

**SCHEME AND DETAILED SYLLABUS
of**

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

(w. e. f. academic year 2019-20)

FOUR YEAR DEGREE COURSE IN SCIENCE & TECHNOLOGY



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

Sub Code / Faculty Name	SEMESTER-VII	Examination Scheme									
	Subject	L	P	Total	CT	TH	TW	P	Total	Credits	Duration of Theory Exam
ETC401	Digital Image Processing	4		4	20	80			100	4	3 Hrs
ETC402	Microwave and Radar Enginrring	4		4	20	80			100	4	3 Hrs
ETC403	Advance Embeded System	4		4	20	80			100	4	3 Hrs
ETC404	VLSI Design	4		4	20	80			100	4	3 Hrs
ETC441-443 444444	Elective - I	4		4	20	80			100	4	3 Hrs
ETC421	Digital Image Processing		2	2				50	50	1	
ETC422	Microwave and Radar Enginrring		2	2			25		25	1	
ETC423	Advance Embeded System		2	2				50	50	1	
ETC424	VLSI Design		2	2				50	50	1	
ETC425	Elective - I		2	2			25		25	1	
ETC426	Project Part I		2	2				50	50	1	
	Total of semester-V	20	12	32	100	400		50	200	750	26
Sub Code / Faculty Name	SEMESTER-VIII	Examination Scheme									
	Subject	L	P	Total	CT	TH	TW	P	Total	Credits	Duration of Theory Exam
ETC451	Computer Network & Security	4		4	20	80			100	4	3 Hrs
ETC452	Antenna Theory	4		4	20	80			100	4	3 Hrs
ETC453	Wireless Mobile Communication	4		4	20	80			100	4	3 Hrs
ETC491-493	Elective -II	4		4	20	80			100	4	3 Hrs
ETC471	Computer Network & Security		2	2				50	50	1	
ETC472	Antenna Theory		2	2			50		50	1	
ETC473	Wireless Mobile Communication		2	2				50	50	1	
ETC474	Elective -II		2	2				50	50	1	
ETC475	Project Part -II		6	6			50	100	150	6	

Unit-V	:	Image Compression: Need for image compression, Redundancies, classification of redundancies ,Fidelity criteria, image compression models, classification of image compression, Fundamentals of information theory, error free compression variable length coding, Huffman coding, Arithmetic coding ,bit plane coding, Run length coding, predictive coding, transform coding, image compression standards- JPEG, MPEG. Numerical based on above. [08 Hours]
Unit-VI	:	Morphological Image Processing & Applications: Basic operations dilation and erosion, opening and closing operations, Basic Morphological algorithm such as region filling, thinning, thickening, pruning, skeletons, Numerical based on above. Applications: Security applications such as Finger print recognition face recognition, Medical applications such as MRI, X-ray. Case study on digital camera. [06 Hours]
Reference Books:	:	<ul style="list-style-type: none"> · “Digital Image Processing”, Gonzalez, Woods, PHI, 2nd edition. · “Digital Image Processing”, Milan Sonka, Castleman k.r. printicehall 1996. · “An introduction to DIP”, Bill Silver. · “An introduction to DIP”, A.K. Jain. · “Digital Image Processing”, S Jayaraman, S Esakkiranjan, McGraw Hill Education Private Limited. · “Digital Image Processing PIKS Scientific Inside”, 4ed, w/cd Wiley Publications

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:

- Minimum ten questions.
- Five questions in each section.
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Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Final Year (ETC/EC/E&C/IE) Semester-VII	
Code No.: ETC 402	Title: Microwave and Radar Engineering
Teaching Scheme: 04Hrs/week	Class Test (Marks): 20
Theory: 04Hrs/week	Theory Examination (Duration): 03 Hrs
Credits:04	Theory Examination (Marks): 80
Prerequisites	:
Electromagnetics, Matrices, Electronics devices and Circuits	
Objectives	:
<ul style="list-style-type: none"> · Basic concepts of microwave communication and transmission line. · Building blocks of microwave communication. 	

Unit-I	:	Introduction to Microwave Transmission Lines and Components: History of Microwaves, Microwave Frequency bands. WAVEGUIDES: Introduction, comparison with transmission lines, propagation in TE & TM mode, rectangular waveguide. TEM mode In rectangular waveguide cut off frequency, characteristic impedance, introduction to circular waveguides and planar transmission lines. Introduction to Scattering Parameters. Microwave Passive Components: Directional Coupler, Power Divider, tees, attenuator, resonator, Isolators, circulators along with S matrix. [08 Hours]
Unit-II	:	Active Microwave Semiconductor Devices and Tubes: Microwave Semiconductor Devices: Gunn Diodes (Gunn Effect, operation, modes of operation, microwave generation and amplification), Tunnel diode (Tunneling, tunnel diode Amplifier and Oscillator), IMPATT diodes, Varactor diodes, Parametric Amplifiers. Microwave Tubes: Klystron (Two and multi cavity klystron), Reflex klystron. Travelling wave tube, Microwave crossed field tubes - Magnetron (operation, characteristics and applications) [08 Hours]
Unit-III	:	Modern Trends in Microwaves Engineering: Effect of Microwaves on human body. Medical and Civil applications of microwaves. Electromagnetic interference / Electromagnetic Compatibility (EMI / EMC). Monolithic Microwave IC fabrication. RFMEMS for microwave components. Microwave Imaging. [08 Hours]
Unit-IV	:	Fundamentals of Radar: Block diagram of radar, radar equation, radar frequencies, applications of radar, Detection of Signals in Noise, Probability of Detection and false alarm, Integration of pulses, Radar cross-section of targets, cross-section fluctuations, PRFs and Range Ambiguities, Antenna parameters, System losses and propagation effects. Noise figure, radar mixers, Duplexers, A scope and PPI display, Matched Filters [08 Hours]
Unit-V	:	MTI and Pulse Doppler Radar: Introduction to Doppler and MTI radar, Delay line cancellers, MTI Improvement factor, Staggered PRFs, Doppler Filter banks, MTI Processing, Limitations to MTI Performance, AMTI, Pulse Doppler Radar, Sub Clutter Visibility, Non-Coherent MTI Radar. [08 Hours]
Unit-VI	:	Antenna Scanning And Tracking: Mono Pulse Tracking, Conical Scan and sequential lopping, low angle tracking, phased array, planner array, Limitations to tracking accuracy. [08 Hours]
Reference Books:	:	Text Books: 1. Liao S.Y., "Microwave devices and Circuits", Prentice Hall of India. 2. Skolnik, "Introduction to radar system", Tata Mc-Graw Hill pub. Reference Book: 1. Rizzi,P.A , "Microwave Engineering, Passive Circuits" Prentice Hall of India. 2. Pozar D.M., "Microwave Engineering", John Wiley. 3. M.Kulkarni., "Microwave devices and Radar Engg." Umesh Publications. 4. Chatterji R., "Microwave Engineering, Special topics", East West Press. 5. Peyton Z. Peebles, Jr., "Radar principles", Wiley Publications.

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Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of B. E. (Electronics and Telecommunication Engineering) Semester-VII	
Code No.: ETC 403	Title: Advanced Embedded system Design
Teaching Scheme: 04Hrs/week	Class Test (Marks): 20

	Theory: 04Hrs/week	Theory Examination (Duration): 03 Hrs
	Credits:04	Theory Examination (Marks): 80
Prerequisites	:	Knowledge of 8 bit Microcontroller, interfacing of different peripherals.
Objectives	:	<ul style="list-style-type: none"> · To get students familiar with RISC processors and embedded system. · To get students familiar with different real world peripherals such as sensors ,motors and displays.
Unit-I	:	Introduction to Embedded system: Embedded system definition, Difference between General computing system and Embedded system, Classification of embedded system, Embedded system life cycle ,Core of Embedded system, Examples of embedded systems:-i) Digital thermometer, Navigation system, Software defined radio and RF tags <p style="text-align: right;">[8 Hours]</p>
Unit-II	:	Introduction to 32 Bit RISC Processor: ARM 7 Block diagram, Big and little endian concept, Operating modes, Programmers model,3 stage pipeline ARM organization, Barrel shifter, ARM instruction set ,Thumb programmers model, Features of ARM9,ARM11. <p style="text-align: right;">[8 Hours]</p>
Unit-III	:	Interfacing with peripherals : Timers/counters of ARM, Registers related to timers, Watch dog Timer,UART,I2C. Interfacing with External peripherals like GLCD,SD Card, ultrasonic sensor, Accelerometer. Stepper motor and Servo motor(*Use LPC2148 ARM controller) <p style="text-align: right;">[8 Hours]</p>
Unit-IV	:	Introduction to Cortex-M3 Microcontroller: Meaning of the the term cortex. Difference between ARM7 and Cortex-M3, block diagram, Operating modes, Bit banding concept, Processor core registers ,GPIO configuration, Port bit set/reset register <p style="text-align: right;">[8 Hours]</p>
Unit-V	:	Programming with Cortex-M3: Instruction set summary, Embedded C programs for blinking of LED, Interfacing of Temperature sensor, Pressure sensor LCD, stepper motor, Servo motor and DC motor. Use of inbuilt ADC. <p style="text-align: right;">[8 Hours]</p>
Unit-VI	:	RTOS Based embedded system Design: i) Operating system basics-Architecture, Need of RTOS for embedded system, Functions of RTOS Task scheduling:- 1) Non preemptive scheduling:-i)LIFS ii)LCFS iii)Shortest Job first iv) Priority Based 2) Preemptive scheduling:-i)Shortest job first/Shortest remaining Time ii)Round robin Scheduling iii)Priority based Scheduling Task Communication:- <ul style="list-style-type: none"> · Concept of shared memory:- i) Pipes ii) Memory mapped objects · Message passing:-i) Message queue ii) Mailbox iii) Signaling <p style="text-align: right;">[8 Hours]</p>
Reference Books:	:	Text Books: i)Introduction to Embedded systems by Shibu K.V., McGraw Hill Publication ii) ARM assembly language programming and architecture by Mazidi and Mazidi iii) Embedded and Real time system by K.V.K.Prasad Reference Books: i) Cortex-M3 Technical reference manual. ii) A definitive guide to Cortex-M3 by YIU. iii) Embedded systems –A contemporary design Tool by James Peckol ,Willey Publication. iv) Embedded system design by Frank Wahid.

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- 2 Five questions in each section
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Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Final Year (ETC/EC/E&C/IE) Semester-VII	
Code No.: ETC404	Title: VLSI Design
Teaching Scheme: 04Hrs/week	Class Test (Marks): 20
Theory: 04Hrs/week	Theory Examination (Duration): 03 Hrs
Credits:04	Theory Examination (Marks): 80
Prerequisites :	Knowledge of Digital electronics.
Objectives :	<ul style="list-style-type: none"> · To learn design of digital circuit using VHDL. · To learn characteristics of CMOS. · To learn design rules and fabrication of CMOS.
Unit-I :	Introduction to VHDL & Design of Digital Circuits: Moore's law, VLSI Design flow, modeling styles: Behavioural modeling, Dataflow modeling, Structural modeling, Packages and configurations, functions, Procedures, Test benches, CPLD, FPGA. [08 Hrs]
Unit-II :	Fault Tolerance and Testability: Types of fault, stuck-Open and Stuck-short faults, stuck at 1& 0 fault, Fault coverage, Need of Design for testability, Testability, Design-for -testability, controllability and Absorbability, Boundary Scan check, JTAG technology, TAP controller and TAP controller stack diagram, Scan path, Full and partial scan.. [06 Hrs]
Unit-III :	Introduction to CMOS: Introduction In MOS Technology, CMOS Inverter, I - V Characteristics of NMOS and PMOS, C-V Characteristics, Simple MOS capacitance model, Detailed MOS -GATE capacitance model, MOS diffusion capacitance model, voltage transfer curve, Static & Dynamic dissipation, Noise Margin, Static CMOS inverter DC characteristics, BETA ratio effect. [06 Hrs]
Unit-IV :	Non Ideal I-V Effects: Velocity saturation & mobility degradation, Channel length Modulation, Body effect, Threshold voltage effect, sub threshold conduction, junction leakage, Tunneling, Power delay product. [06 Hrs]
Unit-V :	CMOS Design: CMOS Logic families: Static & Dynamic, Ratio Circuits, CMOS logic gate, Pass transistor logic. CPL, Combinational logic design, Compound gate, Transmission gate, design using pass transistor logic, design using TGs.

		Hrs]
Unit-VI	:	Fabrication and Layout: Basic CMOS Technology: N well, P well, Twin tub, layout of CMOS Inverter, CMOS Layout and Design rules, Wire & Vias, Static diagram. [08 Hrs]
Reference Books:	:	Text Books: <ul style="list-style-type: none"> · Stephen Brown, Zvonko Vranesic, Fundamental of digital logic design with VHDL. · Neil H. E. Weste, Devid Harris and ,Ayan Banetjee, CMOS VLSI Design, Third Edition, Pearson. · Doulas Peny, VHDL, Third Edition, Tata McGraw Hil. · Kang S. M., CMOS Digital Integrated Circuits, TMH 3rd 2003. · Douglas Pueknell & Kamran Eshraghian, Basic VLSI Design, Third Edition, PHI. · VLSI Design Black Book, Prasad Wiley Publications. Reference Books: <ul style="list-style-type: none"> · J. Bhasker, VHDL PRIMER, Third Edition, PHI. · J. Rabaey, Digital Integrated Circuits: A Design Perspective, Second Edition Prentice Hall India, 2003. · Boyce and Baker "CMOS" EEE Press. · Xilinx FPGA /CPLD Data Book.

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Dr.Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Final Year (ETC/EC/E&C/IE) Semester-VII	
Code No.: ETC441	Title: Internet of Things
Teaching Scheme: 04Hrs/week	Class Test (Marks): 20
Theory: 04Hrs/week	Theory Examination (Duration): 03 Hrs
Credits:04	Theory Examination (Marks): 80

Prerequisites	:	Basics of microprocessor, microcontroller, C language
Objectives	:	<ul style="list-style-type: none"> · To get the understanding of the concepts of Internet of Things · To enable the students to build IoT applications. · To understand the various protocols in IoT and Networking. · To develop the essential programming skill required
Unit-I	:	Introduction to IoT Definition, characteristics of IoT, logical design of IoT, IoT communication models, IoT communication APIs: REST, Websocket, IoT Enabling Technologies: Wireless sensor networks, Cloud computing, Big data analytics, communication protocols, Embedded systems, IoT vs M2M. [06 Hours]
Unit-II	:	Introduction to C and Node Mcu C: Introduction, Data types, variable, operator, branches, loops, functions, Debugging and Optimization of C programs. NodeMCU: 8266 Wi-Fi module, hardware and pin diagram, Interface with Arduino IDE. Interfacing of analog and digital sensors. [06 Hours]
Unit-III	:	Introduction to Python and Raspberry Pi Python: Python IDE, Data types, variable, operator, branches, loops, functions, List, Dictionary, Writing to a File, Reading from a File, handling exceptions. Raspberry Pi: Models of Raspberry pi, R Pi 3 hardware, GPIO pins, operating system for R pi3, Basic of Linux commands, configuring R pi3, Interfacing of Digital and Analog sensors. [08 Hours]
Unit-IV	:	Interacting with Web Services Configuring NodeMCU to connecting to server, NodeMCU interfacing with web services, configuring R pi 3 Wi-Fi and Ethernet, publishing and subscribing data from web using R pi3, interfacing R Pi 3 with twitter and whatsapp. [08 Hours]
Unit-V	:	IoT Protocols UART, Wi-Fi, Ethernet, Bluetooth Low Energy (BLE), Message Queue Telemetry Transport (MQTT), Extensible Messaging and Presence Protocol (XMPP), Data Distribution Service (DDS), Advanced Message Queuing Protocol (AMQP). [06 Hours]
Unit-VI	:	Case study and Applications of IOT Smart cities, Home automation, Weather Monitoring, smart Grids, Inventory Management, Smart irrigation, Industrial internet, smart Wearables. [06 Hours]
Reference Books:	:	Text Books: 1. Get Started With ESP8266 Programming NodeMCU Using Arduino, Up skill Learning. 2. Internet of Things with Raspberry Pi 3, ManeeshRao, pack 3. Internet of Things with ESP8266, Marco Schwartz 4. Internet of Things with Arduino Cookbook, Marco Schwartz Reference Books: 1. Internet of Things: A Hands-On Approach- Arsheep Bahga, Vijay Madiseti 2. Raspberry Pi Cookbook for Python Programmers by Tim Cox 3. Learning Internet of Things, Peter Waher

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Code No.: ETC442		Title: Artificial Intelligence and Machine Learning
Teaching Scheme: 04Hrs/week		Class Test (Marks): 20
Theory: 04Hrs/week		Theory Examination (Duration): 03 Hrs
Credits:04		Theory Examination (Marks): 80
Prerequisites : IOT basics, matlab software, C or Python language		
Objectives : <ul style="list-style-type: none"> · To Apply a given AI technique to a given concrete problem · To Implement non-trivial AI techniques in a relatively large system · To understand uncertainty and Problem solving techniques. · To understand various symbolic knowledge representation to specify domains and reasoning tasks of a situated software agent. · To understand different logical systems for inference over formal domain representations, and trace how a particular inference algorithm works on a given problem specification. 		
Unit-I	:	What is Artificial Intelligence?; Problems, problem spaces, and search; Intelligent Agents; What is Artificial Intelligence? The AI Problems, The Underlying assumption, What is an AI Technique? The Level of the model, Criteria for success, some general references, One final word and beyond. Problems, problem spaces, and search: Defining, the problem as a state space search, Production systems, Problem characteristics, Production system characteristics, Issues in the design of search programs, Additional Problems. Intelligent Agents: Agents and Environments, The nature of environments, The structure of agents. <p style="text-align: right;">[8hrs]</p>
Unit-II	:	Heuristic search techniques; Knowledge representation issues; Using predicate logic; Logical Agents; Heuristic search techniques: Generate-and-test, Hill climbing, Best-first search, Problem reduction, Constraint satisfaction, Mean-ends analysis. Knowledge representation issues: Representations and mappings, Approaches to knowledge representation, Issues in knowledge representation, The frame problem. Using predicate logic: Representing simple facts in logic, representing instance and ISA relationships, Computable functions and predicates, Resolution, Natural Deduction. Logical Agents: Knowledge –based agents, the Wumpus world, Logic-Propositional logic, Propositional theorem proving, Effective propositional model checking, Agents based on propositional logic. <p style="text-align: right;">[8 hrs]</p>
Unit-III	:	Symbolic Reasoning Under Uncertainty Introduction to Nonmonotonic reasoning, Logic for nonmonotonic reasoning, Implementation Issues, Augmenting a problem-solver, Implementation: Depth-first search, Implementation: Breadth-first search. <p style="text-align: right;">[6 hrs]</p>
Unit-IV	:	Weak Slot-and-filter structures; Strong slot-and –filler structures: Adversarial Search: Weak Slot-and-filter structures: Semantic Nets, Frames. Strong slot-and –filler structures: Conceptual dependency, scripts, CYC. Adversarial Search: Games, Optimal Decision in Games, Alpha-Beta Pruning, Imperfect Real-Time Decisions, Stochastic Games, Partially Observable Games, State-Of-The-Art Game Programs, Alternative Approaches, Summary. <p style="text-align: right;">[8 hrs]</p>
Unit-V	:	Learning-I: Introduction: What is Machine Learning?: Concept, Scope of Machine Learning, Goals of Machine Learning , Challenges of Machine Learning. Learning Paradigms: Generative modeling Approach, Discriminative modeling approach, Imitative modeling. Learning Concepts, Methods and Models: Rote Learning, Learning from observations, Supervised Learning, Unsupervised Learning, Semi-supervised Learning, Ensemble Learning, Discovery-based Learning, Learning by Problem Solving. Statistical Learning Methods: Bayesian network, Bayesian Learning, Learning with Hidden Variables-The EM Algorithm. <p style="text-align: right;">[6 hrs]</p>

Unit-VI	:	Learning-2 : Artificial Neural Network-Based Learning: Backpropagation Algorithm. Support Vector Machines(SVM), Reinforcement Learning: Learning Model, Q-Learning. Multi-agent-based Learning, Distributed Learning, Adaptive Learning, Learning for Decision-Making, Speedup Learning, Analytical and Empirical Learning Tasks, Learning Algorithm: Performance Matters- Prior knowledge and Bias, Noise and Performance Evaluation. Multi-perspective Decision-Making, Active Learning, Learning Based on Limited Information. [8 hrs]
Reference Books:	:	Text Books: 1. Elaine Rich, Kevin Knight, Shivashankar B Nair: Artificial Intelligence, Tata McGraw Hill 3rd edition. 2013. 2. Stuart Russel, Peter Norvig: Artificial Intelligence A Modern Approach, Pearson 3rd edition 2013. Reference Books: 1. Nils J. Nilsson: "Principles of Artificial Intelligence", Elsevier, ISBN-13: 9780934613101. 2. Parag Kulkarni, Prachi Joshi: "Artificial Intelligence: Building Intelligence Systems @2015 by PHI Learning Private Limited.

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Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of B.E. (ETC/EC/E&C/IE) Semester-V	
Code No.: ETC443	Title: Industry 4.0
Teaching Scheme: 04Hrs/week	Class Test (Marks): 20
Theory: 04Hrs/week	Theory Examination (Duration): 03 Hrs
Credits:04	Theory Examination (Marks): 80

Prerequisites	:	Internet of Things, Knowledge of Internet, Data Analysis Techniques.			
Objectives	:	<ul style="list-style-type: none"> To offer learners an introduction to Industry 4.0 (or the Industrial Internet), its applications in the business world. Learners will gain deep insights into how smartness is being harnessed from data and appreciate what needs to be done in order to overcome some of the challenges. 			
Unit-I	:	Introduction to Industry 4.0 The Various Industrial Revolutions, Digitalization and the Networked Economy Drivers Enablers, Compelling Forces and Challenges for Industry 4.0, The Journey so far: Developments in USA, Europe, China and other countries, Comparison of Industry 4.0 Factory and Today's Factory. <p style="text-align: right;">[06 Hrs]</p>			
Unit-II	:	Technology Roadmap for Industry 4.0 Internet of Things (IoT) & Industrial Internet of Things (IIoT) & Internet of Services (IoS) & Internet of Energy (IoE), Introducing the Smart Factories, Smart Manufacturing, Smart Devices and Products, Smart Logistics, Smart Cities, Predictive Analytics for Smart Business Transformation. <p style="text-align: right;">[06] Hrs</p>			
Unit-III	:	Disciplines, System, Technologies for Enabling Industry 4.0 Cyber-physical Systems (CPS), Cyber Security, Robotic Automation and Collaborative Robots, Support System for Industry 4.0, Mobile Computing, Artificial Intelligence, Additive Manufacturing (3D Printing). <p style="text-align: right;">[08 Hrs]</p>			
Unit-IV	:	Role of Data, Information, Knowledge and Collaboration in Future Organizations Resource-based view of a firm, Trends of Industrial Big Data, Data Mining, Data Analytics & Data as a new resource for organizations, Harnessing and sharing knowledge in organizations, Cloud Computing and Industry 4.0 <p style="text-align: right;">[06 Hrs]</p>			
Unit-V	:	Other Applications and Case Studies, Opportunities and Challenges Industry 4.0 laboratories, IIoT case studies, Changes for Companies, Entrepreneurs, SMEs and start-ups, Sustainability and circular economy, Infrastructure in Developing Countries, Jobs, Skills and Education in Developed and Developing Countries, Ethical Implications of Industry 4.0 technologies. <p style="text-align: right;">[08 Hrs]</p>			
Unit-VI	:	Business Issues in Industry 4.0 and Impacts on Various Sectors Future of Works and Skills for Workers in the Industry 4.0 Era, Impact on Automotive industry, Agriculture 4.0, Retail and Consumer Goods, Healthcare Industry, E-commerce for Manufacturing, Strategies for competing in an Industry 4.0 world. <p style="text-align: right;">[06 Hrs]</p>			
Reference Books	:	Sr. No.	Title	Author	Publication
		1	Industry 4.0_ the Industrial Internet of Things	Alasdair Gilchrist	Apress
		2	Industry 4.0_ Managing The Digital Transformation	Alp Ustundag, Emre Cevikcan	Springer
		3	Industry 4.0_ Opportunities Behind The Challenge	Dr. Mirjana Stankovic, Ravi Gupta and Dr. Juan E. Figueroa	UNIDO General Conference 2017
		4	The concept Industry 4.0		Springer

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Code No.: ETC421	Lab: I
Teaching Scheme: 02Hrs/week	Title: Digital Image Processing
Practical/Oral Examination: 50 Marks	Credits: 01
Course Objectives	: <ul style="list-style-type: none"> · The course provides the knowledge of fundamentals of Digital Image Processing. · Students will learn the proper image representation, enhancement, filtering, restoration, analysis, reconstruction.
List of Practical	: <ol style="list-style-type: none"> 1. Write a program to extract different attributes of an image 2. Write program for mathematical operation on digital image. 3. Write a program for Image negation, power Law correction 4. Write a program for Histogram mapping & equalization, stretching 5. Write a program for Image smoothing, sharpening 6. Write a program for Edge detection – use of Sobel, Prewitt and Roberts operators 7. Write a program for Morphological operations on binary images 8. Write a program for Morphological operations on Gray scale images 9. Write a program for Pseudo coloring 10. Write a program for Chain coding 11. Write a program for FFT or DCT. 12. To study of object detection using image processing.
List of Reference Books	: <ul style="list-style-type: none"> · “Digital Image Processing”, Gonzalez, Woods, PHI, 2nd edition. · “Digital Image Processing”, Milan Sonka,Castleman k.r. printicehall 1996. · “An introduction to DIP”, Bill Silver. · “An introduction to DIP”, A.K. Jain. · “Digital Image Processing”,S Jayaraman, S Esakkiranjan, McGraw Hill Education Private Limited.
List of Equipments /Instruments	: 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 (Faculty of Science & Technology) Syllabus of T.E. (ETC/EC/E&C/IE) Semester-V	
Code No.: ETC422	Lab II
Teaching Scheme: 02Hrs/week	Title: Microwave and Radar Engineering
Practical/Oral Examination: 25 Marks	Credits: 01
Course Objectives	: <ul style="list-style-type: none"> · Basic concepts of microwave communication and transmission line. · Building blocks of microwave communication.
List of Practical	: <ol style="list-style-type: none"> 1. Study of microwave components. 2. To plot modes (characteristics) of reflex klystron. 3. Study of microwave Tee’s. 4. Plot V/I characteristics of Gunn oscillator. 5. Study of characteristics of Isolator and Circulator. 6. Measurement of guide wavelength & frequency in rectangular Waveguide. 7. Microwave power (Low/High) measurement. 8. Measurement of vibrations of tuning for using Radar. 9. Measurement of velocity of moving object using Radar. 10. Measurement of RPM of moving fan using Radar. 11. Measurement of frequency and time of a moving object using Radar.
List of	: Text Books:

Reference Books	1. Liao S.Y, “Microwave devices and Circuits”, Prentice Hall of India. 2. Skolnik, “Introduction to radar system”, Tata Mc-Graw Hill pub. Reference Book: 1. Rizzi,P.A , “Microwave Engineering, Passive Circuits” Prentice Hall of India. 2. Pozar D.M., “Microwave Engineering”, John Wiley. 3. M.Kulkarni., “Microwave devices and Radar Engg.” Umesh Publications. 4. Chatterji R., “Microwave Engineering, Special topics”, East West Press. 5. Peyton Z. Peebles, Jr., “Radar principles”, Wiley Publications.
List of Equipments /Instruments	: Microwave Test Bench, All microwave Devices.

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 B.E. (ETC/EC/E&C/IE) Semester-V	
Code No.: ETC423	Lab: III
Teaching Scheme: 02Hrs/week	Title: Advanced Embedded system Design
Practical/Oral Examination: 50 Marks	Credits: 01
Course Objectives	: <ul style="list-style-type: none"> · To get the knowledge of embedded system using ARM7 and ARM cortex microcontroller. · To get aware with Vxworks and MicroC RTOS.
List of Practical	: <ul style="list-style-type: none"> · Write a program to Turn on the LED for specific time using ARM 2148 · Write a program to display a message on LCD using 4 bit mode and using I2C module · Write a program to display a message using GLCD · Write a program to rotate stepper motor clockwise and anticlockwise with specific degree rotation · Write a program to rotate Servo motor clockwise and anticlockwise with specific degree rotation. · Design a digital thermometer using STM32 Microcontroller(Cortex-M3) · Design a system using accelerometer to find the angle of tilt (Use STM32 fxx) · Design a system for obstacle detection using Ultrasonic sensor and STM32Fxx Microcontroller. · Design a system for heart rate monitoring using pulse sensor and STM32Fxx) · Interfacing of Servo motor with STM32fxx · Demonstrate basic multi-tasking capabilities of μC/OS-II · Ten task display a number between 0 to 9 at random location on the screen. · Create a mailbox using μC/OS-II.
List of Reference Books	: <ul style="list-style-type: none"> · ARM7 LPC 2148 Data sheet · STM32fxx Data sheet
List of Equipments /Instruments	: ARM7 Development board,,Cortex-M3 board, accelerometer, Temperature sensor, Servo motor, Stepper motor, LCD, Pulse sensor, Ultrasonic sensor and stepper motor

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 Final Year (ETC/EC/E&C/IE) Semester-VII	
Code No.: ETC424	Lab IV
Teaching Scheme: 02Hrs/week	Title: VLSI Design

Practical/Oral Examination: 50 Marks		Credits: 01
Course Objectives	:	<ul style="list-style-type: none"> · To implement various digital circuit using VHDL. · To learn CMOS layout design using Microwind.
List of Practical	:	<ul style="list-style-type: none"> · Introduction to VLSI Lab (XILINX ISE, Microwind Tools, VHDL, Verilog code) · Design and implementation of Adder (H.A, Full adder by H.A, 4 Bit adder) · Design and implementation of MUX, DEMUX. · Design and implementation of DECODER using data flow modeling. · Design and implementation of FF (SRJK,D,T) · Design and implementation of COUNTER · Layout design of PMOS, NMOS using Microwind · Design of CMOS inverter using Microwind · Design of Half adder using Microwind
List of Reference Books	:	<p>Text Books:</p> <ul style="list-style-type: none"> · Stephen Brown, Zvonko Vranesic, Fundamental of digital logic design with VHDL · Neil H. E. Weste, David Harris and Ayan Banerjee, CMOS VLSI Design, Third Edition, Pearson. · Douglas Peny, VHDL, Third Edition, Tata McGraw Hil. · Kang S. M., CMOS Digital Integrated Circuits, TMH 3rd 2003 · Douglas Pueknell & Kamran Eshraghian, Basic VLSI Design, Third Edition, PHI. · VLSI Design Black Book, Prasad Wiley Publications <p>Reference Books:</p> <ul style="list-style-type: none"> · J. Bhasker, VHDL PRIMER, Third Edition, PHI. · J. Rabaey, Digital Integrated Circuits: A Design Perspective, Second Edition Prentice Hall India, 2003. · Boyce and Baker "CMOS" EEE Press. · Xilinx FPGA /CPLD Data Book
List of Equipments /Instruments	:	Xilinx Software, Microwind 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

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Final Year (ETC/EC/E&C/IE) Semester-VII		
Code No.: ETC425		Lab V Title: Internet of Things
Teaching Scheme: 02Hrs/week		Teachers Assessment: 25 Marks
		Credits: 01
Course Objectives	:	<ol style="list-style-type: none"> 1. To get the understanding of the concepts of Internet of Things 2. To enable the students to build IoT applications. 3. To understand the various protocols in IoT and Networking. 4. To develop the essential programming skill required
List of Practical	:	<ol style="list-style-type: none"> 1. Interfacing of Digital and Analog sensor to NodeMcu 2. Interfacing of Digital sensor to 8266 Wi-Fi module 3. Interfacing of analog and digital sensor to raspberry Pi

	:	4. Interfacing of Servo motor to Raspberry Pi 5. Data transfer to cloud using 8266 Wi-Fi module 6. Home automation using Raspberry Pi 7. SECURITY SURVEILLANCE using Raspberry Pi 8. To study Interfacing between 8266 Wi-Fi module and Raspberry Pi 9. To study Interfacing of Raspbey pi to whats app and twitter
List of Reference Books	:	1. Internet of Things: A Hands-On Approach- Arsheep Bahga,Vijay Madiseti 2. Raspberry Pi Cookbook for Python Programmers by Tim Cox 3. Learning Internet of Things, Peter Waher
List of Equipments /Instruments	:	Digital and Analog sensors, Wi-Fi module, Raspbery Pi.

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-VII		
Code No.: ETC425	Lab V Title: Title: ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING	
Teaching Scheme: 02Hrs/week	Teachers Assessment: 25 Marks	
	Credits: 01	
Course Objectives	:	<ul style="list-style-type: none"> · To Apply a given AI technique to a given concrete problem · To implement non-trivial AI techniques in a relatively large system. · To understand uncertainty and Problem solving techniques. · To understand various symbolic knowledge representation to specify domains and reasoning tasks of a situated software agent. · To understand different logical systems for inference over formal domain representations, and trace how a particular inference algorithm works on a given problem specification. · To understand various learning techniques
List of Practical	:	<ol style="list-style-type: none"> 1. Study of PROLOG. Write the following programs using PROLOG. 2. Write a program to solve 8 queens problem. 3. Solve any problem using depth first search. 4. Solve any problem using best first search. 5. Solve 8-puzzle problem using best first search. 6. Solve Robot (traversal) problem using means End Analysis. 7. Solve traveling salesman problem.
List of Reference Books	:	<p>Text Books:</p> <ol style="list-style-type: none"> 1. Elaine Rich, Kevin Knight, Shivashankar B Nair: Artificial Intelligence, Tata McGraw Hill 3rd edition. 2013. 2. Stuart Russel, Peter Norvig: Artificial Intelligence A Modern Approach, Pearson 3rd edition 2013. <p>Reference Books:</p> <ol style="list-style-type: none"> 1. Nils J. Nilsson: "Principles of Artificial Intelligence", Elsevier, ISBN-13: 9780934613101. 2. Parag Kulkarni, Prachi Joshi: "Artificial Intelligence: Building Intelligence Systems @2015 by PHI Learning Private Limited.

List of Equipments /Instruments	:	Computer, Matlab Software
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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 (Faculty of Science & Technology) Syllabus of B.E. (ETC/EC/E&C/IE) Semester-VII	
Course Code: ETC 475	Title: Project Part I
Teaching Scheme Theory: 02Hours/Week	Examination Scheme Theory Examination: 50 Marks
Credits: 04	
<p>The project work will be carried out by a batch of at most 3 students Preferably 2 students working on a topic related to the electronics and allied branches. The topic may be from one of the following.</p> <ul style="list-style-type: none"> · Laboratory work involving constructional, theoretical and design aspects of the project/ system. · Modification aspect of existing electronics systems. · It can be practical need of the industry, which should involve system design aspect. · Survey of latest development in Electronics and allied fields. It shall consist of the term work in the form of hand written typed report not less than 25 pages. <p>This should include the literature survey, technical details related data that is collected and design that are required for project work part-I.</p> <p>The candidate shall give a seminar on the subject chosen above in the presence of guide and external examiner preferably from industry or the university.</p>	

Syllabus of B.E. (ETC/EC/E&C/IE) Semester-VIII

	<table border="1"> <tr> <td>Code No.: ETC 451</td> <td>Title: Computer Network & Security</td> </tr> <tr> <td>Teaching Scheme: 04Hrs/week</td> <td>Class Test (Marks): 20</td> </tr> <tr> <td>Theory: 04Hrs/week</td> <td>Theory Examination (Duration): 03 Hrs</td> </tr> <tr> <td>Credits:04</td> <td>Theory Examination (Marks): 80</td> </tr> </table>	Code No.: ETC 451	Title: Computer Network & Security	Teaching Scheme: 04Hrs/week	Class Test (Marks): 20	Theory: 04Hrs/week	Theory Examination (Duration): 03 Hrs	Credits:04	Theory Examination (Marks): 80
Code No.: ETC 451	Title: Computer Network & Security								
Teaching Scheme: 04Hrs/week	Class Test (Marks): 20								
Theory: 04Hrs/week	Theory Examination (Duration): 03 Hrs								
Credits:04	Theory Examination (Marks): 80								
Prerequisites :	Concepts of Basics of Computer Networking								
Objectives :	<ul style="list-style-type: none"> · To interpret the layering concepts in computer networks. · To understand internals of protocols such as HTTP, FTP, SMTP, TCP, UDP, IP. · To study different security techniques & its algorithms. 								
Unit-I :	Introduction: Computer Networking: Components of communication system, Date representation, Networking Hardware, Network topologies, Network software Overview of network model: ISO-OSI and TCP/IP. Network design issues, layered architecture. Communication Networks: Switching Technique circuit switching network, Packet switching, comparison of Circuit and Packet switching. <p style="text-align: center;">[8 Hours]</p>								
Unit-II :	Data Link Layer and Network Layer : Error detection and correction, Elementary data link protocols: A simplex stop and wait protocol, sliding window protocols. Network layer des algorithm, Congestion control algorithm, Quality of service. <p style="text-align: center;">[6 Hours]</p>								
Unit-III :	Transport Layer and Application Layer: Connectionless verses connection oriented services, UDP, TCP, SCTP, congestion control, DNS, Electronic mail-Architecture, user Agent, SMT Protocol, WWW, HTTP.								
Unit-IV :	Cryptography: Introduction, Cryptography components, Ancient Cryptography, Symmetric Key cryptography, Asymmetric Key cryptography: RSA and Diffie-Hellman <p style="text-align: center;">[6 Hours]</p>								
Unit-V :	Network Security: Message confidentiality, message integrity, message Authentication, Digital signature-comparison, Need for keys, Key management, IPSecurity, <p style="text-align: center;">Hours]</p>								
Unit-VI :	ISDN: ISDN overview, ISDN Interfaces and Functions, ISDN physical layer, ISDN Data Link Layer, ISDN Network Layer, ISDN services, Broadband <p style="text-align: center;">[6 Hours]</p>								
Reference Books:	Text Books : 1. Andrew Tenenbaum, "Computer Networks", 3rd and 4th Edition, Prentice Hall 2. Behrouz A. Forouzan, "Data Communication and Networking", 4th Edition, McGraw Hill 3. Willam Stallings, "ISDN, Frame Relay, ATM", Prentice Hall 4. Bansod, "Computer Networks", Wiley Publication Reference Books : 1. D.Comer, " Computer Networks and Internet TCP/IP" 2. Willam Stallings, "Computer Networks", Prentice Hall 3. Willam Stallings, "Data and Computer Communications", 7th Edition Prentice Hall 4. Tularam M. Bansod, "Computer Networks", Dreamtech								

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:

- Minimum ten questions.
- Five questions in each section.
- 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.
- 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 B.E. (ETC/EC/E&C/IE) Semester-VIII	
Code No.: ETC 452	Title: Antenna Theory
Teaching Scheme: 04Hrs/Week	Class Test (Marks): 20
Theory: 04Hrs/Week	Theory Examination (Duration): 03 Hrs
Credits: 04	Theory Examination (Marks): 80
Prerequisites	: Electromagnetics, Microwaves, PCB Designing
Objectives	: <ul style="list-style-type: none"> · Make students aware of the fundamentals of Antenna system in order to reach the desire industry skills sets. · Introduce the students about various Antenna types to know their applications in various domains.
Unit-I	: Fundamental Parameters of Antennas: Introduction, Isotropic radiators, Radiation pattern, Gain, Directivity, Reciprocity theorem & its applications, effective aperture, radiation resistance, impedance, elementary ideas about self & mutual impedance, front-to-back ratio, beam width, bandwidth, beam efficiency, beam area or beam solid angle, polarization, temperature. Friis Transmission Equation. <div style="text-align: right;">[08 Hours]</div>
Unit-II	: Linear Wire Antennas: Current distribution of a thin wire antenna, Infinitesimal dipole, small dipole, finite length dipole, half wavelength dipole and ground effects. Loop Antennas: Introduction, Small circular loop antennas, rectangular loop. <div style="text-align: right;">[08 Hours]</div>
Unit-III	: Arrays: Radiation patterns of centre fed horizontal dipoles, Radiation patterns of vertical dipoles, Two-element uniform array, Uniform linear arrays, Field strength of a uniform linear array, First side lobe ratio (SLR), Broadside and End-fire arrays, Patterns of array of non-isotropic radiators, Binomial arrays. <div style="text-align: right;">[06 Hours]</div>
Unit-IV	: Frequency independent antennas: Log- Periodic antenna, Yagi Uda Antenna Aperture antennas: Rectangular Aperture antennas Types of Lens Antennas : Dielectric & Metal Plate. <div style="text-align: right;">[06 Hours]</div>
Unit-V	: Microstrip Antennas: Basic Characteristics, Feeding Mechanisms, Method of Analysis, Design concept of Rectangular patch & circular patch. <div style="text-align: right;">(06 Hours)</div>
Unit-VI	: Microwave Antennas:

	<p>Horn Antennas: E and H- plane Sectoral horn, pyramid horn, conical horn, corrugated horn, aperture matched horn, multimode horn and phase centre.</p> <p>Reflector Antennas: Introduction, plane reflector, corner reflector, parabolic reflector, spherical reflector.</p> <p>Hours]</p>	[06
Books:	<p>Text/Reference Books:</p> <ol style="list-style-type: none"> 1. G.S.N. Raju, "Antenna and wave propagation", Pearson Education. 2. J.D.Krauss, "Antennas for all applications", 3rd Edition, TMH. 3. Jordan and Balmain, "Electromagnetic wave & radiating systems", PHI Publication. 4. K.D. Prasad, "Antenna & Wave Propagation", Satyaprakash Publications. <p>Reference Books:</p> <ol style="list-style-type: none"> 1. C. Balanis, "Antenna Theory: Analysis and design", Wiley India. 	

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:

- Minimum ten questions.
- Five questions in each section.
- 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.
- Two questions of 15 marks each from remaining questions from each section A and B be asked to solve.

<p>Dr.Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of B.E. (ETC/EC/E&C/IE) Semester-VIII</p>		
<p>Code No.: ETC 453</p>	<p>Title: Wireless Mobile Communication</p>	
<p>Teaching Scheme: 04Hrs/week</p>	<p>Class Test (Marks): 20</p>	
<p>Theory: 04Hrs/week</p>	<p>Theory Examination (Duration): 03 Hrs</p>	
<p>Credits:04</p>	<p>Theory Examination (Marks): 80</p>	
Prerequisites	:	Concepts of Digital Communication.
Objectives	:	<ul style="list-style-type: none"> · To introduce the concepts of wireless / mobile communication using cellular environment. · To make the students to know about the various modulation techniques, propagation methods, coding and multi access techniques used in the mobile communication. Various wireless network systems and standards are to be

		introduced.
Unit-I	:	Introduction to Wireless Communication System: Fundamental terms of communications, Evolution of mobile communications, Mobile radio systems around the world, Frequencies for radio transmission, Types of wireless communication systems, Comparison of common wireless systems, Trends in cellular radio and personal communication. [08 Hours]
Unit-II	:	The Cellular Concept-System design fundamentals: Cellular system, Hexagonal geometry cell, cellular system operation, concept of frequency reuse and its analysis, channel assignment strategies, Distance to frequency reuse ratio, channel and co-channel interference reduction factor, S/I ratio consideration and calculation for minimum co-channel and adjacent channel interference. Hand-off, its necessity and advantages, Handoff strategies, Umbrella cell concept, Trunking and Grade of service, Improving coverage & capacity in cellular system – cell splitting, cell sectorization, repeaters, micro cell zone concept. [06 Hours]
Unit-III	:	Wireless Networks: Second generation cellular networks, Third generation (3G), Fourth generation (4G) and Fifth generation (5G) wireless networks, Traffic routing in wireless networks, Wireless data services, ISDN, Wireless Local Loop (WLL), Wireless Local Area Network (WLAN), Bluetooth and Personal Area Network [06 Hours]
Unit-IV	:	Multiple Access Techniques or Schemes for wireless communication: Introduction and overview, TDMA, CDMA, FDMA, OFDM, SDMA, CSMA protocols, Comparisons of multiple access strategies. [08 Hours]
Unit-V	:	Wireless Systems: GSM system architecture, Radio interface, Protocols, Localization and calling, signal processing, frame structure, Types of handover in GSM, Authentication and security in GSM, GSM speech coding. Concept of spread spectrum, Architecture of IS-95 CDMA system, Air interface, CDMA forward channels and reverse channels, Soft handoff, CDMA features and mobile services, Power control in CDMA, performance of CDMA system, CDMA 2000 cellular technology, GPRS system architecture. [06 Hours]
Unit-VI	:	Recent Trends: Introduction to Wi-Fi, WiMAX, ZigBee Networks, Wireless Adhoc Network and Mobile Portability Performance limits & design issues: Problems related to mobile or wireless channel, synchronization, channel estimation and design of wireless orthogonal frequency access, mobility & teletraffic. Advances in wireless networks. Security Issues and challenges in Wireless Network: Network security and fault management, Delay, Jitter and Throughput Quality of service and reliability issues: Network reliability, Network protection mechanisms [06 Hours]
Reference Books:	:	TEXT BOOKS: 1. Andreas.F. Molisch, “Wireless Communications”, John Wiley – India, 2006. 2. Simon Haykin & Michael Moher, “Modern Wireless Communications”, Pearson Education, 2007. REFERENCE BOOKS: 1. Rappaport. T.S., “Wireless communications”, Pearson Education, 2003. 2. Gordon L. Stuber, “Principles of Mobile Communication”, Springer International Ltd., 2001. 3. Andrea Goldsmith, Wireless Communications, Cambridge University Press, 2007.

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:

- Minimum ten questions.
- Five questions in each section.
- 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.
- 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 B.E. (ETC/EC/E&C/IE) Semester-VIII	
Elective II	
Code No.: ETC391	Title: Fiber Optic Communication
Teaching Scheme: 04Hrs/week	Class Test (Marks): 20
Theory: 04Hrs/week	Theory Examination (Duration): 03 Hrs
Credits:04	Theory Examination (Marks): 80

Prerequisites	:	Analog and Digital Communication.
Objectives	:	<ul style="list-style-type: none"> · Building blocks of Optical Fiber communication system. · Traffic Routing and Grade of Service. · Different networks Systems and Standards.
Unit-I	:	Introduction: Basic Block Diagram of Optical Fiber Communication system, Ray theory transmission, Types of optical fibers and their Construction. Fiber materials. Propagation in optical fibers. Related numerical on above topics. <p style="text-align: right;">[8 Hrs]</p>
Unit-II	:	Light Sources and Light Detectors: LED and LASER. Photodiode and Phototransistor. Light Sources and Light Detector parameters. Optoisolators. Related numerical on above topics. <p style="text-align: right;">[6 Hrs]</p>
Unit-III	:	Optical Fiber Losses: Attenuation/Absorption, Scattering, Dispersion, Bending losses, Coupling losses, Splices and Connectors. Related numerical on above topics.. <p style="text-align: right;">(6Hrs)</p>
Unit-IV	:	Digital FOC System: Introduction , System Design Considerations. Noise Penalties, System Margin.WDM. Link Power Budget and Rise Time Budget. Related numerical on above topics. <p style="text-align: right;">[6 Hrs]</p>
Unit-V	:	Optical Networks: Network Concept, Network Topologies, SONET, SDH Tracking. Photonic switching and Sensor applications. WDM network, Passive optical Networks, optical Ethernet. Related numerical on above topics. <p style="text-align: right;">[6 Hrs]</p>
Unit-VI	:	Performance Measurement and Monitoring: Measurement Standards, Basic Test Equipment, Optical Power Measurement, Optical fiber characteristics, Eye Design Test, Optical Time Domain Reflectometer(OTDR), Optical Performance Monitoring. <p style="text-align: right;">[8 Hrs]</p>
Reference Books:	:	Text/Reference Books: 1. Optical Fiber Communications- Keiser (McGraw Hill) 2. Fiber Optic Communication- Agrawal (Khanna) 3. Optical Fiber Communication- Senior (PHI) 4. Optical Fibers and Fiber Optic Communication System- Sarkar(S. Chand) 5. Fiber-Optic Communication: Systems and Components- Mishra(Wiley)

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:

- Minimum ten questions.
- Five questions in each section.
- 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.
- 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 B. E. (ETC/EC/E&C/) Semester- VIII	
Code No.: ETC 392	Title: Cloud Computing

	Teaching Scheme: 04Hrs/week	Class Test (Marks): 20
	Theory: 04Hrs/week	Theory Examination (Duration): 03 Hrs
	Credits:04	Theory Examination (Marks): 80
Prerequisites	:	Programming Concepts, Data Structure, Basic Linear Algebra, Basic Probability and Statistics
Objectives	:	1.To learn how to useCloud Services. 2.To implement Virtualization 3.To implement Task Scheduling algorithms. 4.Apply Map-Reduce concept to applications. 5.To build Private Cloud
Unit-I	:	Introduction: Basic Nomenclature, Understand the V's of Big Data (Volume, Velocity, and Variety); Build models for data; Understand the occurrence of rare events in random data. Analytical Model requirements. [8 Hrs.]
Unit-II	:	Data Collection, Sampling, and Pre-processing: Types of Data Sources, types of data elements, missing values, outlier detection and treatment, Standardization and categorization of data, variable selection and segmentation. [8 Hrs.]
Unit-III	:	Big Data Tools: NoSQL: Databases, MongoDB, Hbase, MapReduce: Hadoop, Hive, Pig, Storage: S3, Hadoop Distributed File System, Servers: EC2, Google App Engine, Processing: R, Datameer, Bigsheets. [8 Hrs.]
Unit-IV	:	Predictive Analytics: Target Definition, Linear Regression, Decision Trees, Neural Networks, Support Vector Machines, Multiclass Classification Techniques [10 Hrs.]
Unit-V	:	Descriptive Analytics: Association Rules, Sequence Rules, Segmentation [6 Hrs.]
Unit-VI	:	Social Network Analytics: Social Networks: Definitions, Metrics, and Learning. Relational Neighbour Classifier, Probabilistic Neighbour Classifier, Collective Inferencing, Egonets, Bigraphs. [8 Hrs.]
Reference Books:	:	Text Books: · Analytics in Big Data World, by Bart Baesens, Wiley Publications Reference Books: · Dirk Deroos et al., Hadoop for Dummies, Dreamtech Press, 2014. 2.Chuck Lam, Hadoop in Action, December, 2010. 3. Leskovec, Rajaraman, Ullman, Mining of Massive Datasets, Cambridge University Press. · 4. I.H. Witten and E. Frank, Data Mining: Practical Machine learning tools and techniques. · 5. Erik Brynjolfsson et al., The Second Machine Age: Work, Progress, and Prosperity in a Time of Brilliant Technologies, W. W. Norton & Company, 2014.

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:

- Minimum ten questions.
- Five questions in each section.
- 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.
- 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-VIII		
Code No.: ETC 393	Title: ELE-II Android Programming	
Teaching Scheme: 04Hrs/week	Class Test (Marks): 20	
Theory: 04Hrs/week	Theory Examination (Duration): 03 Hrs	
Credits:04	Theory Examination (Marks): 80	
Prerequisites	:	Android programming is based on Java programming language so basic understanding on Java programming would be helpful in learning Android application development.
Objectives	:	<ul style="list-style-type: none"> · This course facilitates classroom and laboratory learning, letting students develop competence and confidence in android programming and understand the entire Android Apps Development Cycle · It would also enable the students to independently create new Android Applications
Unit-I	:	Introduction to Mobile Operating Systems and Mobile Application Development (6 Hrs) Introduction to Mobile OS: Palm OS, Windows CE, Embedded Linux, J2ME (Introduction), Symbian (Introduction). Overview of Android: Devices running android, Why Develop for Android, Features of android, Architecture of Android, Libraries. How to setup Android Development Environment: Android development Framework - Android-SDK, Eclipse, Emulators – What is an Emulator / Android AVD? , Creating & setting up custom Android emulator, Android Project Framework, My first android application.
		[08 Hours]
		Android Activities, UI Design and Database (6 Hrs)

Unit-II	:	<p>Understanding Intent, Activity, Activity Lifecycle and Manifest, Form widgets, Text Fields, Layouts: Relative Layout ,Table Layout, Frame Layout, Linear Layout, Nested layouts.</p> <p>UI design: Time and Date, Images and media, Composite, Alert Dialogs & Toast, Popup.</p> <p>Menu: Option menu, Context menu, Sub menu.</p> <p>Database: Introducing SQLite, SQLite Open Helper, SQLite Database, Cursor,</p> <p>Content providers: defining and using content providers, example- Sharing database among two different applications using content providers, Reading and updating Contacts, Reading bookmarks.</p> <p style="text-align: right;">[08 Hours]</p>
Unit-III	:	<p>Preferences, Intents and Notifications</p> <p>Preferences: Shared Preferences, Preferences from xml</p> <p>Intents: Explicit Intents, Implicit intents.</p> <p>Notifications: Broadcast Receivers, Services (Working in background) and notifications, Alarms.</p> <p style="text-align: right;">[06 Hours]</p>
Unit-IV	:	<p>Telephony, SMS and Location Based Services</p> <p>Telephony: Accessing phone and Network Properties and Status, Monitoring Changes in Phone State, Phone Activity and data Connection.</p> <p>SMS: Sending SMS and MMS from your Application, sending SMS Manually, Listening for incoming SMS.</p> <p>Location based Services: Using Location Based Services, Working with Google Maps, Geocoder.</p> <p style="text-align: right;">[06 Hours]</p>
Unit-V	:	<p>Accessing Android Hardware Networking:</p> <p>An overview of networking, checking the network status, communicating with a server socket, Working with HTTP, Web Services.</p> <p>Bluetooth: Controlling local Bluetooth device, Discovering and bonding with Bluetooth devices, Managing Bluetooth connections, communicating with Bluetooth.</p> <p style="text-align: right;">[06 Hours]</p>
Unit-VI	:	<p>Audio Video Handling</p> <p>Audio and Video: Playing Audio and Video, Recording Audio and Video, Using Camera and Taking Picture</p> <p style="text-align: right;">[06 Hours]</p>
Reference Books:	:	<ul style="list-style-type: none"> · Reto Meier “Professional Android™ Application Development”, Wrox Publications. · Lauren Dercy and Shande Conder “Sams teach yourself Android application development” , Sams publishing. · Hello Android, Introducing Google’s Mobile Development Platform, Ed Burnette, Pragmatic Programmers, ISBN: 978-1-93435-617-3

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:

- Minimum ten questions.
- Five questions in each section.
- 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.
- 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 B.E. (ETC/EC/E&C/IE) Semester-VIII	
Code No.: ETC 471	Lab: VI
Teaching Scheme: 02Hrs/week	Title: Computer Network & Security
Practical/Oral Examination: 50 Marks	Credits: 01
Course Objectives	: - To interpret the layering concepts in computer networks. · To understand internals of protocols such as HTTP, FTP, SMTP, TCP, UDP, IP. · To study different security techniques & its algorithms.
List of Practical	: 1. Study of ISO-OSI reference model 2. Study of TCP/IP reference model 3. Study of Topologies and Interconnection devices 4. Study of LAN, MAN, WANS. 5. Study of Errors and error correction techniques 6. Study of sliding window protocol 7. Study of UDP, TCP. 8. Study of DNS,WWW,Electronic mail 9. Study of architecture of ISDN 10. Study of fire walls 11. Study of ISDN 12. Write a program for encryption and description using monoalphabetic substitution or poly alphabetic substitution. 13. Write a program for PC to PC communication using RS232 port.
List of Reference Books	: Text Books : 1. Andrew Tenenbaum, "Computer Networks", 3rd and 4th Edition, Prentice Hall 2. Behrouz A. Forouzan, "Data Communication and Networking", 4th Edition, McGraw Hill 3. Willam Stallings, "ISDN, Frame Relay, ATM", Prentice Hall 4. Bansod, "Computer Networks", Wiley Publication Reference Books : 1. D.Comer, " Computer Networks and Internet TCP/IP" 2. Willam Stallings, "Computer Networks", Prentice Hall 3. Willam Stallings, "Data and Computer Communications", 7th Edition Prentice Hall 4. Tularam M. Bansod, "Computer Networks",Dreamtech
List of Equipments /Instruments	: Computers, Networking 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 (Faculty of Science & Technology) Syllabus of T.E. (ETC/EC/E&C/IE) Semester-VI	
Code No.: ETC 472	Lab: VII
Teaching Scheme: 02Hrs/week	Title: Antenna Theory
Teachers Assessment: 50 Marks	Credits: 01
Course Objectives	: <ul style="list-style-type: none"> · Make students aware of the fundamentals of Antenna system in order to reach the desire industry skills sets. · Introduce the students about various Antenna types to know their applications in various domains.
List of Practical	: <ol style="list-style-type: none"> 1 Plot the radiation pattern of dipole antenna and measure parameters. 2 Plot the radiation pattern of Helical antenna and measure parameters 3 Plot the radiation pattern of Array antenna and measure parameters 4 Plot the radiation pattern of Yagi –Uda antenna and measure parameters 5 Plot the radiation pattern of Log periodic antenna and measure parameters 6 Plot the radiation pattern of micro strip antenna and measure parameters 7 Plot the radiation pattern of reflector antenna and measure parameters. 8 Design and test microstrip antenna using simulation software.
List of Reference Books	: <p>Text/Reference Books:</p> <ol style="list-style-type: none"> 1. G.S.N. Raju, “Antenna and wave propagation”, Pearson Education. 2. J.D.Krauss, “Antennas for all applications”, 3rd Edition, TMH. 3. Jordan and Balmain, “Electromagnetic wave & radiating systems”, PHI Publication. 4. K.D. Prasad, “Antenna & Wave Propagation”, Satyaprakash Publications. <p>Reference Books:</p> <ol style="list-style-type: none"> 1. C. Balanis, “Antenna Theory: Analysis and design”, Wiley India.
List of Equipments /Instruments	: Different types of antennas, antenna radiation pattern testing system and 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 (Faculty of Science & Technology) Syllabus of T.E. (ETC/EC/E&C/IE) Semester-VI	
Code No.: ETC373	Lab: VIII
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

Dr.Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of B.E. (ETC/EC/E&C/IE) Semester-VIII	
Lab:IX	
Code No.: ETC 474	Title: Fiber Optic Communication
Teaching Scheme: 02Hrs/week	Practical/Oral Examination: 50 Marks
	Credits: 01
Course Objectives	: <ul style="list-style-type: none"> · Building blocks of Optical Fiber communication system. · Traffic Routing and Grade of Service. · Different networks Systems and Standards.
List of Practical	: <ol style="list-style-type: none"> 1. To Study Fiber Optic Analog link and Digital Link. 2. To plot electrical characteristics of source and Detector. 3. Numerical Aperture measurement of fiber 4. To study OTDR. 5. Eye pattern Measurement 6. BER measurement. 7. To study WDM. 8. Study of Bending Loss.
List of Reference Books	: <ol style="list-style-type: none"> 1. Optical Fiber Communications- Keiser (McGraw Hill) 2. Fiber Optic Communication- Agrawal (Khanna) 3. Optical Fiber Communication- Senior (PHI) 4. Optical Fibers and Fiber Optic Communication System- Sarkar(S. Chand) 5. Fiber-Optic Communication: Systems and Components- Mishra(Wiley)
List of Equipments /Instruments	: Different optical fiber cables, kits of BER measurement, loss measurement 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

Dr.Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of B.E. (ETC/EC/E&C/IE) Semester-VIII	
Lab:IX	
Code No.: ETC 474	Title: Cloud Computing
Teaching Scheme: 02Hrs/week	Practical/Oral Examination: 50 Marks
Credits: 01	
Course Objectives	: <ul style="list-style-type: none"> · Programming Concepts · Data Structure · Basic Linear Algebra · Basic Probability and Statistics
List of Practical	: <ul style="list-style-type: none"> · To understand overall programming architecture. · To store basic information of employees using various collection types such as List, Set Map. · To perform basic CRUD operations on any No SQL Database for given scenario. · To perform Map Reduce using any platform for given scenario. · To retrieve desired information from employee collection. · To perform basic operations on HDFS for given scenario. · To perform processing of data using R for given scenario. · To perform predictive analytics for given data set. · To perform descriptive analytics for given data set. · To perform Social Network Analytics for given data set. · Mini Project.
List of Reference Books	: Text Books: <ul style="list-style-type: none"> · Analytics in Big Data World, by Bart Baesens, Wiley Publications Reference Books: <ol style="list-style-type: none"> 1. Dirk Deroos et al., Hadoop for Dummies, Dreamtech Press, 2014. 2.Chuck Lam, Hadoop in Action, December, 2010. 3. Leskovec, Rajaraman, Ullman, Mining of Massive Datasets, Cambridge University Press. 4. I.H. Witten and E. Frank, Data Mining: Practical Machine learning tools and techniques. 5. Erik Brynjolfsson et al., The Second Machine Age: Work, Progress, and Prosperity in a Time of Brilliant Technologies, W. W. Norton & Company, 2014.
List of Equipments /Instruments	: Computers, Softwares .

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 B.E. (ETC/EC/E&C/IE) Semester-VIII

Lab:IX

Code No.: ETC 474	Title: Android Programming
Teaching Scheme: 02Hrs/week	Practical/Oral Examination: 50 Marks
	Credits: 01

Course Objectives	: · This course facilitates classroom and laboratory learning, letting students develop competence and confidence in android programming and understand the entire Android Apps Development Cycle. · It would also enable the students to independently create new Android Applications
List of Practical	: · Introduction to android · Program to show use of UI elements · Program to show demo of layouts · Program to create Menus and Dialog box. · Program to show how to use intents (implicit and explicit) · Program to work with database (create, insert ,delete ,update ,select operations) · Program to show how to use notifications · Program to make call, send and receive SMS. · Program to work with Google maps. · Program to play Audio and video files · Program to send and receive file using Bluetooth 12. Program to show how to use Networking and web-services in Android
List of Reference Books	: · Reto Meier “Professional Android™ Application Development”, Wrox Publications. · Lauren Dercy and Shande Conder “Sams teach yourself Android application development”, Sams publishing. · Hello Android, Introducing Google’s Mobile Development

		Platform, Ed Burnette, Pragmatic Programmers, ISBN: 978-1-93435-617-3
List of Equipments /Instruments	:	Arduino, Different types of sensor, R Pi.

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 B.E. (ETC/EC/E&C/IE) Semester-VIII	
Course Code: ETC 475	Title: Project Part II
Teaching Scheme Theory: 02Hours/Week	Examination Scheme Theory Examination: 50 Marks
Credits: 04	
<p>Term Work: Project part II will be continuation of project part-I undertaken by the candidates in the first term. The term work shall consists of a typed report of about 60 pages on the work carried out by a batch of students in respect of the project assigned during the first term part-I and the second term part II</p> <p>Practical Examination: It shall consist of an oral examination based on the report submitted by the candidates and or the demonstration of the fabricated design project. The said examination will be conducted by a panel of two examiners consisting of preferably the guide working as a senior and other external examiner preferably from industry or the university.</p> <p>Note: The candidate must bring the project part-I report and the final report completed in all respect while appearing for practical examination of the project.</p>	