Marks** **ISE II : 15 Marks** **ISE III : 10 Marks** **End Semester Exam : 60 Marks**

Course description: After completing this course, students will have a broad and fundamental understanding of IoT. Topics range from an overview of basics IoT, network and communication aspect, Domain specific applications of IoT, Developing IoTs.

Course Objectives:

- To provide a clear view of Internet of Things (IoT).
- To get accustomed with building blocks of IoT and its characteristics.
- To get familiarize with various applications of IoT.

Course Outcomes

After completing the course, students will be able to:

CO1	Understand the concepts of Internet of Things and various challenges regarding it	K1
CO2	Analyze basic protocols in wireless sensor network	K2
CO3	Describe IoT applications in different domain and be able to explain their performance	K3
CO4	Demonstrate IoT applications on embedded platform	K3

Detailed Syllabus:

Unit 1	**Introduction to IoT** Defining IoT, Characteristics of IoT, Physical design of IoT, Logical design of IoT, Functional blocks of IoT
Unit 2	**Network & Communication aspects** Basics of Networking, Communication Protocols, Sensor Networks, Machine-to-Machine Communications. Overview of Embedded OS, IoT Communication model and protocols
Unit 3	**Challenges in IoT** Design challenges, Development challenges, Security challenges, Other challenges
Unit 4	**Developing IoT** Interpretability inIoT, Introduction to Arduino Programming, Integration of Sensors and Actuators with Arduino. Introduction to Embedded programming, Introduction to Raspberry. Implementation of IoT with Raspberry Pi
Unit 5	**Industrial Case studies** Agriculture, Healthcare, Activity Monitoring, Home automation, Logistics, Retail, etc.

Text and Reference Books

1. Vijay Madisetti, Arshdeep Bahga, *Internet of Things A Hands-On-Approach*, 2014, ISBN:9780996025515
2. Adrian McEwen, *Designing the Internet of Things*, Wiley Publishers, 2013, ISBN: 978-1-118-43062-0
3. Daniel Kellmereit, *The Silent Intelligence: The Internet of Things,* 2013
4. David Etter, *IOT (Internet of Things) Programming: A Simple and Fast Way of Learning IOT*
5. Waltenegus Dargie, Christian Poellabauer, *Fundamentals of Wireless sensor Networks: Theory and Practice*

Mapping of Course outcome with Program Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1					1	1		1			
CO2	2	2	1		1	1	1					
CO3	1	1	1									
CO4		2	2		2	1	1		1	2		1

3 – High 2 – Medium 1-Low

Assessment:

ISE I: Shall be on the basis of Class Tests/ Assignments/ Quizzes/ Field visits/Presentations/ Course Projects

ISE II: Shall be based on class test

ISE III: Shall be on the basis of Class Tests/ Assignments/ Quizzes/ Field visits/ Presentations/ Course Projects

Assessment Table:

Assessment Tool	K1	K2	K3	K3
Course Outcomes	CO1	CO2	CO3	CO4
ISE I (15 Marks)	15	00	00	00
ISE II (15 Marks)	00	15	00	00
ISE III (10 Marks)	00	00	00	10
ESE Assessment (60 Marks)	15	20	25	00

Assessment Pattern:

Assessment Pattern Level No.	**Knowledge Level**	**ISE I**	**ISE II**	**ISE III**	**End Semester Examination**
K1	Remember	05	05	00	20
K2	Understand	10	10	05	10
K3	Apply	00	00	05	30
K4	Analyze	00	00	00	00
K5	Evaluate	00	00	00	00
K6	Create	00	00	00	00
	Total	15	15	10	60

Approved in XXIVth Academic Council,Dated 23/07/2022

Department of E&TC Engineering

Lists of Humanities corses

Open Elective	Code	Title	Semester	Eligibility
HSMC II	ETHS0020	Foreign Language (German)	Odd	All Students
HSMC III	ETHS1030	Foreign Language (Japanese)	Even	All Students

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ETHS0020: Foreign Language - German	
Teaching Scheme **Lectures: 3 Hrs/Week** **Total Credits : 03**	**Examination Scheme** **ISE I : 15 Marks** **ISE II : 15Marks** **ISE III : 10 Marks** **End Semester Exam : 60 Marks**

Prerequisites: Nil

Course description: The course is designed to give the basic communication skills in the German Language. The course deals with Self introduction, Grammar topics like Verb forms, Question and Answers, Modal Verbs, Articles, Separable Verbs etc. Vocabulary of Family, Hobbies, Food and Profession is also covered.

Course Objectives: The course has the following objectives:

- To introduce a Foreign Language.
- To teach basic and advance patterns of German Grammar.
- To make the students be able to communicate in German Language.
- To make the students express about themselves, family, profession etc.
- To make the students be able to form questions & respond to questions formed by other students.
- Students can answer and ask questions related to their personal details like the things that they have, where they live.

Course Outcomes: After completing the course, students will able to:

CO1	Introduce themselves in German Language.
CO2	Use German Vocabulary on various themes.
CO3	Communicate in German Language by utilizing learnt Basic German Grammar patterns.
CO4	Form questions in German language & respond to questions formed by other students.
CO5	Communicate in German Language by utilizing learnt Advanced German Grammar patterns.
CO6	Communicate (in German language) in a simple manner if the person they are speaking to speaks slowly and clearly.

Detailed Syllabus:

Unit 1	**<u>Conversational Skills Part 1:</u>** - Self-Introduction (die Vorstellung) - Greetings (Grüßen) - Nos, upto 10,000 (die Nummer bis 10,000) - Weekdays, Months (die Wochentage und die Monate)

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	- Alphabetes & Spellings (das Alphabet und buchstabieren)
Unit 2	**Vocabulary related to following Themes:** - My House - My Family - Daily Routine - Hobbys - Food - Profession
Unit 3	**Grammar Part 1:** - Verb forms of Regular & Irregular Verbs (in Present Tense) - Articles in Nominative (definite, indefinite & negative) - Singular and Plural Forms - Possessivpronouns (in Nominative) - Hilfsverben (sein and haben in Present Tense) - Negation. - Past-Tense of sein and haben
Unit 4	**Conversation Skills Part 2:** - Seasons & Directions. - Describing Address (Wegbeschreibung) - Date and Time (Ordinalzahlen) - Wh-Questions and Yes-No Questions (W Fragen und Ja-Nein Fragen) - Forming Questions in German Language (Fragen stellen)
Unit 5	**Grammar Part 2**: - Separable Verbs - Modal Verbs (können, müssen , mögen, dürfen, wollen und sollen) - Sentence Formation. (Satzstruktur) - Possessivpronouns (in Akkusativ) - Articles in Akkusativ (definite, indefinite & negative)

Text and Reference Books

1. Netzwerk A1 Klett - Langenscheidt
2. Berliner Platz Einsteigskurs – Langenscheidt

Mapping of Course outcome with Program Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1									2	3		2			
CO2									2	3		2			
CO3									2	3		2			
CO4									2	3		2			
CO5									2	3		2			
CO6									2	3		2			

3 – High 2 – Medium 1-Low

Approved in XXIVth Academic Council,Dated 23/07/2022

Assessment: **ISE I:** Shall be on the basis of Class Tests/ Assignments/ Quizzes/ Field visits/ Presentations/ Course Projects on First and Second unit

ISE II: Shall be based on class test on third and fourth units

ISE III: Shall be on the basis of Class Tests/ Assignments/ Quizzes/ Field visits/ Presentations/ Course Projects on Fifth unit

Assessment Pattern

Assessment Pattern Level No.	Knowledge Level	ISE I	ISE II	ISE III	ESE
K1	Remember	5		5	10
K2	Understand		5		20
K3	Apply	10	10	5	30
K4	Analyze				
K5	Evaluate				
K6	Create				
Total Marks 100		15	15	10	60

Assessment table

Assessment Tool	K1	K2	K3	K2	K3	K3
	CO1	CO2	CO3	CO4	CO5	CO6
ISE I (15 Marks)	5		10			
ISE II (15 Marks)		5			10	
ISE III (10 Marks)	5					5
ESE Assessment (60 Marks)	10	10	10	10	10	10

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ETHS1030 : Foreign Language (Japanese)	
Teaching Scheme **Lectures: 3 Hrs/Week** **Total Credits : 03**	**Examination Scheme** **ISE I : 15 Marks** **ISE II : 15Marks** **ISE III : 10 Marks** **End Semester Exam : 60 Marks**

Prerequisites: Nil

Course description: The course is designed to give the basic communication skill in the Japanese language. The course deals with Self introduction, daily used expressions and basic conversation, Grammar includes uses of demonstratives, particles (prepositions), verb and adjective forms. Writing includes Hiragana, Katakana scripts and introduction to Kanji.

Course Objectives: The course has the following objectives:

- Introduction to Japanese Language writing system
- To give basic ideas of simple grammar sentences
- To make the students express themselves in daily used conversation.

Course Outcomes: After completing the course, students will able to:

CO1	Use Hiragana and Katakana script to write the sentences.
CO2	Understand the concept of Kanji and is able to read and write basic kanji with its different readings in kanji combinations.
CO3	Exhibit self introduction in Japanese language
CO4	Participate in simple daily conversation
CO5	Understand the expressions used in the classroom and act accordingly.
CO6	Construct small sentences using basic grammar pattern taught in the class.

Detailed Syllabus:

Unit 1	Conversation skills – Self-Introduction – Daily used greetings – Nos. up to 1,00,000 – Weekdays, Months – Date and Time

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Unit 2	Scripts in Japanese: – Introduction to scripts in Japanese and the history related to scripts. – Hiragana script and rules for word formation – Katakana script and rules for word formation – Understanding the concept of kanji, its readings(Japanese and Chinese readings) – Basic Kanji(50kanji) and their combinations – Understanding the way of writing sentences using Hiragana, Katakana and basic Kanji.
Unit 3	Vocabulary ,reading and listening: – Conversation in daily life – Topics encountered in classroom situations – Understanding the sentences written in Hiragana, Katakana and basic Kanji
Unit 4	Grammar – Introduction to particles – Uses of various particles – System of demonstratives – Verb forms(present tense and past tense) – Types of adjectives and their usage in different positions and tenses.

Text and Reference Books

3. Marugoto A1(Katsudo and Rikai)
4. Minna no Nihongo (Part1-1)

Mapping of Course outcome with Program Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1										3					
CO2										3					
CO3										3					
CO4										3					
CO5										3					
CO6										3					

3 – High 2 – Medium 1-Low

Assessment: **ISE I**: Shall be on the basis of Class Tests/ Assignments/ Quizzes/ Field visits/ Presentations/ Course Projects on First and Second unit

ISE II: Shall be based on class test on third and fourth units

ISE III: Shall be on the basis of Class Tests/ Assignments/ Quizzes/ Field visits/ Presentations/ Course Projects on Fifth unit

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Assessment Pattern

Assessment Pattern Level No.	Knowledge Level	ISE I	ISE II	ISE III	ESE
K1	Remember	05	05	02	10
K2	Understand	05	05	03	20
K3	Apply	05	05	05	30
K4	Analyze				
K5	Evaluate				
K6	Create				
Total Marks 100		15	15	10	60

Assessment table

Assessment Tool	K1	K2	K3	K3	K2	K3
	CO1	**CO2**	**CO3**	**CO4**	**CO5**	**CO6**
ISE I (15 Marks)	05		02	03	05	
ISE II (15 Marks)	02		02	03	03	05
ISE III (10 Marks)	01	03	01	02	01	02
ESE Assessment (60 Marks)	05	10	05	10	10	20

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