OFFICE OF THE REGISTRAR
MANIPUR TECHNICAL UNIVERSITY, IMPHAL

(A University established under the Manipur Technical University Act, 2016)
Recognised by UGC under Section 2(f) and Section 22 of UGC Act, 1956
www.mtu.ac.in/www.mtuonline.in

CIRCULAR

Imphal, the 24th April, 2021

File No. 17/2/2016-MTU: It is to inform to all students of VIII semester and the HoDs of Manipur Technical University that Under the provision of sub para 10.2 of Ordinance No. 1 of Manipur Technical University, the University Electives are the courses offered by the Academic Departments to the Students of other disciplines. A student must opt for a/some University Elective course(s) which is/are offered by any other academic department other than his own.

2. Therefore, the various courses offered to the VIII semester students by all departments with the approval of Vice-Chancellor are as follows:

Sl. No.	UEC Name	L	T	P	Offered by (Department)
1	EE4837 Electrical Material (3 credits)	3	0	0	Electrical Engineering
2	HS4805 Entrepreneurship Development (3 credits)	3	0	0	Humanities, Social Science & Mgt.
3	CS4852 Internet of Thing & its applications (3.5 credits)	3	1	0	Computer Science & Engineering
4	CE4851 Remote Sensing (3 credits)	3	0	0	Civil Engineering
5	EC 4835 Introduction to Internet of Things (3.5 credits)	3	1	0	Electronics & Communication Engineering

3. Thereby, HoDs concerned are requested to inform their students and guide them to choose their University Elective Courses (UEC) offered by other department and further requested to submit the course selected by their students to the undersigned latest by 1:00 pm of 28th April, 2021 without fail.

4. Further, if the no. of students choosing a particular course is less than 10, the course may be dropped and those students may be advice to choose another course.

5. Syllabus of University Elective Courses (UECs) offered are enclosed herewith as Annexure.

(Keisham Biju Singh)
Assistant Registrar,
Manipur Technical University, Imphal.

Copy to:

1. The Vice-Chancellor, Manipur Technical University.
2. Registrar, Manipur Technical University.
3. HoDs concerned.
4. Web Administrator for uploading in University's website.

HUMANITIES, SOCIAL SCIENCE & MANAGEMENT
(246)

Entrepreneurship Development

Eighth Semester		
Subject Code: **HS 4805**	**Entrepreneurship Development**	**Credit: 3:0:0**
3 Lectures per week **(1 Lecture= 1 hour)**	**Total Hours:** **48 hours per semester**	**Prerequisite:** **None**

Unit 1: Introduction to self-employment and entrepreneurship: concept, characteristics, creativity and innovativeness. Types of Entrepreneurs; Entrepreneurship development programmes; Government policy for small scale enterprises; Environmental considerations; Scope in local and global market of entrepreneurship development; Starting a New venture.

(7 lectures 15 marks)

Unit 2: Project set up planning: Product selection, Process selection, Process conversion, selection of location and layouts. Project proposal planning: 7M resources, Marketing, Market survey, managing finance, project report preparation; Project report preparation. Enterprise and risk management: Concept of risk, uncertainty and certainty, decision making under risk, methods of risk management, SWOT analysis. **(10 Lectures 20 marks)**

Unit 3: Sickness in small Business: Concept, Magnitude, Causes and Consequences. Corrective Measures: Business Incubators, Government Policy for Small Scale Enterprises, Growth Strategies in small industry, Expansion, Diversification, Joint Venture, Merger and Sub Contracting. **(7 lecture 15 marks)**

Unit 4: Entrepreneurial Support Agencies: District Industry Centres (DICs), Commercial Bank, State Financial Corporations, Small Industries Service Institutes (SISIs), Small Industries Development Bank of India (SIDBI), National Bank for Agriculture and Rural Development (NABARD), National Small Industries Corporation (NSIC) and other relevant institutions/ organizations at State level, national and global level.

(7 lectures 15 marks)

Unit 5: Industrial Structure: private sector vs public sector: Micro and Small Enterprise; Factors influencing location of industries; Balanced regional development of industries vs imbalanced regional development of industries. **(7 lectures 15 marks)**

Unit 6: Entrepreneurship Development Programmes: Meaning, needs, objectives, phrases, evaluation and problems of EDP; FDI and Technology Transfer, Globalization and Technology Intermediation; Balance of Trade and Balance of Payments, Barriers to Trade, Benefits of Trade/Comparative Advantage. Foreign Currency Markets/Exchange Rates, International trade relevance to Manipur. **(10 lecture 20 marks)**

Textbooks/Reference books:

1. David H. Holt, "Entrepreneurship: New Venture Creation", Pearson, 1st Edition, 2016.
2. Dr. S.S. Khanka, "Entrepreneurial Development", S. Chand, Reprint Edition, 2017.
3. Hay, Donald A. and Derek J. Morris, Industrial Economics and Organization: Theory and Evidence, Oxford University Press, 2nd edition 1991.

Course Code:	Course Name:	L:T:P:C	Availability	Pre-Requisites:
EE4837	Electrical Materials	3:0:0:3	8th Semester	

Course Content:

Module 1: Conducting Materials

Introduction of Classification of material into conducting, semi conducting and insulating materials - Resistance and factors affecting it such as alloying and temperature - Classification of conducting material as low resistivity and high resistivity materials - Low resistance materials - Introduction to handle conductors and its applications - Low resistivity copper alloys, their practical applications with reasons for the same - Applications of special metals - High resistivity materials and their applications– Super conductivity.

Module 2: Semi- Conducting Materials

Introduction - Semi-conductors and their properties, Different semiconducting materials (silicon and germanium) used in manufacture of various semiconductor devices (i.e. p-type and n-type semiconductors), Materials used for electronic components like resistors, capacitors, diodes, transistors and inductors etc.

Module 3: Insulating Materials - General Properties

Electrical Properties - Volume resistivity, surface resistance, dielectric loss, dielectric strength (breakdown voltage) dielectric constant, Physical Properties - Hygroscopicity, tensile and compressive strength, abrasive resistance, brittleness, Thermal Properties- Heat resistance, classification according to permissible temperature rise. Effect of overloading on the life of an electrical appliance, increase in rating with the use of insulating materials having higher thermal stability, Thermal conductivity, Electrothermal breakdown in solid dielectrics, Chemical Properties - Solubility, chemical resistance, weather ability, Mechanical properties – mechanical structure, tensile structure.

Module 4: Insulating Materials and Their Applications

Plastics- Definition and classification, thermosetting materials, Thermoplastic materials; Natural insulating materials, properties and their applications; Gaseous materials – Ceramics-properties and applications.

Module 5: Magnetic Materials and Special Materials

Introduction and classification - ferromagnetic materials, permeability, BH curve, magnetic saturation, hysteresis loop (including) coercive force and residual magnetism, concept of eddy current and hysteresis loss, curie temperature, magnetostriction effect, Soft Magnetic Materials, Hard magnetic materials , Hall effect and its applications. Thermocouple, bimetals, leads soldering and fuses Material - their applications.

Text Books:

1. SK Bhattacharya, "Electrical and Electronic Engineering Materials"1stedition Khanna Publishers, New Delhi, 2006. (Unit 1, 2, 3)
2. A.J. Dekker "Electrical Engineering Materials", PHI, 2006.(Unit 4,5)

References:

1. Grover and Jamwal, "Electronic Components and Materials" DhanpatRai and Co., New Delhi.
2. Sahdev, "Electrical Engineering Materials", Unique International Publications
3. C. S. Indulkar& S. Thiruvengadam, "Electrical Engineering Materials", S. Chand & Com. Ltd, New Delhi. 55

Course Code	Name of the Course	L:T:P:C	Availability	Pre-requisite
CE4851	Remote Sensing & GIS	3:0:0:3	University Elective	

Course Outcomes: At the end of the course, the student will be able to

CO1	Analyses the principles and components of remote sensing
CO2	Identify the earth surface features from satellite images
CO3	Understand the basic concept of GIS and its applications, know different types of data representation in GIS
CO4	Apply knowledge of GIS software and able to work with GIS software in various

Couirse Content:

Unit I: Introduction

History, Basic concepts and principles of remote sensing; Definition components of remote sensing - energy sensor, interacting body – active and passive remote sensing – platforms - EMR interaction with earth surface material, radiance, irradiance, incident, reflected, absorbed and transmitted energy – reflectance – specular and diffused reflection surfaces – spectral signature – spectral signature curves – EMR interaction with water, soil and earth surface.

Unit II: Photogrammetry

Principles& types of aerial photograph, geometry of vertical aerial photograph, Scale & Height measurement on single vertical aerial photograph, Height measurement based on relief displacement, Fundamentals of stereoscopy, fiducial points, parallax measurement using fiducial line

Unit II: Resolution of Images

Physic of Remote sensing orbits, Remote sensing satellites and their data products, Characteristics of different platforms: Landsat, SPOT, IRS series: Concept of Spatial, Spectral, Radiometric and Temporal resolution

Unit III: Remote sensing data

Remote sensing data product and its purchase, Visual image interpretation, Digital Image processing

Unit IV: Applications of Remote Sensing and GIS

Advanced applications of GIS – Disaster management, Water resource, Land use – Land cover – Urban planning - Intelligent Transport Systems - Development of Resources Information Systems

Indicative reading

Textbooks

1. Lillesand, Kiefer and Chipman, "Remote Sensing and Image Interpretation", Wiley student edition, 2013.
2. A. M. Chandra and S. K. Gosh, "Remote Sensing and GIS", Alpha Science, 2006.

References

1. Anji Reddy, "Remote sensing and Geographical systems", BS Publications, 2012.
2. L R A Narayana, "Remote Sensing and its applications", Universities Press, 1999
3. J. V. S. Murthy, "Watershed management", New Age International, 1998.
4. Wurbs, R. A., and James, W. P., "Water Resources Engineering". PHI Learning, 2009.
5. M G Srinivas (Edited by), "Remote sensing applications", Narosa Publishing House, 2001.
6. Burrough P A., "Principles of GIS for land resource assessment", Clarendon Press, 1994.
7. Michael N. Demers, "Fundamentals of geographic information system", Wiley student edition, 2012.

Internet of Things(IoT) & its Applications

Course Code: CS 4852 (3.5 credit) (L-3,T-1,P-0)

Course Content:

1. Introduction:
Concept, Importance, Interdisciplinary, Challenges, Various applications/smart objects, Major Players/Industry, Standards

2. IoT Architecture:
a. Node Structure: Sensing, Processing, Communication, Powering
b. Networking: Topologies, Layer/Stack architecture

3. Communication Technologies: Introduction to ZigBee, BLE, WiFi, LTE, IEEE 802.11ah, Discuss data rate, range, power, computations/bandwidth, QoS

4. Smartness - Signal Processing/Analytics: Impact on Power/Energy savings, dynamic networks, simple case studies

5. IoT Fabricator: Introduction to Embedded electronics, fabricating electronics, Communication Network requirements, Data processing challenges – recreation, IP/security, Challenges

6. Hands-on in IoT: Projects based on some Hardware (Raspberry pi, Arduino, Intel, IITH Mote, Smartphones), Software (Contiki, TinyOS, Android), IoT Fabricator

Reference Books:

1. Interconnecting Smart Objects with IP: The Next Internet, Jean-Philippe Vasseur, Adam Dunkels, Morgan Kuffmann
2. Designing the Internet of Things , Adrian McEwen (Author), Hakim Cassimally
3. Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems, Dr. Ovidiu Vermesan, Dr. Peter Friess, River Publishers
4. Internet of Things (A Hands-on-Approach) , Vijay Madisetti , Arshdeep Bahga
5. 6LoWPAN: The Wireless Embedded Internet, Zach Shelby, Carsten Bormann, Wiley
6. Building the internet of things with ipv6 and mipv6, The Evolving World of M2M Communications, Daniel Minoli John Wiley & Sons
7. Recent research/white papers

ELECTRONICS & COMMUNICATION ENGINEERING

University Elective Courses (UEC) syllabus:

Course Code	Course Name	L:T:P:C	Availability	Pre-requisites
EC4835	Introduction to Internet of Things (IoT)	3:1:0:3/3.5	8th Semester, ECE	

Course Outcomes:

Course Content:

Unit 1: INTRODUCTION & CONCEPTS **(8 hours)**

Introduction to Internet of Things, Physical Design of IoT, Logical Design of IoT, IoT Enabling Technologies, IoT Levels.

Unit 2: DOMAIN SPECIFIC IOTS **(8 hours)**

Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health & Life Style.

Unit 3: IOT NETWORKING **(8 hours)**

Basics of Networking, Communication Protocols, Sensor Networks, Overview of IoT supported Hardware platforms such as: Raspberry pi, ARM Cortex Processors, Arduino and Intel Galileo boards.

Unit 4: IOT ARCHITECTURE **(8 hours)**

M2M – Machine to Machine, Web of Things, IoT protocols. Applications: Remote Monitoring & Sensing, Remote Controlling, Performance Analysis. Architecture: The Layering concepts , IoT Communication Pattern, IoT protocol Architecture, The 6LoWPAN; Security aspects in IoT

Unit 5: CASE STUDY & IOT APPLICATIONS **(8 hours)**

IoT applications in home, infrastructures, buildings, security, Industries, Home appliances, other IoT electronic equipments. Use of Big Data and Visualization in IoT, Industry 4.0 concepts. Sensors and sensor Node and interfacing using any Embedded target boards (Raspberry Pi / Intel Galileo/ARM Cortex/ Arduino)

Text Books:

1. Arshdeep Bahga and Vijay Madisetti , "Internet of Things: A Hands-on Approach", Orient Blackswan Private Limited, 2015

Reference Books:

1. Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", by CRC Press, 2017
2. Adrian McEwen "Designing the Internet of Things", Wiley Publishers, 2013, ISBN: 978-1-118-43062-0

Course Code	Course Name	L:T:P:C	Availability	Pre-requisites
EC4836	Hardware Modeling using Verilog	3:1:0:3/3.5	8th Semester, ECE	

Course Outcomes:

At the end this course students will demonstrate the ability to:

1. To design combinational, sequential circuits using Verilog HDL.
2. To understand behavioral and RTL modeling of digital circuits
3. To verify that a design meets its timing constraints, both manually and through the use of computer aided design tools
4. To verify and design the digital circuit by means of Computer Aided Design tools which involves in programming with the help of Verilog HDL.

Course Content:

Unit 1: OVERVIEW OF DIGITAL DESIGN (8 hours)

Combinational Circuits, MUX based digital design, Design using ROM, Programmable Logic Arrays (PLA) and Programmable Array Logic (PAL), Sequential circuit design, Design of Moore and Mealy circuits.

Unit 2: VERILOG VARIABLES, OPERATORS AND LANGUAGE CONSTRUCTS (8 hours)

Introduction to Verilog, Verilog Language Features, Verilog Operators, Verilog Modeling examples

Unit 3: MODELING COMBINATIONAL CIRCUITS USING VERILOG (8 hours)

Verilog Description styles, Procedural Assignment, Combinations circuit examples

Unit 4: MODELING SEQUENTIAL CIRCUITS USING VERILOG (8 hours)

Blocking/Non-blocking assignments, user defined primitives, design of latches and flip-flops, counters, pattern detector.

Unit 5: VERILOG TEST BENCHES AND DESIGN SIMULATION (8 hours)

Verilog Test Bench, Modeling Finite State Machines, Recommended Practices, Simulation of digital circuits using Computer Aided Design (CAD) tools with the help of Verilog HDL

Text Books:

1. Samir Palnitkar, Verilog HDL, 2nd Edition, Pearson

Reference Books:

1. Morris Mani, Michael D. Ciletti, Digital Design, 5th Edition, Pearson