

Program Name : Electronics Engineering Programme Group
Program Code : DE/EJ/ET/EN/EX/EQ/IE/IS/IC/
Semester : Sixth
Course Title : Emerging Trends in Electronics
Course Code : 22636

1. RATIONALE

Every technological area is developing at an exponential rate. New applications are coming up and it is mandatory for all technologists to be well versed in these developments to survive and provide satisfactory and quality services to the society and industry. This course aims to prepare the diploma graduates to be conversant with such emerging trends. The main areas in which such developments are encompass Smart systems, Digital Factory and Communication. The course gives an introduction of these areas and helps the students to apply emerging trends.

2. COMPETENCY

Aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

- Use the trending practices in Electronics fields.

3. COURSE OUTCOMES (COs)

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry oriented COs associated with the above mentioned competency:

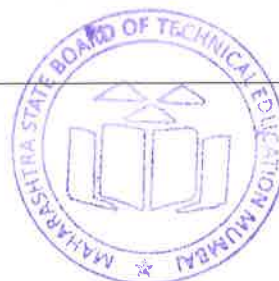
- Suggest the relevant computing systems/processor for specific type of application.
- Suggest the relevant components for the emerging application/s.
- Suggest different telecom network for given application.
- Suggest the relevant IoT technologies for Digital Factory.
- Suggest the different electronic systems for smart world.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit (L+T+P)	Examination Scheme												
L	T	P		Theory						Practical						
				Paper Hrs.	ESE		PA		Total		ESE		PA		Total	
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
3	-	-	3	90 Min	70*#	28	30*	00	100	40	--	--	--	--	--	--

(*): Under the theory PA, Out of 30 marks, 10 marks are for micro-project assessment to facilitate integration of COs and the remaining 20 marks is the average of 2 tests to be taken during the semester for the assessment of the cognitive domain UOs required for the attainment of the Cos(*#): On Line ESE

Legends: L-Lecture; T – Tutorial/Teacher Guided Theory Practice; P -Practical; C – Credit, ESE –End Semester Examination; PA - Progressive Assessment #-External Assessment



5. COURSE MAP (with sample COs, UOs, ADOs and topics)

This course map illustrates an overview of the flow and linkages of the topics at various levels of outcomes (details in subsequent sections) to be attained by the student by the end of the course, in all domains of learning in terms of the industry/employer identified competency depicted at the centre of this map.

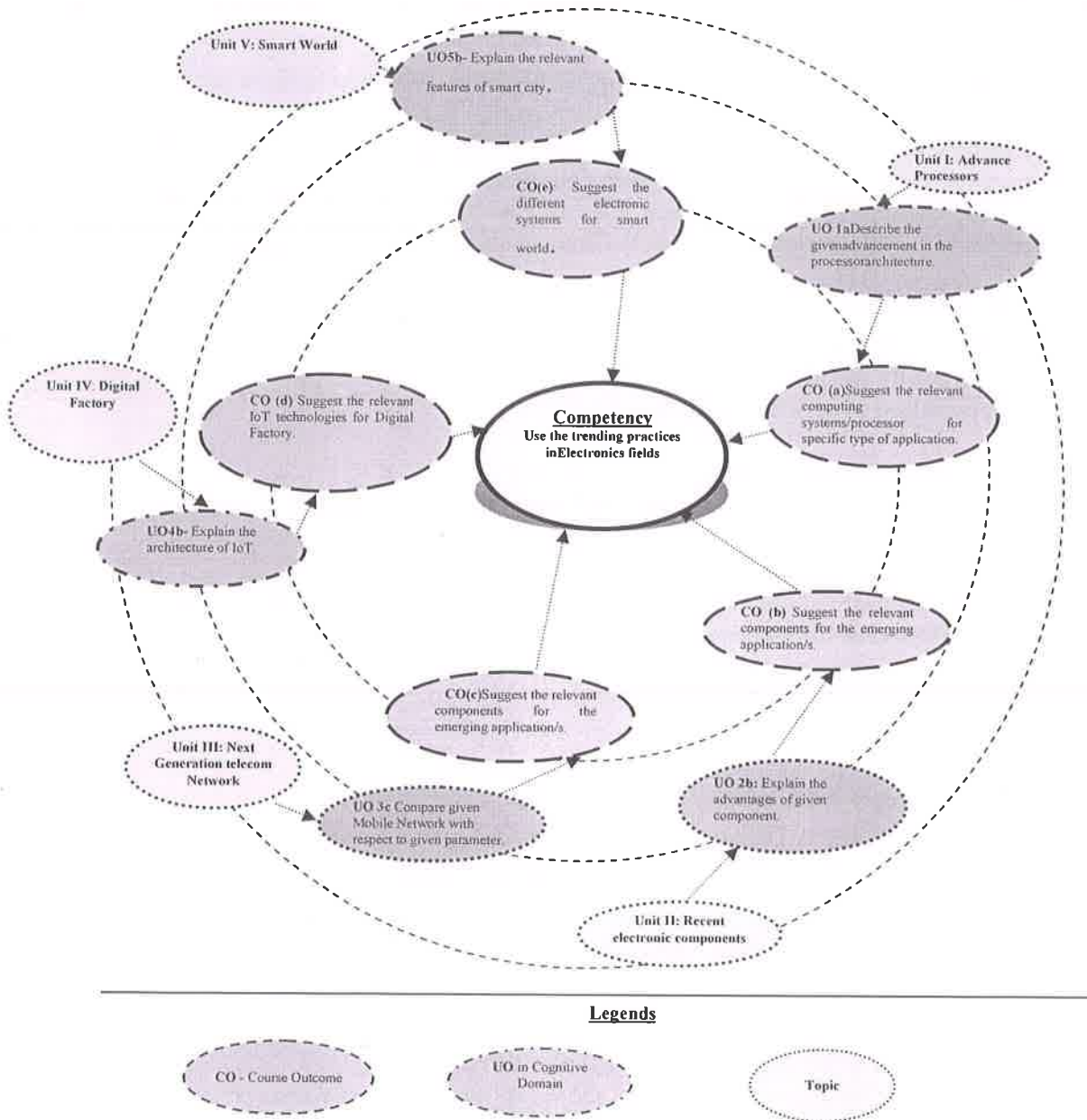


Figure 1 - Course Map

6. SUGGESTED PRACTICALS/ EXERCISES: Not Applicable

7. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED: Not Applicable



8. UNDERPINNING THEORY COMPONENTS

The following topics are to be taught and assessed in order to develop the sample UOs given below for achieving the COs to attain the identified competency. More UOs could be added.

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
Unit– I Advance Processors	1a. Describe the given advancement in the processor architecture. 1b. Describe the given features of Arduino board. 1c. Describe the given function in Arduino IDE. 1d. Describe the given feature of the ARM7 processors. 1e. Compare the given salient features of ARM 7 and ARM 7TDMI processors.	1.1 Advances in processor architecture: RISC, Pipelining and Superscalar concepts, advantages and Applications. 1.2 Arduino: Introduction, Compatible R2/R3 Uno board Features. Atmega 328: Introduction, pin description. 1.3 Arduino IDE: Features, Sketch: C,C++ functions setup(), loop(), pinMode(), digitalWrite(), digitalRead() and delay() 1.4 Arduino Interfacing: LED, Relay, DC motor. 1.5 ARM: Introduction, Features of ARM7 and ARM7TDMI, advantages, applications. Versions of ARM processor only features.
Unit – II Recent Electronic Components	2a. State features of given component. 2b. Explain the advantages of given component. 2c. Explain the concept of SMD and soldering method	2.1 Flexible PCB: Features and Applications 2.2 Battery [Li-ion, nuclear] :Concepts and Applications 2.3 Memristor, Organic LED: Concepts, Features and Applications 2.4 Surface Mount Device: Concepts, advantages, Applications and Reflow soldering method.
Unit– III Next Generation telecom Network	3a. Explain the function of given Network components. 3b. Describe the Spectrum in Telecom sector. 3c. Compare given Mobile Network with respect to given parameter. 3d. Explain the given component used in FTTH. 3e. Explain the Multi Protocol Label Switching in NGN core. 3f. Describe the features of OTN and PON.	3.1 NGN architecture: Features, Functional block diagram, Network components: Media Gateway, Media Gateway Controller, and Application Server. 3.2 NGN Wireless Technology: Telecom network Spectrum: Types [licensed and unlicensed], Mobile Network Evolution (2G to 5G), Comparative features, 3.3 Fiber to the Home (FTTH): Features, Architecture And Components: Optical Line Termination (OLT), Optical Network Unit (ONU). 3.4 NGN Core: Features, Multi Protocol Label Switching (MPLS): Concepts, Features and Advantages.



Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
		3.5 Next generation transmission system: Optical Transport Network variants: Synchronous Transfer Module STM1, STM4, STM16, STM64 and STM256 Features: bit rates and capacity .Passive Optical Network: BPON, Ethernet PON, Gigabit PON features.
Unit– IV Digital Factory	4a. Explain the principle of IoT used in given application. 4b. Explain the architecture of IoT. 4c. Explain the importance of Industrial revolution I4.0.	4.1 Internet of Things IoT: Introduction, principles and features of Cyber Physical system Components [Sensors, Edge-Gateways, Cloud]. 4.2 Architectures [Sensor to cloud various data routes: sensor-PLC-SCADA-cloud, sensor-server-cloud, sensor-edge gateway-cloud], Applications in Automotive/ Discrete Manufacturing; Telecom Industry; Agro Industries 4.3 I4.0/IIoT/ Smart Manufacturing: Introduction/ Evolution from I1.0 to I4.0, Applications and benefits of I4.0, Compare I3.0 with I4.0, Architecture of I4.0
Unit– V Smart World	5a. Explain the working principle of given electronic system in smart home. 5b. Explain the relevant features of smart city. 5c. Explain the mechanism of city surveillance in smart city. 5d. Explain the given Network component functions.	5.1 Evolution of smart home. 5.2 Basic requirements and components for Smart Home: Video Monitoring, Security and Alarm, Door control, Heating Ventilation and Air Conditioning control (HVAC), Smart lighting, Smart metering and Web controlling appliances. 5.3 Basic requirements for Smart City: Smart Transportation, Smart Healthcare, Smart waste, Smart physical safety/Security (IP based CCTV, Fire and Gas detection, Fire extinguishers) and Smart education. 5.4 IOT/M2M Network architecture: Conceptual diagram Domains for operation: Application domain, Network domain, M2M device domain. Network components: functions of Sensors, Access devices, Gateways, Access Protocols. Communication Network and Application server.



Note: To attain the COs and competency, above listed UOs need to be undertaken to achieve the 'Application Level' and above of Bloom's 'Cognitive Domain Taxonomy'.

9. SUGGESTED SPECIFICATION TABLE FOR QUESTIONPAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Advance Processors	10	02	06	08	16
II	Recent Electronic Components	08	02	04	04	10
III	Next Generation Telecom Network	12	04	04	08	16
IV	Digital Factory	10	04	06	06	16
V	Smart world	08	02	04	06	12
	Total	48	14	24	32	70

Legends: R=Remember, U=Understand, A=Apply and above (Bloom's Revised taxonomy)

Note: This specification table provides general guidelines to assist student for their learning and to teachers to teach and assess students with respect to attainment of UOs. The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may vary from above table.

10. SUGGESTED STUDENT ACTIVITIES

Other than the classroom and laboratory learning, following are the suggested student-related *co-curricular* activities which can be undertaken to accelerate the attainment of the various outcomes in this course: Students should conduct following activities in group and prepare reports of about 5 pages (one activity by each group), also collect/record physical evidences for their (student's) portfolio which will be useful for their placement interviews:

- Prepare a report on proposed features of Smart city.
- Prepare a power point presentation on IoT/IIoT applications.
- Prepare report on visit to nearby telecom exchange/industry.
- Perform Group discussion on new Electronic Components.
- Prepare a comparative chart of recent processors.

11. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are suggested strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course:

- Massive open online courses (*MOOCs*) may be used to teach various topics/sub topics.
- 'L' in item No. 4 does not mean only the traditional lecture method, but different types of teaching methods and media that are to be employed to develop the outcomes.
- About *15-20% of the topics/sub-topics* which is relatively simpler or descriptive in nature is to be given to the students for *self-directed learning* and assess the development of the COs through classroom presentations (see implementation guideline for details).
- With respect to item No.10, teachers need to ensure to create opportunities and provisions for *co-curricular activities*.
- Guide student(s) in undertaking micro-projects.



- f. Show video demonstration on safety precautions.
- g. Demonstrate the actions and care to be taken.
- h. Arrange a visit to Electronic industry.
- i. Arrange expert lecture of industry person.

12. SUGGESTED MICRO-PROJECTS

Only one micro-project is planned to be undertaken by a student that needs to be assigned to him/her in the beginning of the year. In the first two years, the micro-project is group-based. In the third year the number of students in the group should *not exceed three*.

The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based. Each micro-project should encompass two or more COs which are in fact, an integration of PrOs, UOs and ADOs as applicable. Each student will have to maintain dated work diary consisting of individual contribution in the project work and give a seminar presentation of it before submission. The total duration of the micro-project should not be less than **16 (sixteen) student engagement hours** during the course. The student ought to submit micro-project by the end of the semester to develop the industry oriented COs.

A suggestive list of micro-projects is given here. Similar micro-projects could be added by the concerned faculty:

- a. Prepare a report on existing automation in an industry and suggest improvements.
- b. Prepare a report on Smart City.
- c. Build arduino based project for smart home.
- d. Build arduino based project for smart city.
- e. Prepare a report on Smart city surveillance systems.
- f. Prepare report on electronic systems in Disaster Management.
- g. Present a power point presentation on upcoming 5G technology.
- h. Prepare a report on automatic electronic components assembly machines.
- i. Conduct a survey and prepare a report on various EDA tools.
- j. Prepare an application report on AR VR Technologies.
- k. Prepare a report on Artificial Intelligence.
- l. Prepare a report on Machine Learning.
- m. Prepare report on electronic home security systems.
- n. Prepare report on fire and gas detection and deluge systems.
- o. Prepare report on ATM security systems.

13. SUGGESTED LEARNING RESOURCES

Sr. No.	Title of Book	Author	Publication
1	Sustainable Smart Cities in India: Challenges and Future Perspectives	Poonam Sharma, Swati Rajput,	Spinger; ISBN 978-3-319-47145-7
2	The ABC of Fiber Optics Communication	Sudhir Warier	Artech House Boston London ISBN 13: 978-1-63081-414-4
3	IoT Fundamentals: Networking Technologies Protocols and use cases for IoT	David Hanes, Gonzalo Salguein	Cisco Press. ISBN 13: 978-1-58714-456-1



Sr. No.	Title of Book	Author	Publication
4	The AVR Microcontroller and Embedded Systems using Assembly and C.	MuhammadAli Mazidi	MicroDigitalEd.com ISBN-13:078-0997925968
5	ARM Assembly Language Programming & Architecture	Muhammad Ali Mazidi, Sarmad Naimi	MicroDigitalEd.com ISBN-13: 978-0997925906

14. SUGGESTED SOFTWARE/LEARNING WEBSITES:

Sr No	Theory topic /sub topic	Web site
1	Unit– I Advance Processors (Advances in processor architecture)	https://slideplayer.com/slide/8290583/
2	Unit– I Advance Processors (Arduino)	http://www.hobbytronics.co.uk/arduino-uno-r3
3	Unit– I Advance Processors (Arduino)	https://www.arduino.cc/en/Guide/HomePage
4	Unit– Advance Processors(ARM)	http://www.microdigitaled.com
5	Unit– Advance Processors (ARM)	https://en.wikipedia.org/wiki/ARM7
6	Unit – II Recent Electronic Components (Flexible PCB)	https://en.wikipedia.org/wiki/Flexible_circuit
7	Unit – II Recent Electronic Components (SMT)	https://www.electronics-notes.com/articles/electronic_components/surface-mount-technology-smd-smt/what-is-smt-primer-tutorial.php
8	Unit– III Next Generation telecom Network	TRAI official website: www.traai.gov.in
9	Unit– III Next Generation telecom Network	https://www.itu.int/rec/dologin_pub.asp?lang=e&id=T-REC-Y.2012-200609-S!!PDF-E&type=items
10	Unit– IV Digital Factory (IoT)	https://en.wikipedia.org/wiki/Internet_of_things
11	Unit– IV Digital Factory	http://dot.gov.in/sites/default/files/National%20Telecom%20M2M%20Roadmap.pdf
12	Unit– IV Digital Factory	http://www.tec.gov.in/technical-reports/
13	Unit– IV Digital Factory(14.0/IIoT)	http://i40today.com/
14	Unit– V Smart World	http://tec.gov.in/pdf/M2M/Design%20Planning%20Smart%20Cities%20with%20IoT%20ICT.pdf

