

DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY**CIRCULAR NO.SU/Engg./B.E.IIrd Yr./64/2018**

It is hereby informed to all concerned that, the syllabi prepared by the Board of Studies & recommended by the Dean, Faculty of Science & Technology the **Academic Council at its meeting held on 30 June & 02 July 2018 has accepted the following syllabi in accordance with Choice Based Credits & Grading System for all Branches Third Year Engineering & Second Year of Bachelor of Architecture** under the Faculty of Science & Technology as enclosed herewith:-

Sr.No.	Syllabi as per CBC & GS
[1]	Third Year B.E.[Civil Engineering],
[2]	Third Year B.E [Mechanical Engineering],
[3]	Third Year B.E [EE/EEE/Electrical, Electronics & Power,],
[4]	Third Year B.E [Chemical Engineering],
[5]	Third Year B.E [Instrumentation Engineering],
[6]	Third Year B.E [E&TC/E&C/IE/ECT],
[7]	Third Year B.E [CSE/IT].
[8]	Second Year of Bachelor of Architecture.

This is effective from the Academic Year 2018-2019 and onwards.

All concerned are requested to note the contents of this circular and bring the notice to the students, teachers and staff for their information and necessary action.

University Campus,
Aurangabad-431 004.

REF.NO.SU/2018/

Date:- 03-07-2018. / 10497-03

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6/7/18
Deputy Registrar,
Syllabus Section

Copy forwarded with compliments to :-

- 1] **The Principals, affiliated concerned Colleges, Dr. Babasaheb Ambedkar Marathwada University.**
- 2] The Director, University Network & Information Centre, UNIC, with **a request to upload this Circular on University Website.**

Copy to :-

- 1] The Director, Board of Examinations & Evaluation,
- 2] **The Section Officer, [Engineering Unit] Examination Branch,**
- 3] The Section officer, [Eligibility Unit],
- 4] **The Programmer [Computer Unit-1] Examinations,**
- 5] **The Programmer [Computer Unit-2] Examinations,**
- 6] The In-charge, [E-Suvidha Kendra],
- 7] The Public Relation Officer,
- 8] The Record Keeper,

**SCHEME AND DETAILED SYLLABUS
of**

T.E. (ETC/EC/E&C/IE)

(w. e. f. academic year 2018-19)

FOUR YEAR DEGREE COURSE IN SCIENCE & TECHNOLOGY



**DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,
AURANGABAD**

FACULTY OF SCIENCE AND TECHNOLOGY
Revised Structure w.e.f. 2018-2019
T.E. (ECT/EC/E&C/IE)

Sub Code / Faculty Name	SEMESTER-V	Contact Hrs / Week				Examination Scheme						
	Subject	L	T	P	Total	CT	TH	TW	P	Total	Credits	Duration of Theory Exam
ETC 301	Electromagnetic Engineering	4	-	-	4	20	80	-	-	100	4	3 Hrs
ETC 302	Microprocessors and Microcontroller	4	-	-	4	20	80	-	-	100	4	3 Hrs
ETC303	Digital Communication	4	-	-	4	20	80	-	-	100	4	3 Hrs
ETC304	Digital Signal Processing	4	-	-	4	20	80	-	-	100	4	3 Hrs
ETC341-43	Elective I	4	-	-	4	20	80	-	-	100	4	3Hrs
ETC321	Lab I: Microprocessors and Microcontroller	-	-	2	2	-	-	-	50	50	1	
ETC322	Lab II: Digital Communication	-	-	2	2	-	-	-	50	50	1	
ETC323	LabIII: Digital Signal Processing	-	-	2	2	-	-	-	50	50	1	
ETC324-26	Lab IV: Elective -I	-	-	2	2	-	-	50	-	50	1	
BSH305	*Lab V:Communication Skills-II	-	-	2	2	-	50	-	-	50	2	
	Total of semester-	20	-	10	30	100	400	100	15	750	26	
Sub Code / Faculty Name	SEMESTER-VI	Contact Hrs / Week				Examination Scheme						
	Subject	L	T	P	Total	CT	TH	TW	P	Total	Credits	Duration of Theory Exam
ETC351	Embedded System	4	-	-	4	20	80	-	-	100	4	3 Hrs
ETC352	Feedback Control System	4	-	-	4	20	80	-	-	100	4	3 Hrs
BSH353	Power Electronics and Drives	4	-	-	4	20	80	-	-	100	4	3 Hrs
ETC354	Electronic Circuit Technology	4	-	-	4	20	80	-	-	100	4	4Hrs
ETC391-93	Elective-II	4	-	-	4	20	80	-	-	100	4	3 Hrs
ETC371	Lab V: Embedded System	-	-	2	2	-	-	-	50	50	1	
ETC372	Lab VI: Feedback Control System	-	-	2	2	-	-	-	50	50	1	
ETC373	Lab VII: Power Electronics and Drives	-	-	2	2	-	-	-	50	50	1	
ETC374	Lab VIII: Electronic Circuit Technology	-	-	2	2	-	-	50	-	50	1	
ETC375	Mini Project I	-	-	2	2	-	-	50	-	50	2	
	Total of semester-	20	-	10	30	100	400	100	150	750	26	
	Grand Total of V& VI									1500	52	

L: Lecture hours per week T: Tutorial hours per P: Practical hours per week CT: Class Test

TH: University Theory Examination TW: Term Work P: Practical/Oral Exam

*Lab V: Communication Skills-II- Online Exam

Elective I: Programming in JAVA (ETC341)

Information Theory and Coding (ETC342)

Computer Architechre and Operating System (ETC343)

Elective II: Robotics (ETC391)

Industrial Automation (ETC392)

Speech Processing (ETC393)

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
(Faculty of Science & Technology)
Syllabus of T.E. (ETC/EC/E&C/IE) Semester-V

Code No.: ETC301
Teaching Scheme: 04Hrs/week
Theory: 04Hrs/week
Credits:04

Title: Electromagnetic Engineering
Class Test (Marks): 20
Theory Examination (Duration): 03 Hrs
Theory Examination (Marks): 80

Prerequisites	:	Fundamentals of co-ordinate symmetry, Foundations of Electromagnetics.
Objectives	:	<ul style="list-style-type: none"> • To train the students with different laws, equations & electric field intensity related to electromagnetic engineering. • To study energy & potential In an electric field. • To study conductors, dielectric & capacitance of a material. • To study magnetic forces, material & inductance. • To analyze wave propagation in an uniform plane
Unit-I	:	Unit-I: Vector Analysis and Coordinate systems: Scalars and Vectors, Vector Algebra, Cartesian, Cylindrical and Spherical Coordinate System, Conversion of vectors between the coordinate systems, Differential length, Area and Volume, Del Operator, Divergence and divergence Theorem, Curl and Stroke Theorem. [06 Hours]
Unit-II	:	Unit-2 Electrostatics: Coulombs Law, Electric Field Intensity. Field due to a continuous volume charge distribution Field of a Line Charge, Field of a sheet charge, Electric Flux, Density, Gauss' Law, Applications of Gauss' Law to symmetrical charge distribution and differential volume Element, Maxwell's First law. [06 Hours]
Unit-III	:	Unit-3 Energy, Potential, Conductors, Dielectrics: Energy and potential in a moving point charge in an electric field, Potential difference and potential, Potential field of a point charge, Current and Current Density, Continuity of current, Metallic Conductors, Conductor-free space boundary conditions, Dielectric materials, Boundary conditions for perfect dielectric materials. [08 Hours]
Unit-IV	:	Unit -4 The Steady Magnetic Field Magnetic Forces, Materials and Inductance: Biot Savart Law Amperes Circuital Law, Magnetic flux and Magnetic flux density. Force on a Moving Charge and Differential Current Element, Force and Torque on a Closed Circuit, Magnetic Boundary Conditions. [06 Hours]
Unit-V	:	Unit-5- Maxwell's equations And Uniform Plane Wave: Faraday's Law, Displacement Current, Maxwell's Equations in point form and integral form, Wave Propagation in Free Space, dielectrics, Good conductors, Skin effect, Poynting Vector and power Considerations, Standing wave ratio, Reflection of uniform plane wave in normal incident. [08 Hours]
Unit-VI	:	Unit6: Transmission Lines: Introduction, Transmission Line Parameters, Transmission Line Equations, Lossless Line, Distortion less Line, Input Impedance, SWR, Power, The smith Chart. [6 Hours]

Reference Books:	:	<ul style="list-style-type: none"> • Engineering Electromagnetic W H Hayt, J A Buck Tala Me Graw Hill • Problems and Solutions in Electromagnetic W H Hayt, Tata Mc Graw Hill • Elements of Electromagnetic, Matthew N. Sadiku, Oxford University Press- New Delhi • Principles of Electromagnetic R G Kaduskar ,Wiley India Reference Books: Introduction to Electrodynamics 3rd Edition: David J. Griffiths PHI Learning • Electromagnetic Field Theory and Transmission Lines O S N Raju Pearson Education • Electromagnetic Field Theory and Transmission Lines O S Rao Wiley India Ltd.
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Section A: Includes Unit I, II and III; **Section B:** Includes Unit IV, V and VI.

Pattern of Question Paper:

The six/four units in the syllabus shall be divided in two equal parts i.e. 3/2 units respectively. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:

1. Minimum ten questions.
2. Five questions in each section.
3. Question no 1 from section A and Question no 6 from section B be made compulsory and should cover complete syllabus of the respective section and should be set for ten marks each. The Question no.1 and 6 should be of objective nature.
4. Two questions of 15 marks each from remaining questions from each section A and B be asked to solve.

Dr.Babasaheb Ambedkar Marathwada University, Aurangabad
(Faculty of Science & Technology)
Syllabus of T.E. (ETC/EC/E&C/IE) Semester-V

Code No.: ETC 302
Teaching Scheme: 04Hrs/week
Theory: 04Hrs/week
Credits:04

Title: Microprocessors and Microcontroller
Class Test (Marks): 20
Theory Examination (Duration): 03 Hrs
Theory Examination (Marks): 80

Prerequisites	:	Digital electronics and circuits, Basic electronics and circuits
Objectives	:	<ul style="list-style-type: none"> • To understand 8 bit microprocessor 8085 and microcontroller 8051 architecture and programming. • To introduce basic concepts of interfacing memory and peripheral devices to 8 bit microprocessor. • To illustrate interfacing of various peripheral ICs with 8085. • To analyze the basic concepts and programming of 8051 microcontroller. • To understand the interfacing circuits for various applications of 8051 microcontroller.
Unit-I	:	Introduction and Architecture of 8085 Microprocessor evolution, Microprocessor 8085-Architecture, Pin configuration, addressing modes. [04 Hours]
Unit-II	:	8085 Instruction Set and Programming Instruction set of 8085, and Assembly language programs, Timing diagram (basic machine cycles), Interrupt structure, Counters & time delays, stack & subroutines and programs. [08 Hours]
Unit-III	:	Microprocessor 8085 Memory and IO Interfacing Various Interfacing techniques ,Memory organization & interfacing, Introduction to 8255, Interfacing of LED's, 7 Segment display, ADC / DAC, Stepper motor & keys/keyboard with 8255.Interfacing different peripheral ICs like USART 825I, Programmable Interval Timer 8253, Programmable Interrupt Controller 8259. [08 Hours]
Unit-IV	:	Architecture of Microcontroller 8051 Introduction, evolution, comparison between microprocessor and microcontroller, architecture of 8051, key features of 8051, pin details, programming model, memory organization- data and program memory , internal RAM organization-special function registers, control registers, I/O ports, counters and timers, interrupt structures. [06 Hours]
Unit-V	:	8051 Programming Addressing modes, Instruction set of 8051, assembly language programming [07 Hours]
Unit-VI	:	8051 memory and IO interfacing Programming I/O ports, Interrupts, timer/ Counter, serial communication, external memory interfacing.Interfacing of LED, LCD ADC, DAC, Stepper Motor, keyboard. [07 Hours]

Reference Books:	:	Text Books: <ol style="list-style-type: none"> 1. Microprocessor Architecture, Programming and Application- Ramesh Gaonkar, Willey Eastem Ltd. 2. Fundamentals of Microprocessor and Microcomputer- B. Ram, Dhanpat Rai and Sons, New Delhi. 3. Microprocessors and Interfacing- D. Hall, Tata McGraw Hill. 4. The Intel Microprocessors: Architecture, Programming & Interfacing- Berry Bray, C.R.Sharma, Pearson Education. 5. The 8051 Microcontrollers and Embedded Systems-Muhammed Ali Mazidi-Pearson Education 6. The 8051 Micro controllers Architecture, Programming & Applications-Kenneth J. Ayala 7. Microcontrollers- Ajay Deshmukh, TMH Reference Books: <ol style="list-style-type: none"> 1. 0000 to 8085- Shridhar Ghosh, Prentice Hall India 2. Microprocessor and Programming Logic- K.L. Short, Prentice-Hall India Pvt Ltd. 3. Microprocessor and Microcomputer Based System Design- Mohammad Raffiquazaman. 4. Programming and customizing the 8051 Microcontroller- Myke Predko, Tata McGraw-Hill, 1994.
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Section A: Includes Unit I, II and III; **Section B:** Includes Unit IV, V and VI.

Pattern of Question Paper:

The six/four units in the syllabus shall be divided in two equal parts i.e. 3/2 units respectively. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:

- 1 Minimum ten questions.
- 2 Five questions in each section.
- 3 Question no 1 from section A and Question no 6 from section B be made compulsory and should cover complete syllabus of the respective section and should be set for ten marks each. The Question no.1 and 6 should be of objective nature.
- 4 Two questions of 15 marks each from remaining questions from each section A and B be asked to solve.

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
(Faculty of Engineering & Technology)
Syllabus of T.E. (ETC/EC/E&C/IE) Semester-V

Code No.:ETC303

Teaching Scheme: 04Hrs/week

Theory: 04Hrs/week

Credits:04

Title: Digital Communication

Class Test (Marks): 20

Theory Examination (Duration): 03 Hrs

Theory Examination (Marks): 80

Prerequisites	:	Fourier series, Fourier transform, probability theory, Analog communication.
Objectives	:	To study- <ul style="list-style-type: none"> • Fundamentals of digital communication • Pulse modulation and digital modulation techniques • Spread Spectrum Techniques. • Probability theory and random process
Unit-I	:	Digital Baseband Modulation Techniques and Waveform Coding Techniques: Base Band System, Formatting Textual Data, Messages, Characters & Symbols, Formatting Analog Information, PCM, Bandwidth, SNR of PCM, DPCM, DM, ADM. [08 Hours]
Unit-II	:	Probability Theory: Conditional Probability, Statistical Independence, Baye's Theorem, Binomial, Poisson Normal Distribution, Information transmission on continuous and discrete channel. [06 Hours]
Unit-III		Random Process: Introduction to Random variable, Functions of Random Variable, Random Processes, Statistics of Random Process. Transmission of a Random Process Through a LTI Filter Power Spectral Density. [06 Hours]
Unit-IV	:	Baseband Transmission: Narrow Band Noise, Representation of Narrowband Noise in terms of Phase & Quadrature Components, Concept of line Codes, Representation of Signals through line codes, Response of Linear System to Random Processes, Matched Filter. [06 Hours]
Unit-V		Carrier Modulation Techniques: Introduction to Carrier Modulation, FSK, PSK, BPSK, DPSK, QPSK, Coherent Detection and Non Coherent Detection, Error Performance for Binary Systems [08 Hours]
Unit-VI	:	Spread Spectrum Techniques: Pseudo-random Sequence, Direct Sequence Spread Spectrum, Block Details & mathematical treatment, Jamming margin and processing gain, Frequency Hop Spread Spectrum, Applications of DSSS and FHSS. [06Hours]
Reference Books:	:	1. Bernard Sklar, "Digital Communications fundamentals and Applications" Pearson Education, Second Edition. 2. Simon Haykin "Communication Systems", John Wiley & Sons, Fourth Edition. 3. A.B Carlson, "Principles of communication systems", TMH, Third Edition. 4. Taub Schilling, "Principles of Communication system", TMH, Fourth Edition.

Section A: Includes Unit I, II and III; **Section B:** Includes Unit IV, V and VI.

Pattern of Question Paper:

The six/four units in the syllabus shall be divided in two equal parts i.e. 3/2 units respectively. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:

1. Minimum ten questions
2. Five questions in each section
3. Question no 1 from section A and Question no 6 from section B be made compulsory and should cover complete syllabus of the respective section and should be set for ten marks each. The Question no.1 and 6 should be of objective nature.
4. Two questions of 15 marks each from remaining questions from each section A and B be asked to solve.

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
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Syllabus of T.E. (ETC/EC/E&C/IE) Semester-V

Code No.: ETC304
Teaching Scheme: 04Hrs/week
Theory: 04Hrs/week
Credits:04

Title: Digital Signal Processing
Class Test (Marks): 20
Theory Examination (Duration): 03 Hrs
Theory Examination (Marks): 80

Prerequisites	:	Knowledge of Signals and Systems
Objectives	:	<ul style="list-style-type: none"> • To understand DSP & ASP Systems • To understand ZT, DTFT and DFT. • To understand, analyze and design FIR and IIR filters and its realization. • To understand its hardware implementation using DSP Processor.
Unit-I	:	<p>Introduction to DSP Systems: Basic Elements of DSP systems, Advantages of DSP over ASP, Introduction to FIR & IIR Systems</p> <p>Realization of FIR and Systems: Introduction, Basic realization blocks diagram. FIR realization- Direct Form (Non-linear phase and Linear phase), Cascade and Parallel realization. IIR realization- Direct form I and II, Cascade and parallel realization. (6 Hrs)</p>
Unit-II	:	<p>The Z- Transform: The direct Z -transform , the inverse Z -Transform, properties of the Z-transform, Rational Z -transforms , inversion of the Z- transform , stability in Z –domain , the one sided Z- transform. Relation between Laplace Transform and Z –transform, Relation between Fourier transform and Z-transform. (8 Hrs)</p>
Unit-III	:	<p>Discrete Fourier Transforms (DFT) and Fast Fourier Transform (FFT): Frequency domain sampling, the Discrete Fourier Transforms (DFT), DFT as a linear transformation, properties of the DFT , circular convolution, linear convolution vs. circular convolution. FFT Algorithms: Decimation-in –time (DIT) algorithm , Decimation –in-frequency (DIF) algorithm , computation of inverse DFT using FFT, fast convolution techniques: Overlap- add method, overlap-save method . (8 Hrs)</p>
Unit-IV	:	<p>FIR Filter Design Characteristics of FIR Filters. Properties of FIR Filters. FIR Design using Windowing Technique [Rectangular Window, Hamming Window and Hamming Window] , FIR Design using Kaiser Window, FIR Design using Frequency Sampling Technique (6 Hrs)</p>
Unit-V	:	<p>IIR Filter Design. Introduction to IIR Filters, IIR Filter Designing by using Approximation of Derivatives, Impulse Invariant method and Bilinear Z Transformation method, Matched Z Transform Method, Design of Low pass digital Butterworth filter, Frequency Transformation, Comparison of FIR & IIR Filters (6 Hrs)</p>

Unit-VI	:	Finite word length effects in Digital Filters Binary fixed point and floating point number representations, Comparison - Quantization noise – truncation and rounding – quantization noise power-input quantization error- coefficient quantization error – limit cycle oscillations-dead band- Overflow error-signal scaling. DSP Processors. Introduction, Architecture of DSP Processor, TMS320C67XX, Specifications, Comparison between general purpose and DSP Processor (6 Hrs)
Reference Books:	:	Text Books: <ol style="list-style-type: none"> 1. “Digital Signal Processing Principles, Algorithms and Application” John G Prokis, Manolakis, Pearson Education publication 2. “Digital Signal Processing” Salivahanam, A Vallavaraj, C. Guanapriya, Tata MCGraw Hill. 3. “Digital Signal Processing” P. Ramesh Babu, Scitech publication Reference Books: <ol style="list-style-type: none"> 1. “Digital Signal Processing”, Tarun Kumar Rawat (Oxford) 2. “Digital Signal Processing – A Computer Based Approach” Sanjeet Mitra, Tata Mc Graw Hill 3. “Digital Signal Processing”-Ashok Ambardar (Cengage learning) 4. “Digital Signal Processing”, Emmanuel C. Ifeakor, and Barrie. W. Jervis, Second Edition, Pearson Education, Prentice Hall, 2002. 5. “Discrete-Time Signal Processing”, A. V. Oppenheim, R. W. Schaffer and J.R. Buck, 8th Indian Reprint, Pearson, 2004

Section A: Includes Unit I, II and III; **Section B:** Includes Unit IV, V and VI.

Pattern of Question Paper:

The six/four units in the syllabus shall be divided in two equal parts i.e. 3/2 units respectively. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:

1. Minimum ten questions.
2. Five questions in each section.
3. Question no 1 from section A and Question no 6 from section B be made compulsory and should cover complete syllabus of the respective section and should be set for ten marks each. The Question no.1 and 6 should be of objective nature.
4. Two questions of 15 marks each from remaining questions from each section A and B be asked to solve.

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
(Faculty of Science & Technology)
Syllabus of T.E. (ETC/EC/E&C/IE) Semester-V

Code No.: ETC341
Teaching Scheme: 04Hrs/week
Theory: 04Hrs/week
Credits:04

Title: Programming in Java
Class Test (Marks): 20
Theory Examination (Duration): 03 Hrs
Theory Examination (Marks): 80

Prerequisites	:	Fundamentals of java programing, basics of data types Programming fundamentals,
Objectives	:	Students will learn the fundamentals of Java. The focus is on developing high quality, working software that solves real problems
Unit-I	:	Java Fundamentals Features of Java, OOPs concepts ,Java virtual machine Reflection byte codes, Byte code interpretation Data types, variable, arrays, expressions, operators, and controlStructures Objects and classes [08 Hours]
Unit-II	:	Java Classes Abstract classes,Static classes,Inner classes,Packages,Wrapper classes,Interfaces,SuperAccess control [06 Hours]
Unit-III	:	Exception handling Exception as objects, Exception hierarchy, Try catch finally, Throw, throws [06 Hours]
Unit-IV	:	IO package Input streams, Output streams,Object serialization,Deserialization,Sample programs on IO files,Filter and pipe streams [06 Hours]
Unit-V	:	Multi threading Thread Life cycle,Multi threading advantages and issues,Simple thread program,Thread synchronization [08 Hours]
Unit-VI	:	GUI Introduction to AWT programming,Layout and component managers,Event handlingApplet class,Applet life-cycle,Passing parameters embedding in HTML [06 Hours]
Reference Books:	:	Text Books: <ul style="list-style-type: none"> • Java 1: Basic syntax and semantics, paul Klausen, bookboon publication. • Object Oriented Programming using Java, Simon Kendal, • Java 3: Object-oriented programming, Poul Klausen. <p style="text-align: center;">Reference Books:</p> <ul style="list-style-type: none"> • Java the complete reference, Herbert Schildt

Section A: Includes Unit I, II and III; **Section B:** Includes Unit IV, V and VI.

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2. Five questions in each section.
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4. Two questions of 15 marks each from remaining questions from each section A and B be asked to solve.

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
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Syllabus of T.E. (ETC/EC/E&C/IE) Semester-V

Code No.: ETC342
Teaching Scheme: 04Hrs/week
Theory: 04Hrs/week
Credits:04

Title: Information Theory & Coding
Class Test (Marks): 20
Theory Examination (Duration): 03 Hrs
Theory Examination (Marks): 80

Prerequisites	:	—
Objectives	:	<ul style="list-style-type: none"> • To impart knowledge about information and entropy, • To learn various linear block, cyclic, convolution and BCH codes • To explore source coding for text, audio and speech
Unit-I	:	Information Theory Information Theory, Entropy, Source coding theorem, Shannon-Fano coding, Huffman coding, Channel models, capacity and coding, Information capacity theorem, Shannon's Limit <p style="text-align: right;">[08 Hours]</p>
Unit-II	:	Linear block codes Linear Block Coding/Decoding, Matrix description of Linear block codes, Hamming codes, optimal linear codes, Maximum Distance Separable <p style="text-align: right;">[06 Hours]</p>
Unit-III	:	Cyclic codes Cyclic Codes, Polynomials, Generation of Cyclic codes, matrix description of cyclic codes, Burst Error Correction, Fire Codes, Golay Codes, Cyclic Redundancy Check <p style="text-align: right;">[06 Hours]</p>
Unit-IV	:	BCH Codes BCH Coding /Decoding, Primitive elements, Minimal Polynomials, Generator Polynomials, Reed Solomon codes, Nested Codes, examples <p style="text-align: right;">[06 Hours]</p>
Unit-V	:	Convolution Codes Convolutional Code, Tree Codes and trellis codes, Polynomial description of Convolutional Codes, Distance Notion, Generating function, Matrix description, Viterbi coding, Distance Bound, Performance bound, Turbo Coding/Decoding <p style="text-align: right;">[06 Hours]</p>
Unit-VI	:	Source Coding: Text, Audio and Speech Text: Adaptive Huffman Coding, Arithmetic Coding, LZW algorithm – Audio: Perceptual coding, Masking techniques, Psychoacoustic model, MEG Audio layers I,II,III, Dolby AC3 - Speech: Channel Vocoder, Linear Predictive Coding <p style="text-align: right;">[08 Hours]</p>
Reference Books:	:	TEXT BOOKS <ul style="list-style-type: none"> • Ranjan Bose, "Information Theory coding and Cryptography", McGraw-Hill Publication, • R. Avudaiammal, "Information Coding Techniques" Second Edition. Tata McGrawHill

	<ul style="list-style-type: none"> • J C Moreira, P G Farrell, “Essentials of Error-Control Coding”, Wiley Student Edition. • Simon Haykin, “Communication Systems”, John Wiley & Sons, Fourth Edition. <p>REFERENCE BOOKS</p> <ul style="list-style-type: none"> • K Sayood, “Introduction to Data Compression” 3/e, Elsevier 2006 • Fred Halsall, “Multimedia Communications: Applications, Networks, Protocols and Standards”, Pearson Education Asia, 2002 • S Gravano, “Introduction to Error Control Codes”, Oxford University Press 2007 • Todd Moon, “Error Correction Coding : Mathematical Methods and Algorithms”, Wiley Publication • Amitabha Bhattacharya, “Digital Communication”, TMH 2006
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Section A: Includes Unit I, II and III; **Section B:** Includes Unit IV, V and VI.

Pattern of Question Paper:

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For 80 marks Paper:

1. Minimum ten questions.
2. Five questions in each section.
3. Question no 1 from section A and Question no 6 from section B be made compulsory and should cover complete syllabus of the respective section and should be set for ten marks each. The Question no.1 and 6 should be of objective nature.
4. Two questions of 15 marks each from remaining questions from each section A and B be asked to solve.

Dr.Babasaheb Ambedkar Marathwada University, Aurangabad
(Faculty of Science & Technology)
Syllabus of T.E. (ETC/EC/E&C/IE) Semester-V

Code No.: ETC343

Title: Computer Architecture and Operating System

Teaching Scheme: 04Hrs/week

Class Test (Marks): 20

Theory: 04Hrs/week

Theory Examination (Duration): 03 Hrs

Credits:04

Theory Examination (Marks): 80

Prerequisites	:	—
Objectives	:	<ul style="list-style-type: none"> • To state advantages and necessity of parallel processing • To discuss principles of pipelining architecture • To share fundamentals of Operating System • To elaborate concepts of multitasking, multiprogramming, timesharing, buffering & spooling
Unit-I	:	<p>Overview of Parallel Processing and Pipelining Processing Necessity of high performance, Constraints of conventional architecture, Parallelism in uniprocessor system, Evolution of parallel processors, Future trends, Architectural classification, Applications of parallel processing, Instruction level Parallelism and Thread Level Parallelism, Principles of scalable performance: Performance metrics and measures, Speedup performance laws. [06 Hours]</p>
Unit-II	:	<p>Pipeline Architecture Principles and implementation of pipelining, Classification of pipelining processors, General pipelining reservation table, Design aspect of arithmetic and instruction pipelining, Pipelining hazards and resolving techniques, Data buffering techniques, Job sequencing and collision, Advanced pipelining techniques, Loop unrolling techniques, Out of order execution, Predicated execution, Speculative loading, Register Stack Engine, Software pipelining [08 Hours]</p>
Unit-III	:	<p>Computer Architecture Explicitly Parallel Instruction Computing (EPIC) Architecture, Case study of Intel Itanium Processor, VLIW (Very Long Instruction Word) processor, Superscalar Architecture: Pentium, Ultra SPARC, Dual core [06 Hours]</p>
Unit-IV	:	<p>System Software Overview of all system software, Operating system, I/O manager, Assembler, Compiler, linker, Loader, OS services and Components, Multitasking, Multiprogramming, Timesharing, Buffering, Spooling [06 Hours]</p>
Unit-V	:	<p>Process and Thread Management Concept of process and threads, Process states, Context switching, inter process communication, mutual exclusion, semaphores, wait and signal procedures, process scheduling and algorithms, critical sections, Multithreading [08 Hours]</p>
Unit-VI	:	<p>Memory Management Memory partitioning, Swapping, Paging, Virtual Memory, Page replacement algorithms, Segmentation [06 Hours]</p>

Reference Books	:	TEXT AND REFERENCE BOOKS <ol style="list-style-type: none"> 1. Kai Hwang, Faye A. Briggs, “ Computer Architecture and Parallel Processing ” McGraw Hill International Edition 2. Kai Hwang, “ Advanced Computer Architecture ”, Tata McGraw hill Edition 3. V. Rajaraman, L Sivaram Murthy, “Parallel Computers”, PHI 4. William Stallings, “ Computer Organization and Architecture, Designing for Performance ” 6th Ed. PHI 5. Harrold Stone “ High Performance Computer Architecture ” 6. Richard Y. Kain “ Advanced Computer Architecture ” 7. Achyut S. Godbole, Operating Systems, Tata McGraw Hill 2nd edition. 8. D.M. Dhamdhare, Operating Systems, Tata McGraw Hill 2nd edition. 9. Andrew S. Tanenbaum, Albert S. Woodhull, Operating Systems Design & implementation Pearson
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Section A: Includes Unit I, II and III; **Section B:** Includes Unit IV, V and VI.

Pattern of Question Paper:

The six/four units in the syllabus shall be divided in two equal parts i.e. 3/2 units respectively. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:

1. Minimum ten questions.
2. Five questions in each section.
3. Question no 1 from section A and Question no 6 from section B be made compulsory and should cover complete syllabus of the respective section and should be set for ten marks each. The Question no.1 and 6 should be of objective nature.
4. Two questions of 15 marks each from remaining questions from each section A and B be asked to solve.

Dr.Babasaheb Ambedkar Marathwada University, Aurangabad
(Faculty of Science & Technology)
Syllabus of T.E. (ETC/EC/E&C/IE) Semester-V

Code No.: ETC321

Teaching Scheme: 02Hrs/week

Lab: I

Title: Microprocessor & Microcontroller.

Practical/Oral Examination: 50 Marks

Credits: 01

Course Objectives	:	To enhance Programming Techniques of 8 bit microcontroller and to understand System Peripheral and Interface.
List of Practical	:	<ol style="list-style-type: none"> 1. Study of 8085 Microprocessor Kit used in laboratory. 2. Programming for Data Transfer Operations 3. Programming for Arithmetical Operations 4. Programming for Logical Operations 5. Programming for String Operations 6. Programming for Sorting (Ascending & Descending Order) 7. Code Conversion programs. . 8. Study of interfacing cards of LED, A/D and D/A converter, stepper motor 9. Study of 8255, 8259, 8253 10. Arithmetical Operations using 8051 microcontroller 11. Logical Operations using 8051 microcontroller 12. Data transfer operations using 8051 microcontroller 13. Bit manipulation Operations using 8051 microcontroller 14. Study 8051 Assembler and simulator. 15. Examining Flags and stacks for 8051.
List of Reference Books	:	<ol style="list-style-type: none"> 1. Ramesh Gaonkar, "Microprocessor, Architecture, Programming and Application", Willey Eastern Ltd, Fourth Edition. 2. Ray & Bhurchandi, "Advanced Microprocessors and Peripherals", Tata McGraw Hill 2nd Edition. 3. A. P .Godse, D. A. Godse , "Microprocessor Techniques 8085 and 8086 Archetecture,Instruction set,Programming and Interfacing", Technical Publication Pune, Fourth Revised Edition 2008. 4. Muhammad A Mazidi, "The 8051 Microcontroller and Embedded Systems", Pearson Education Asia, first Indian reprint, 2002. 5. Raj Kamal, "Embedded Systems Architecture, Programming and Design", TMH 2nd Edition.
List of Equipments /Instruments	:	Hardware: 8085 Microprocessor and 89c51 Microcontroller Trainer kits, CRO, Power supply. Software: Keil μ Vision3, Flash Magic.

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above

The assessment of practical examination shall be on the following criteria:

The practical examination shall consist of performing an experiment based on the practical work done during the course, the record of the experiments submitted by the candidate and viva -voce based on the syllabus.

Dr.Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of T.E. (ETC/EC/E&C/IE) Semester-V	
Code No.: ETC322	Lab II
Teaching Scheme: 02Hrs/week	Title: Digital Communication
Practical/Oral Examination: 50 Marks	Credits: 01
Course Objectives	: To understand modulation techniques in digital communication.
List of Practical	: <ol style="list-style-type: none"> 1. Verification of Sampling theorem. 2. Study of Pulse code Modulation and Demodulation. 3. Study of Delta Modulator and Demodulator. 4. Generation & reception of BPSK & its spectral analysis. 5. Generation & reception of ASK & its spectral analysis. 6. Generation & reception of FSK & its spectral analysis 7. Generation & reception of PSK & its spectral analysis 8. Generation & reception of QPSK & its spectral analysis. 9. Generation & reception of DPSK & its spectral analysis. 10. Spectral analysis of line codes. 11. Simulation of any digital communication system using Scilab/ MATLAB.
List of Reference Books	: <ol style="list-style-type: none"> 1. Taub Schilling, “Principles of Communication system”, TMH, Fourth Edition. 2. John G. Proakis, Masoud Salehi, and Gerhard Bauch, “Contemporary Communication System using MATLAB”, Cengage learning.
List of Equipments /Instruments	: DSO, Trainer kits, Power Supply, Function Generator, and MATLAB Software.

The assessment of term work shall be done on the basis of the following.

1. Continuous assessment
2. Performing the experiments in the laboratory
3. Oral examination conducted on the syllabus and term work mentioned above

The assessment of practical examination shall be on the following criteria:

The practical examination shall consist of performing an experiment based on the practical work done during the course, the record of the experiments submitted by the candidate and viva -voce based on the syllabus

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
(Faculty of Science & Technology)
Syllabus of T.E. (ETC/EC/E&C/IE) Semester-V

Code No.: ETC323

Lab: III

Teaching Scheme: 02Hrs/week

Title: Digital Signal Processing

Practical/Oral Examination: 50 Marks

Credits: 01

Course Objectives	:	<ul style="list-style-type: none"> • To understand Digital Signal Processing Concept using MATLAB/ Software • Study of Digital Signal Processor using Code Composer Studio
List of Practical	:	<ol style="list-style-type: none"> 1. MATLAB based program to study discrete time system described by difference equation. 2. MATLAB based program to find N point DFT & IDFT. 3. MATLAB based program to calculate circular convolution using DFT & IDFT. 4. MATLAB based program to calculate linear convolution using DFT & IDFT. 5. MATLAB based program to design FIR filter using hamming & hanning windowing techniques. 6. MATLAB based program to design FIR filter using rectangular windowing technique. 7. MATLAB based program to design FIR filter using frequency sampling technique. 8. MATLAB based program to design & implementation of IIR filter using bilinear transformation 9. MATLAB based program to design & implementation of IIR filter using impulse invariance Method 10. MATLAB based program to study interpolation & decimation. 11. Familiarization with Code Composer Studio 12. Study of FFT, Linear Convolution, Factorial implementation using DSP TMS320C6713
List of Reference Books	:	1. Ingle, John G. Proakis, " Digital Signal Processing MATLAB, Asia Edition, Thomson
List of Equipments /Instruments	:	MATLAB Software, DSP Processor, Code Composer Studio

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above

The assessment of practical examination shall be on the following criteria:

The practical examination shall consist of performing an experiment based on the practical work done during the course, the record of the experiments submitted by the candidate and viva -voce based on the syllabus.

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Syllabus of T.E. (ETC/EC/E&C/IE) Semester-V

Code No.: ETC324

Lab IV

Teaching Scheme: 02Hrs/week

Title: Programming in JAVA

Teachers Assessment: 50 Marks

Credits: 01

Course Objectives	:	Students will learn the fundamentals of Java. The focus is on developing high quality, working software that solves real problems
List of Practical	:	<p>1) Write a Java program that takes a number as input and prints its multiplication table up to 10.</p> <p>2) Write a Java program to convert temperature from Fahrenheit to Celsius degree.</p> <p>3) Write a program in Java to display the pattern like right angle triangle with a number.</p> <pre> 1 12 123 1234 12345 123456 1234567 </pre> <p>4) Write a Java program to sum values of an array.</p> <p>5) Write a Java program to get the character at the given index within the String</p> <p>6) Write a Java program to get and display information (year, month, day, and hour, minute) of a default calendar.</p> <p>7) Write a Java method to find the smallest number among three numbers.</p> <p>8) Write a Java program to generate random integers in a specific range</p> <p>9) Write a Java program to get specific files by extensions from a specified folder.</p> <p>10) Write a Java program to round up the result of integer division.</p> <p>11) Write a Java program to create a new array list, add some colors (string) and print out the collection.</p>
List of Reference Books	:	<ul style="list-style-type: none"> • Java 1: Basic syntax and semantics, paul Klausen, bookboon publication. • Object Oriented Programming using Java, Simon Kendal, • Java 3: Object-oriented programming, Poul Klausen.
List of Equipments /Instruments	:	Computer, Programming Software.

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
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Syllabus of T.E. (ETC/EC/E&C/IE) Semester-V

Code No.: ETC325

Lab IV

Teaching Scheme: 02Hrs/week

Title: Information Theory & Coding

Teachers Assessment: 50 Marks

Credits: 01

Course Objectives	:	<ul style="list-style-type: none"> • To impart knowledge about information and entropy, • To learn various linear block, cyclic, convolution and BCH codes • To explore source coding for text, audio and speech
List of Practical	:	<ol style="list-style-type: none"> 1. Write a program to find out, entropies and mutual information of given signals for given channel. Test various types of channel such as <ol style="list-style-type: none"> a) Noise free channel. b) Error free channel c) Binary symmetric channel d) Noisy channel Compare channel capacity of above channels. 2. Write a program for generation and evaluation of source coding <ol style="list-style-type: none"> a) Shannon – Fano coding and decoding b) Huffman Coding and decoding c) Lempel Ziv Coding and decoding 3. Write a Program for coding & decoding of Linear block codes. 4. Write a Program for coding & decoding of Cyclic codes. 5. Write a program for coding and decoding of BCH and RS codes. 6. Write a program for coding and decoding of convolutional codes 7. Write a program to study performance of a coded and un-coded Communication 8. Implementation of any one of the coding technique for real world 1-D or 2-D signals
List of Reference Books	:	<ul style="list-style-type: none"> • K Sayood, “Introduction to Data Compression” 3/e, Elsevier 2006 • Fred Halsall, “Multimedia Communications: Applications, Networks, Protocols and Standards”, Pearson Education Asia, 2002 • S Gravano, “Introduction to Error Control Codes”, Oxford University Press 2007
List of Equipments /Instruments	:	Computer, Matlab Software

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above

The assessment of practical examination shall be on the following criteria:

The practical examination shall consist of performing an experiment based on the practical work done during the course, the record of the experiments submitted by the candidate and viva -voce based on the syllabus.

Dr.Babasaheb Ambedkar Marathwada University, Aurangabad
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Syllabus of T.E. (ETC/EC/E&C/IE) Semester-V

Code No.: ETC326

Lab IV

Title: Computer Architecture and Operating System

Teaching Scheme: 02Hrs/week

Teachers Assessment: 50 Marks

Credits: 01

Course Objectives	:	<ul style="list-style-type: none"> • To state advantages and necessity of parallel processing • To discuss principles of pipelining architecture • To share fundamentals of Operating System • To elaborate concepts of multitasking, multiprogramming, timesharing, buffering & spooling
List of Practical	:	<ol style="list-style-type: none"> 1.Simulation and development of applications of parallel processing using MATLAB 2.Practical study of Ultra SPARC, Dual core processors 3.Study of design aspect of arithmetic and instruction pipelining 4.Program to control USB and COM devices 5.Program to access PCI devices and LPT devices 6.Shell programming for Operating System 7.Thread synchronization using semaphores 8.Implementation of CPU scheduling algorithms 9.Implementation of memory allocation algorithms 10.Demand paging implementation-using algorithms
List of Reference Books	:	<ol style="list-style-type: none"> 1. Kai Hwang, Faye A. Briggs, “ Computer Architecture and Parallel Processing ” McGraw Hill International Edition 2. Kai Hwang, “ Advanced Computer Architecture ”, Tata McGraw hill Edition 3. V. Rajaraman, L Sivaram Murthy, “Parallel Computers”, PHI 4. William Stallings, “ Computer Organization and Architecture, Designing for Performance ” 6th Ed. PHI
List of Equipments /Instruments	:	Computer, Matlab Software

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above

Dr.Babasaheb Ambedkar Marathwada University, Aurangabad
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Syllabus of T.E. (ETC/EC/E&C/IE) Semester-V

Course Code: BSH305

Title: Communication Skill-II

Teaching Scheme
Theory: 02Hours/Week

Class Test (Marks): 20
Examination Scheme
Term Work: 50 Marks

Credits:02

Prerequisites	:	1. Basic Knowledge of Soft Skills 2. Good understanding of English
Objectives	:	1. To imbibe leadership skills 2. To develop interpersonal Skills 3. To introduce corporate etiquettes 4. To imbibe team skills
Unit-I	:	Understanding self and Goal Setting Self-Assessment: Understanding Self Core Competency (SWOT/SWOC), Long term and short-term Goal Setting, Execution Skills (5 Hours)
Unit-II	:	Interpersonal Skills Interpersonal Communication, Conflict Management, Problem Solving, Decision Making, Persuasion and Influence (6 Hours)
Unit-III	:	Group Dynamics and Team Building Group Vs Team, Team Building, Team Work, Developing Leadership Skills (4 Hours)
Unit-IV	:	Corporate Etiquette Clothing Etiquette, Personal hygiene and grooming, Time Management, Influencing Skills (Impression), Balancing personal and professional Life, Ethics, Values and Laws (5 Hours)
Reference Books	:	Text Book: 1. The Ace of Soft Skills (Gopalaswamy Ramesh) Pearson Publication Reference Books: 1. Execution; :Ram Charan (Publisher: Crown Business; 1 edition (June 15, 2002) Language: English ISBN-10: 0609610570 ISBN-13: 978-0609610572 2. Laws of Teamwork : John C Maxwell 3. Master of Business Etiquette: Cyrus Gonda (Author: Cyrus Gonda, Publisher EMBASSY BOOKS, 2017, ISBN 9385492721, 9789385492723)

	<p>4. Goals : (Author: Brain Tracy ISBN: 1-57675-235-6Published by Berrett-Koehler Publishers, Inc)</p> <p>5. Interpersonal Skills at work : (Author: John Hayes Second Edition: Routledge)</p> <p>6. People Smart : (Author: Freda Hansburgby Berrett-Koehler Publishers, Inc)</p>
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Term Work Assessment (50 marks):

The term work shall consist of internal online examination of 50 Marks, conducted at institute level. The marks of the examination shall be forwarded to the University.

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
(Faculty of Science & Technology)
Syllabus of T.E. (ETC/EC/E&C/IE) Semester-VI

Code No.: ETC351

Teaching Scheme: 04Hrs/week

Theory: 04Hrs/week

Credits:04

Title: Embedded System

Class Test (Marks): 20

Theory Examination (Duration): 03 Hrs

Theory Examination (Marks): 80

Prerequisites	:	Digital electronics, Microprocessor based systems.
Objectives	:	To understand the applications of Microcontrollers. To understand need of microcontrollers in embedded system. To understand architecture and features of typical Microcontroller. To learn interfacing of real world input and output devices. To study various hardware & software tools for developing applications.
Unit-I	:	PIC18F4550 Microcontroller Architecture: PIC family PIC 10, PIC12, PIC16, PIC18, PIC18F4550: Features, architecture, registers, memory organization and types, stack, Pin description, oscillator options, BOD, power down modes and configuration bit settings, Port structure with programming, watchdog timer, timer and its programming. All programs in embedded C. [8 Hours]
Unit-II	:	Programming Concepts and Embedded Programming in C: Comparison of Software Programming in Assembly language and in high level language 'C', C program elements: Header and source files and processor directives, data types, data structures, modifiers, statements, loops, pointers, object oriented programming. [6 Hours]
Unit-III	:	PIC18F4550 Interfacing: Interrupt Structure (Legacy and priority mode) of PIC18F with SFRS. Use of timers with interrupts, CCP modes: Capture, Compare and PWM generation, Sensor interfacing using ADC, LCD (4&8 bits), DC Motor speed control with CCP, MSSP structure (SPI & I2C), Enhanced USART(LIN), RTC(DS1306) with I2C and EEPROM with SPI, CAN : All programs in embedded C. [6 Hours]
Unit-IV	:	Arduino Uno R3: Introduction, The Arduino Platform, Block diagram, Atmel ATmega328/AVR family, Architecture, Pin functions, overview of main features such as I/O Ports, Timers, interrupts, serial port, PWM, ADC. [6 Hours]
Unit-V	:	Arduino Basic programming: Arduino Control structure, Functions, operators, Sketch Structure, Variables, Data types, Constants, flow control, Analog and digital I/O, time, math, random, serial. Programming- I/O Ports, Timers, interrupts, serial port, PWM, ADC, 7 Segment display. [8 Hours]

Unit-VI	:	Interfacing with Arduino: LCD, DAC, PWM motor speed controller, IR Sensor, Ultrasonic Sensor (HC-SR04), Temperature and Humidity Sensor (DHT11), SPI, wifi ESP8266, Bluetooth HC-05. [6 Hours]
Reference Books:	:	Reference Books: 1. Mazidi, “PIC microcontroller & embedded system”, 3rd Edition ,Pearson 2. Peatman John B., “Design with PIC Microcontrollers”, Pearson Edition. 3. Tim Wilmshurst, “Designing Embedded Systems with PIC Microcontrollers: Principles and Applications” 2nd Edition, Kindle Edition ,Nerwnes 4. Brain .W. Eveans, “Arduino Programming Notebook”, first edition August 2007 5. Jeremy Blum, “Exploring Arduino Tools and Techniques for Engineering”, Wizardry 1st Edition. 6. Simon Monk, “ Programming Arduino: Getting Started with Sketches”, Second Edition 2nd Edition.

Section A: Includes Unit I, II and III; **Section B:** Includes Unit IV, V and VI.

Pattern of Question Paper:

The six/four units in the syllabus shall be divided in two equal parts i.e. 3/2 units respectively. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:

1. Minimum ten questions.
2. Five questions in each section.
3. Question no 1 from section A and Question no 6 from section B be made compulsory and should cover complete syllabus of the respective section and should be set for ten marks each. The Question no.1 and 6 should be of objective nature.
4. Two questions of 15 marks each from remaining questions from each section A and B be asked to solve.

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
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Syllabus of T.E. (ETC/EC/E&C/IE) Semester-VI

Code No.: ETC 352

Teaching Scheme: 04Hrs/Week

Laboratory: 02Hrs/week

Practical Exam. (Marks): 50

Title: Feedback Control System

Class Test (Marks): 20

Theory Examination (Duration): 03 Hrs

Theory Examination (Marks): 80

Prerequisites	:	Laplace Transform , Matrix Operation , Algebra
Objectives	:	<ul style="list-style-type: none"> • To understand the user specification and analyze the system in time and frequency domain • To find gain of various systems • To analyze performance of the system. • To introduce concepts of PID controllers and digital and control systems • To introduce the state variable analysis method
Unit-I	:	Introduction of Control System: Definition of control system, Various Control Systems, Difference Between Closed Loop and Open Loop Control Systems, Examples on Control System, Feedback and Feed forward Control System, Mathematical modeling of a Physical system, Differential equations of Physical system (06 Hours)
Unit-II	:	Mathematical Modelling: Basic Definitions, advantages and disadvantages of block diagram, block diagram reduction rules, important definitions related to SFG, comparison of block diagram and SFG methods, Mason's gain Formula for SFG, Formation of SFG from equations and electrical networks. Transfer Function, its properties, advantages and disadvantages, poles and zeros of Transfer Function, Mechanical system modeling, Analogous systems (08 Hours)
Unit-III	:	Time Response Analysis: Transient and steady state response, stability and sensitivity, steady state error, First and Second order system analysis, Damping Ratio, Routh's Stability Criterion, Advantages and disadvantages, Hurwitz's criterion, Root Locus & Rules of Root Locus Plot (06 Hours)
Unit-IV	:	Frequency Domain Analysis: Frequency domain specification, Polar plots, Bode plots, Phase and Gain margin, Stability analysis using Bode Plot, Nyquist Stability criterion. (08 Hours)
Unit-V	:	Control Actions and Control System Components: Proportional, integral, PD, PI and PID controllers, servo potentiometers, servo motors, techo generator, stepper motor and synchros. (06 Hours)
Unit-VI	:	State Space Representation: State variables, state model, state diagram representation Study of programmable logic controllers, Concept of fuzzy logic, Neural based control system, sensors, electronic controllers, relays. (06 Hours)
Books:	:	<ol style="list-style-type: none"> 1. N. J. Nagrath and M. Gopal, " Control System Engineering ", New Age International Publishers, 5th Edition 2. Benjamin C. Kuo , "Automatic control systems", Prentice Hall of India, 7th Edition 1995

	<ol style="list-style-type: none"> 3. Ogata, "Modern Control Engineering", PHI publication 4. B.S. Manke, "Linear Control System", Khanna Publication 5. Norman S. Nise - Control system Engineering. 5th edition, Wiley publication. 6. S. K. Bhattacharya – Control system Engineering, Pearson education 7. D Roy Chudhary Modern control Engineering PHI. 8. S Palani Control System engineering McGraw Hill.
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Section A: Includes Unit I, II and III ; **Section B:** Includes Unit IV, V and VI.

Pattern of Question Paper:

The six/four units in the syllabus shall be divided in two equal parts i.e. 3/2 units respectively. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:

1. Minimum ten questions.
2. Five questions in each section.
3. Question no 1 from section A and Question no 6 from section B be made compulsory and should cover complete syllabus of the respective section and should be set for ten marks each. The Question no.1 and 6 should be of objective nature.
4. Two questions of 15 marks each from remaining questions from each section A and B be asked to solve.

Dr.Babasaheb Ambedkar Marathwada University, Aurangabad
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Syllabus of T.E. (ETC/EC/E&C/IE) Semester-VI

Code No.: ETC 353
Teaching Scheme: 04Hrs/week
Theory: 04Hrs/week
Credits:04

Title: Power Electronics And Drives
Class Test (Marks): 20
Theory Examination (Duration): 03 Hrs
Theory Examination (Marks): 80

Prerequisites	:	Basics of signal diode and transistor, R and RL loads, motor basics.
Objectives	:	<ul style="list-style-type: none"> • To understand various power devices, their firing circuits & commutation circuits. • To describe 1-Φ and 3-Φ power converters. • To study D.C. to A.C. conversion techniques. • To learn D.C to D.C. control techniques. • To learn inverter and chopper based drive applications.
Unit-I	:	Power Semiconductor Devices: Principle of operation, construction, characteristics, ratings and applications of: Power Diodes, Power <i>BJT</i> , Power MOSFET, SCR, IGBT, DIAC, TRIAC and GTO. Triggering circuits(R, R-C, and UJT) and Commutation circuits for SCRs. [08 Hours]
Unit-II	:	Power Converters: Single phase and three phase Converters with R and R-L loads. Continuous and discontinuous current mode operation. Dual converters, effect of source inductance, performance parameters. [06 Hours]
Unit-III	:	A. C. Voltage controllers: Integral cycle and phase angle control, single phase A.C. Voltage controller with R, R-L loads. Cyclo-converter and its types. [06 Hours]
Unit-IV	:	Inverters and AC based drives: Single phase series and parallel inverters their analysis and design, 1- Φ bridge Inverter, 3- Φ inverters, 120° mode and 180° mode operation and design. Voltage control techniques, Current source inverter drives, voltage source inverter drives. [08 Hours]
Unit-V	:	Chopper based DC motor drives: Basic chopper operation, analysis of class A Chopper. Four quadrant chopper, voltage commutated and current commutated chopper. Control techniques in chopper i.e. CLC, TRC etc. [06 Hours]
Unit-VI	:	Applications of Power Electronics and drives: Ring counter using SCR, servo controlled stabilizer, HF heating. Intelligent Power Electronics modules. Case Study: Control of VSI using PWM for Adjustable Speed Drive, Speed Control of DC Motor Using MOSFET Based Chopper. [06 Hours]
Reference Books:	:	<ul style="list-style-type: none"> • M.H.Rashid, "Power Electronics", John Wiley & sons • M.D.Singh and K.B.Khanchandani, "Power Electronics" Tata McGraw Hill. • General Electric, "SCR Manual". • B.K.Bose, "Power Electronics & A.C. Drives", PHI.

Section A: Includes Unit I, II and III; **Section B:** Includes Unit IV, V and VI.

Pattern of Question Paper:

The six/four units in the syllabus shall be divided in two equal parts i.e. 3/2 units respectively. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:

- 1 Minimum ten questions.
- 2 Five questions in each section.
- 3 Question no 1 from section A and Question no 6 from section B be made compulsory and should cover complete syllabus of the respective section and should be set for ten marks each. The Question no.1 and 6 should be of objective nature.
- 4 Two questions of 15 marks each from remaining questions from each section A and B be asked to solve.

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Syllabus of T.E. (ETC/EC/E&C/IE) Semester-VI

Code No.: ETC354
Teaching Scheme: 04Hrs/week
Theory: 04Hrs/week
Credits:04

Title: Electronic Circuit Technology
Class Test (Marks): 20
Theory Examination (Duration): 03 Hrs
Theory Examination (Marks): 80

Prerequisites	:	Knowledge of Electronic Devices & Circuits, Digital Electronics, and Instrumentation.
Objectives	:	<ol style="list-style-type: none"> 1. To study different circuit design. 2. To study different aspect of Op-Amp. 3. To study different aspect of physical & analog quantities. 4. To study electronics & digital system design.
Unit-I	:	<p>Design of Power Supply Active and Passive Components: Study of data sheets, characteristics, specifications and selection criteria of various active and passive components. Power Supply Design: Selection of transformers, Design of Power supply and Dual power supply with protection circuits, Design of filter circuit, Design using linear(LM78XX, LM 79XX, LM317 & LM 337) and switching regulators(78S40), Switching Mode Power Supply and its comparison with Linear Power Supply. (8Hrs)</p>
Unit-II	:	<p>Design of Analog Hardware Design using Opamp: Types, specifications, characteristics, selection criteria, Inverting and Non-inverting Amplifier, Voltage to current Amplifier, Current to voltage Amplifier, Instrumentation Amplifier (Three OPAMP configuration), Design of Filters using opamp, Design of power amplifier and special purpose amplifier, Design of oscillators. (8Hrs)</p>
Unit-III	:	<p>Measurement and Signal Coding: Measurement of Temperature by thermistor and IC Temperature sensor, Measurement of light level by photo diodes and photo transistors, Measurement of strain by strain gauge. (4Hrs)</p>
Unit-IV	:	<p>Design Using Specialized IC: IC 555 (Astable and monostable multivibrator), LM 380/ LM 386 (Audio Amplifier), IC7106/7107 (DC voltmeter), ICL 8038 (Function Generator), LM 565 (PLL) (6Hrs)</p>
Unit-V	:	<p>Design of Digital System: Need of Data Acquisition System, Application Areas of DAQs, performance parameters of DAQs, Selection criteria for ADC and DAC. Introduction to Finite State Machines, State Diagrams, Design of Mealy FSM Design of Moore FSM, Interfacing of Single Digit, Multiplexed Seven Segment Display, Opto coupler and relay. (6Hrs)</p>
Unit-VI	:	<p>Electronics System Design Considerations: Reliability Engineering, Exponential Law of Reliability, Quality, Failure or Defects, Maintainability, MTTR, MTTBF, MTTF. Noise in electronics circuits, grounding, Shielding, Guarding, Enclosure sizing Selection of materials for enclosure, Heat transfer fundamentals, thermal calculations, thermal time constants, Heat Sinks,</p>

		PCB Design: Rules, Power and ground traces routing, PCB design rules for digital circuits, Noise due to ground and supply line, grounds, returns, shields, PCB design rules for analog circuits (8Hrs)
Reference Books:	:	<ol style="list-style-type: none"> 1. Ron Lenk, "Practical Design of Power Supplies", John Wiley and Sons 2. Design with Operational Amplifiers and Analog Integrated Circuits 3rd Edition- Sergio Franco 3. Ramakant Gaikwad, "OPAMP and Linear Integrated Circuits" PHI/Pearson Education. 4. K.R. Botkar, "Linear Integrated Circuits", Khanna Publication, New Delhi 5. Dr. R P Jain, "Modern Digital Electronics", TMH 6. William Fletcher, "An Engineering Approach to Digital Designing", PHI 7. R.G. Kaduskar, V.B. Baru, "Electronic Product Design", Willey Publication 8. Waller C. Boshart, "PCB Design and Technology", TMH 9. Linear Design Handbook : www.analog.com 10. The Art of Electronics- Paul Horowitz

Section A: Includes Unit I, II and III; **Section B:** Includes Unit IV, V and VI.

Pattern of Question Paper:

The six/four units in the syllabus shall be divided in two equal parts i.e. 3/2 units respectively. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:

1. Minimum ten questions.
2. Five questions in each section.
3. Question no 1 from section A and Question no 6 from section B be made compulsory and should cover complete syllabus of the respective section and should be set for ten marks each. The Question no.1 and 6 should be of objective nature.
4. Two questions of 15 marks each from remaining questions from each section A and B be asked to solve.

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Syllabus of T.E. (ETC/EC/E&C/IE) Semester-VI

Elective-II

Code No.: ETC391

Teaching Scheme: 04Hrs/week

Theory: 04Hrs/week

Credits:04

Title: ROBOTICS

Class Test (Marks): 20

Theory Examination (Duration): 03Hrs

Theory Examination (Marks): 80

Prerequisites	:	-
Objectives	:	<ol style="list-style-type: none">1. To study Basic concept of robotics.2. Building blocks of robotics for transformation.3. To study motion of robotic manipulator4. To study different type of sensors, actuator and gripper require for robotics5. To study motion planning and controlling of robot
Unit-I	:	Introduction: Definition, law of robotics, Seven criteria defining the robot, Industrial robot Classification by mechanical structure, components in robotic system- manipulator, controller, Power conversion unit etc., Robot category. [06 Hours]
Unit-II	:	Dynamics: Dynamic constraints, velocity and acceleration of moving frame, Robotic mass distribution and inertia, Tension, Newton's equation, Euler equation, dynamic modeling of robotic manipulators [06 Hours]
Unit-III	:	Kinematics: Homogenous co-ordinate vector operation, matrix operation, coordinate reference frame, Robot arm introduction, kinematic chain and forward kinematics, Forward kinematic: URDF notation and D-H matrix, DH notation example : 2 link planer robot and SCARA robot, Inverse or back solutions- problem of obtaining inverse solution, techniques of using direct & geometric approach. [08 Hours]
Unit-IV	:	Sensor, Actuators and End Effectors: Internal & External sensors, position, relocking and acceleration sensors, proximity sensors, force sensors, touch slip laser range finder, camera, type of actuators: Pneumatic, hydraulic and electric, DC and servo motor, Different types of grippers, vacuum & other methods of gripping. [06 Hours]
Unit-V	:	Motion Planning and Controllers: On-off trajectory, relocking and acceleration profile, Cartesian motion of manipulator, joint interpolated control, Jacobian in terms of D-H matrix, Obstacle avoidance, Basic control system, control loops of robotic system. [06 Hours]
Unit-VI	:	Vision System: Machine Vision system, description, sensing, Digitizing, Image Processing and Analysis and Application of Machine Vision System. Robotic assembly sensors & Intelligent Sensors, Object recognition. [08 Hours]
Reference Books:	:	<ol style="list-style-type: none">1. Fundamentals of Robotics: Analysis and Control- Robert J Schilling, PHI, NewDelhi2. Robotic Engineering - Klafter, Thomas, Negin, PHI, New Delhi3. Robotics for Engineers - Yoram Koren, McGraw Hill. New York4. Fundamentals of Robotics - T.C. Manjunath, Nandu Publishers, Mumbai5. Robotics and Control- R. K. Mittal, I. J. Nagrath, TMH, New Delhi

Section A: Includes Unit I, II and III; **Section B:** Includes Unit IV, V and VI.

Pattern of Question Paper:

The six/four units in the syllabus shall be divided in two equal parts i.e. 3/2 units respectively. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:

1. Minimum ten questions.
2. Five questions in each section.
3. Question no 1 from section A and Question no 6 from section B be made compulsory and should cover complete syllabus of the respective section and should be set for ten marks each. The Question no.1 and 6 should be of objective nature.
4. Two questions of 15 marks each from remaining questions from each section A and B be asked to solve.

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Code No.: ETC 392

Title: ELE-II (Advanced Industrial Automation)

Teaching Scheme: 04Hrs/week

Class Test (Marks): 20

Theory: 04Hrs/week

Theory Examination (Duration): 03 Hrs

Credits:04

Theory Examination (Marks): 80

Prerequisites	:	Relay logic, Basics of transducers, actuators
Objectives	:	The trend in the Industry for automation is changing one and student will able to develop the skill set for latest development of automation.
Unit-I	:	<p>Basic of Automation: Introduction of sensors, actuators, control loop, concept of process variables, set point, controlled variable, manipulated variable, load variable. Representation of process loop components using standard symbols (basic with reference to control loop), and Examples of process loops like temperature, flow, level, pressure etc. Hierarchical levels of automation, introduction to plant automation. [08 Hours]</p>
Unit-II	:	<p>Programmable Logic Controller (PLC): Continuous versus Discrete Process Control, ladder diagram using standard symbols, Architecture of PLC, Types of Input & Output modules (AI, DI, AO, DO), Types of Timer, Counters, Interfacing pneumatic & Hydraulic systems, Fixed & Modular PLC (Rack, Slot, Grouping), Specifications, manufacturers, PLC ladder diagram and instructions, PLC Programming for process applications. Supervisory control system and data acquisition (SCADA): Introduction to SCADA, SCADA architecture, creation of data base, interfacing with PLC. [08 Hours]</p>
Unit-III	:	<p>Pneumatics and Hydraulics Introduction, Basic principles, Function and application of pneumatic components, Designation and drawing of pneumatic symbols, Drawing pneumatic circuit diagrams in accordance with standards. Direct and indirect stroke-dependent control systems Shutoff valves, Logical Elements, Time-dependent control systems with time delay valve, Pressure-dependent control systems with pressure sequence valves. Hydraulic system structure, Hydraulic Pumps, Pressure control valves Electro pneumatics and Hydraulics: Function & use of electrical & electro pneumatic & electro hydraulic components such as switches, pushbuttons & solenoid valves, pneumatic & hydraulic symbols, Development of circuit diagrams, Direct & indirect activation of cylinder, Logics, Position control circuits, Exercises. [08 Hours]</p>
Unit-IV	:	<p>Actuators: Types of Control Valve, Control valve terminology Range ability, turndown, valve capacity, Air to open, Air to close, valve gain etc. Control valve characteristics: Inherent & installed Control valve accessories. Positioners: Application/Need, Types, Effect on performance of control valves. Reversing</p>

		relay, Solenoid valves, Air lock, position indicating switches, Electro pneumatic converter, hand wheel. Brief of stepper motor, servo-motor, Motor control circuits, AC Drives, DC Drives, VF Drives, PWM Techniques. [06 Hours]
Unit-V	:	Industry Standard Protocols: HART Protocol introduction, frame structure, programming, implementation examples, Benefits, Advantages and Limitations. Introduction to Foundation Fieldbus H which includes structure, programming, FDS configuration, implementation examples, benefits, advantages and limitations. Comparison with other fieldbus standards like Devicenet, Profibus, Profinet, Controlnet, CAN, Industrial Ethernet etc. [06 Hours]
Unit-VI	:	Project Management Design concept, kickoff meeting, Design :BOM ,control panel, power flow diagram Dough Maker, yogurt mixer, carton sorting, safety in automation. [04 Hours]
Reference Books:	:	References Books / Handbooks <ul style="list-style-type: none"> • Programmable Logic Controller, 5th Edition, by W. Bolton, ELSEVIER • Programmable Logic Controller Principles and Applications by Webb and Reis, PHI Publications • Computer based Process Control by Krishna Kant , PHI Publications • Introduction to Programmable Logic Controller by Garry Dunning, Thomson Learning Publications. • Computer based Process Control by Krishna Kant, PHI Publications. • Oil hydraulic systems by S.R.Mujumdar, Tata McGraw Hill publications. • Pneumatic systems by S.R.Mujumdar, TataMcGraw hill publications. • Siemens PLC Programming Handbook.

Section A: Includes Unit I, II and III; **Section B:** Includes Unit IV, V and VI.

Pattern of Question Paper:

The six/four units in the syllabus shall be divided in two equal parts i.e. 3/2 units respectively. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:

1. Minimum ten questions.
2. Five questions in each section.
3. Question no 1 from section A and Question no 6 from section B be made compulsory and should cover complete syllabus of the respective section and should be set for ten marks each. The Question no.1 and 6 should be of objective nature.
4. Two questions of 15 marks each from remaining questions from each section A and B be asked to solve.

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Code No.: ETC 393
Teaching Scheme: 04Hrs/week
Theory: 04Hrs/week
Credits:04

Title: ELE-II (Speech Processing)
Class Test (Marks): 20
Theory Examination (Duration): 03 Hrs
Theory Examination (Marks): 80

Prerequisites	:	-
Objectives	:	<ol style="list-style-type: none"> 1. To introduce the models of speech production and acoustic phonetics 2. To teach time and frequency domain techniques for estimating speech parameters 3. To teach predictive techniques for speech coding 4. To introduce speech recognition and speech synthesis applications
Unit-I	:	Speech Production, Acoustic Phonetics and Auditory Perception Anatomy and physiology of speech organs, articulatory phonetics, acoustic phonetics, acoustic theory of speech production, discrete time model for speech production. Ear physiology and psychoacoustics [06 Hours]
Unit-II	:	Speech Analysis in Time Domain Time energy, average magnitude, and zero-crossing rate, speech vs silence discrimination Short-time autocorrelation, pitch period estimation using short-time autocorrelation, median smoothing [06 Hours]
Unit-III	:	Speech Analysis in Frequency Domain: Time dependent Fourier representation for voiced and unvoiced speech signals, linear filtering interpretation, spectrographic displays. Pitch period estimation based on FFT and harmonic peak detection method, estimation of formants using log spectrum [08 Hours]
Unit-IV	:	Homomorphic Speech Processing: Cepstral analysis of speech, mel frequency cepstral coefficients (MFCC), perceptual linear prediction (PLP). Pitch period estimation in cepstral domain, evaluation of formants using cepstrum [08 Hours]
Unit-V	:	LPC and Parametric Speech Coding: Review of lattice structure realization, forward and backward error filters, normal equations & its solutions, Levinson-Durbin algorithm, covariance method, Berg's algorithm. Channel Vocoders, linear prediction (LP) based vocoders, residual excited LP (REL) based Vocoders, voice Excited LP (VEL) based vocoders, multi-pulse LP (MPL) based vocoders, code excited LP (CEL) based vocoders [06 Hours]
Unit-VI	:	Speech Processing Applications: Speech recognition systems, deterministic sequence recognition for ASR, statistical sequence recognition for ASR (Hidden Markov Model (HMM)). Text to speech system (TTS), concatenative synthesis, synthesis using formants, LPC synthesizer [06 Hours]

Reference Books:	:	<ol style="list-style-type: none"> 1. Rabiner and Schafer, —<i>Digital Processing of Speech Signals</i>□, Pearson Education, Delhi, 2004. 2. Shaila D. Apte, —<i>Speech and Audio Processing</i>□, Wiley India, New Delhi, 2012. 3. Douglas O'Shaughnessy, —<i>Speech Communications: Human & Machine</i>□, Universities Press, Hyderabad, Second Edition, 2001. 4. Ben Gold and Nelson Morgan, —<i>Speech and Audio Signal Processing</i>□, Wiley India (P) Ltd, New Delhi, 2006. 5. Thomas F. Quatieri, —<i>Discrete-Time Speech Signal Processing: Principles and Practice</i>□, Prentice Hall, 2001. 6. J. L. Flanagan, —<i>Speech Analysis Synthesis and Perception</i>□, Second edition, Springer-Verlag (1972).
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Section A: Includes Unit I, II and III; **Section B:** Includes Unit IV, V and VI.

Pattern of Question Paper:

The six/four units in the syllabus shall be divided in two equal parts i.e. 3/2 units respectively. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:

1. Minimum ten questions.
2. Five questions in each section.
3. Question no 1 from section A and Question no 6 from section B be made compulsory and should cover complete syllabus of the respective section and should be set for ten marks each. The Question no.1 and 6 should be of objective nature.
4. Two questions of 15 marks each from remaining questions from each section A and B be asked to solve.

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Syllabus of T.E. (ETC/EC/E&C/IE) Semester-VI

Code No.: ETC371

Teaching Scheme: 02Hrs/week

Practical/Oral Examination: 50 Marks

Lab:V

Title: Embedded System

Credits: 01

Course Objectives	:	To enhance Programming Techniques of 8 bit microcontroller and to understand System Peripheral and Interface.
List of Practical	:	<p>PIC18F4550 Microcontroller :</p> <ol style="list-style-type: none"> 1. Write a program for interfacing button, LED, relay & buzzer to PIC18F4550 as follows: <ol style="list-style-type: none"> a) when button 1 is pressed, relay and buzzer is turned ON and LED's start chasing from left to right. b) when button 2 is pressed, relay and buzzer is turned OFF and LED start chasing from right to left. 2. Interface a DC motor and write a program to control speed and direction using PWM. 3. Interface Seven Segment Display to display 0 to 99. 4. Serially transfer the data on PC using serial port of PIC18F4550. 5. Generate square wave using timer with interrupt for PIC18F4550 6. Interface temperature sensor to internal ADC and display value on LCD. 7. Interface DS1307 RTC chip using I2C and display date and time on LCD. <p>Arduino Uno R3:</p> <ol style="list-style-type: none"> 1. Interface LEDs and control using an IR sensor. 2. To interface an Ultrasonic Sensor (HC-SR04) with an Arduino and view the distance on the serial monitor. 3. Interface Temperature and Humidity Sensor (DHT11) and display Temperature and Humidity on LCD. 4. Read Temperature and Humidity from a sensor using the SPI protocol. 5. Interface wifi ESP8266 and Control RGB LED. 6. Interface Bluetooth (HC-05) and switch the relay.
List of Reference Books	:	<ol style="list-style-type: none"> 1. Mazidi, "PIC microcontroller & embedded system", 3rd Edition ,Pearson 2. Peatman John B., "Design with PIC Microcontrollers", Pearson Edition. 3. Simon Monk, " Programming Arduino: Getting Started with Sketches", Second Edition 2nd Edition.
List of Equipments /Instruments	:	Hardware: PIC18F4550 Arduino R3 Microcontroller Trainer kits, CRO, Power supply . Software: MPLAB IDE, Arduino IDE

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above

The assessment of practical examination shall be on the following criteria:

The practical examination shall consist of performing an experiment based on the practical work done during the course, the record of the experiments submitted by the candidate and viva -voce based on the syllabus.

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Syllabus of T.E. (ETC/EC/E&C/IE) Semester-VI

Code No.: ETC372

Lab: VI

Teaching Scheme: 02Hrs/week

Title: Feedback Control System

Practical/Oral Examination: 50 Marks

Credits: 01

Course Objectives	:	<ul style="list-style-type: none"> • To understand the user specification and analyze the system in time and frequency domain • To find gain of various systems • To analyze performance of the system. • To introduce concepts of PID controllers and digital and control systems
List of Practical	:	<ol style="list-style-type: none"> 1. Study of potentiometer as an Error detector. 2. Study of Synchro Machines 3. Study of AC/DC Position servo system. 4. Study of PLC Applications. 5. To study Open Loop and Closed Loop Control systems. 6. Transient response of second order system by using standard test signals. 7. Draw a root locus of any system. 8. Draw a Bode plots 9. Draw a polar plots. 10. Draw a Nyquist plots.
List of Reference Books	:	<ol style="list-style-type: none"> 1. N. J. Nagrath and M. Gopal, “ Control System Engineering ”, New Age International Publishers, 5th Edition 2. Benjamin C. Kuo , “Automatic control systems”, Prentice Hall of India, 7th Edition 1995 3. Ogata, ”Modern Control Engineering”, PHI publication 4. B.S. Manke , “Linear Control System”, Khanna Publication
List of Equipments /Instruments	:	Matlab Software, PLC, PID Controllers.

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above

The assessment of practical examination shall be on the following criteria:

The practical examination shall consist of performing an experiment based on the practical work done during the course, the record of the experiments submitted by the candidate and viva -voce based on the syllabus.

Dr.Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of T.E. (ETC/EC/E&C/IE) Semester-VI	
Code No.: ETC373	Lab: VII
Teaching Scheme: 02Hrs/week	Title: Power Electronics And Drives
Practical/Oral Examination: 50 Marks	Credits: 01
Course Objectives	<ul style="list-style-type: none"> • To understand various power devices, their firing circuits & commutation circuits. • To describe 1-Φ and 3-Φ power converters. • To study D.C. to A.C. conversion techniques. • To learn D.C to D.C. control techniques.
List of Practical	<ol style="list-style-type: none"> 1. Study of characteristics of any two devices SCR, IGBT TRIAC Power MOSFET. 2. Study of R, R-C firing circuits. 3. Study of line synchronized UJT firing circuit. 4. A.C. Voltage controller. 5. Study of 1-Φ full bridge converter with R, R-L load, with & without FWD. 6. Study of 3- Φ Converter. 7. Study of 1-Φ inverter (series/parallel). 8. Study of chopper. 9. Study of time delay circuits.
List of Reference Books	<ul style="list-style-type: none"> • M.H.Rashid, "Power Electronics", John Wiley & sons • M.D.Singh and K.B.Khanchandani, "Power Electronics" Tata McGraw Hill. • General Electric, "SCR Manual".
List of Equipments /Instruments	SCR, Diac, Triac, IGBT, UJT etc.

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above

The assessment of practical examination shall be on the following criteria:

The practical examination shall consist of performing an experiment based on the practical work done during the course, the record of the experiments submitted by the candidate and viva -voce based on the syllabus

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Syllabus of T.E. (ETC/EC/E&C/IE) Semester-VI

Code No.: ETC374
Teaching Scheme: 02Hrs/week

Lab:VIII
Title: Electronics Circuit Technology
Teachers Assessment: 50 Marks
Credits: 01

Course Objectives	:	Objective: 1. To study different circuit design. 2. To study different aspect of Op-Amp. 3. To study different aspect of physical & analog quantities.
List of Practical	:	1. Design of Regulated Power Supplies – Fixed & Variable 2. Design of Dual Power Supply. 3. Design of variable gain instrumentation amplifier(3 OPAMP Configuration) 4. Design of active tone control circuit. 5. Design an audio power amplifier using LM380. 6. Temperature measurement using LM35 & Thermister. 7. Design of Mealy FSM/ Moore FSM 8. Design of IC based counter circuit using IC 9. Design of Data Acquisition System for parameters like: Temperature, Pressure, Light. A mini project based on real time application along with – Product brief, Design methodology, total circuit design, fabrication of circuit on PCB, testing and demonstration of the mini- project.
List of Reference Books	:	1. Ron Lenk, “Practical Design of Power Supplies”, John Wiley and Sons 2. Design with Operational Amplifiers and Analog Integrated Circuits 3rd Edition- Sergio Franco 3. Ramakant Gaikwad, “OPAMP and Linear Integrated Circuits” PHI/Pearson Education. 4. K.R. Botkar, “Linear Integrated Circuits”, Khanna Publication, New Delhi
List of Equipments /Instruments	:	Op-Amp, Regulated Power Supply, LM 380, LM 35, Dual Power Supply etc.

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Syllabus of T.E. (ETC/EC/E&C/IE) Semester-VI

Course Code: ETC375

Course: Mini Project

Practical: 02 Hrs/week

Term Work: 50 Marks

Credits: 02

Course Objectives	:	<ul style="list-style-type: none">• To plan for various activities of the project and distribute the work amongst team members.• To develop the ability to define and design the problem and lead to its accomplishment with proper planning.• To understand the importance of document design by compiling Technical Report on the Minor Project work carried out.• To develop student's abilities to transmit technical information clearly and test the same by delivery of Seminar based on the Minor Project.
Guidelines:	:	<ol style="list-style-type: none">1. Students should select a problem which addresses some basic home, office or other real life applications.2. Projects which will address the social issues will be given due weightage.3. It is desirable that the systems developed by the students have some novel features.4. The batch size shall not exceed TWO students per batch.5. The students have to select a suitable problem, design, prepare the drawings, produce the components, assemble and commission the project.6. Institute may arrange demonstration with poster presentation of all mini projects developed by the students at the end of semester.7. At the end of the semester, the students have to prepare and present 20-25 pages project report.8. Final evaluation shall be based on continuous internal assessment followed by Viva-Voce.