

DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY



CIRCULAR NO.SU/B.E.Elective/41/2019

It is hereby informed to all concerned that, on the recommendation of the Dean, Faculty of Science & Technology, the Hon'ble Vice-Chancellor **has accepted the "Electives for B.E. Final Year for the branch of Mechanical Engineering i.e. Introduction to Bearing and B.E. Final Year for the branch of Electronics & Telecommunication i.e. Internet of Things using Embedded System-II as an Open Electives – II** under the Faculty of Science & Technology in his emergency powers under section 12(7) of the Maharashtra Public Universities Act, 2016 on behalf of the Academic Council as appended herewith.

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

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

University Campus,
Aurangabad-431 004.

REF.No. SU/B.E./2019/ 23104-09
Date:- 06-02-2019

★
★
★
★
★

★


Deputy Registrar,
Syllabus Section.

Copy forwarded with compliments to :-

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

Copy to :-

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

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



**Elective-II
Introduction to Bearing
B.E. Final Year
Mechanical Engineering**

UNDER THE FACULTY OF SCIENCE & TECHNOLOGY.

[Effective from 2018-19 & onwards]

Open Elective - II

MED496 - INTRODUCTION TO BEARINGS

Teaching Scheme
Lectures: 4 Hrs. / Week

Examination Scheme
Theory: 80 Marks (3 Hrs.)
Class Test: 20 Marks (1 Hr.)

Objectives:

- To understand the various types bearings.
- To understand the design and life calculation of rolling bearings.

Course Contents:

Unit 1:

(4 Hrs.)

Introduction, Classification of Bearings and Types of Rolling Bearings

Introduction to Tribological consideration in design: Friction, Wear, Lubrication.

Definitions and terminologies used in bearing, classification of bearings i.e. sliding and rolling contact bearings, Types of rolling contact bearings, construction and features. Use of seal and shield in rolling bearing.

Unit 2:

(8 Hrs.)

Boundary Dimensions and Identification Numbers for Bearings

Boundary dimensions including snap ring groove, Formulation of rolling bearing identification number

Tolerance, Fits and Radial Internal Clearance in the Bearings: Dimensional and geometrical tolerance of various types of rolling bearings and introduction to the standard used, Importance of fits, selection and recommendations of fits, Radial internal clearance in various rolling bearings and introduction to the standard used.

Unit 3:

(8 Hrs.)

Rolling Bearing Load Rating and Life Calculation

Static and dynamic load capacities of rolling bearings and its calculation, Stribeck's equation. Equivalent bearing load, load-life relationship, bearing life, load factor, Static and dynamic equivalent load ratings and calculation. L10 life of rolling bearings, factors affecting the bearing life, Introduction to relevant standards.

Rolling Bearing Selection Procedure: Selection of bearing from manufactures catalogue, type, selection of bearing size and selection of bearing arrangement.

Unit 4:

(8 Hrs.)

Limiting Speed, Lubrication and Effect of Contamination in the Rolling Bearing

Definitions, correction of limited speed, limited speed for bearing seals, Importance of lubrication, lubrication methods and various types of lubricants used in rolling bearings, effect of contamination in bearing life, various types of contamination and its prevention.

Housing and Shaft Design: Geometry and surface finish of shaft and housing, shoulder and fillet design of shaft and housing. Introduction to the standard used. Various types of sealing.

Unit 5:

(7 Hrs.)

Rolling Bearing - Material and Feature

Different types of Material used in bearing races, rolling elements, cages and other components and its features.

Special Rolling Bearings, Bearing Units and Accessories Cam followers, Slewing ring Bearings, Axle Box Bearings, Wheel hub bearings, linear guide, Housed units and Bearings for housed units etc.

Unit 6:

(5 Hrs.)

Rolling Bearing – Handling and Maintenance

Precaution in bearing handling, Mounting and dismounting of rolling bearings, inspection, rolling bearing maintenance, various types of rolling bearing failure and its causes.

Section – A: Unit I, II and III

Section – B: Unit IV, V and VI

Text Books:

1. A. W. Macaulay – Handbook on ball and roller bearings; A practical reference book on the design, application and maintenance of ball and roller bearings.
2. N. K. Mehta – Machine Tool Design, 2nd Edition, Tata McGraw Hill, 2011.
3. G. C. Sen, A. Bhattacharya – Principles of Machine Tool, 2nd Edition, New Central book agency, Kolkata.

References Books:

1. Avraham Harnoy – Bearing Design in Machinery: Engineering Tribology and Lubrication.
2. Tedric A Harris – Rolling Bearing Analysis, 4th Edition.
3. Majumdar B. C. – Introduction to Tribology and Bearings, S. Chand and Company Ltd., New Delhi.
4. Halling J. – Principles of Tribology, McMillan Press Ltd.
5. Bhushan B. and Gupta B. K. – Handbook of Tribology: Material, Coatings and Surface Treatments, McGraw Hill Ltd.
6. Cameron A. – Basic Lubrication Theory, Wiley Eastern Ltd.
7. The Design of Aerostatic Bearings – J. W. Powell
8. Gas Bearings – Grassam and Powell

Pattern of the Question Paper:

The units in the syllabus are divided in two equal sections. Question Paper Pattern consists of two sections A and B. **Section – A** questions shall be set on first 3 units (I, II and III) and **Section – B** questions on remaining 3 units (IV, V and VI). Question paper should cover the entire syllabus.

For 80 Marks Paper:

1. Five questions in each section.
2. Attempt any three questions from each section.

LAB - IX MED474 - INTRODUCTION TO BEARINGS

Teaching Scheme
Lectures: 2 Hrs. / Week

Examination Scheme
Term Work: 50 Marks

Practical:

At least 8 assignments as given below should be studied during the course and record for the same should be submitted:

1. Assignment on introduction and classification of bearings.
2. Assignment on identification number of bearings.
3. Assignment on load rating and life of a bearing.
4. Assignment on application based selection procedure of a proper bearing.
5. Assignment on limiting speed and effect of various parameters on roller bearings.
6. Assignment on bearing housing and shaft design corresponding to roller bearings.
7. Assignment on materials used for designing and manufacturing roller bearings.
8. Assignment on handling and maintenance of roller bearings.
9. Industrial visit to any bearing manufacturing industry to observe various operations.

Term work:

The term work shall consist of submitting a file for all assignments with neatly written record and an industry visit observation report. The term work will be assessed by corresponding subject teacher.

Chow

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



Elective-II

Internet of Things using Embedded System- II

B.E.Electronics & Telecommunication

VIIIth semester

UNDER THE FACULTY OF SCIENCE & TECHNOLOGY.

[Effective from 2018-19 & onwards]

Semester-II	
Internet of Things using Embedded System – II	
Teaching schme:4hrs/week Practical: 2hrs/week	Examination scheme: Theory Examination: 80M Class test: 20M Term Work: 50M
Unit 1	
Introduction to MicroPython MicroPython: Introduction, Feature, limitations, working of microPython, board running MicroPython, variables and types, Basic Data Structures, Statements, Loops, Modularization; Modules, Functions and Classes.	6Hrs
Unit 2	
NodeMCU using MicroPython Flash/Upload MicroPython Firmware to board, MicroPython REPL prompt, Internal file system, Network basics, Network - TCP sockets, GPIO Pins, Pulse Width Modulation, Analog to Digital Conversion, Power control, Real time clock and deep sleep mode.	7Hrs
Unit 3	
Raspberry Pi Introduction Node-red, Connecting GPIO pins, injecting messages, debugging flow, user interface, Socket, socket module, Transmission Control Protocol, User Datagram Protocol, IFTTT, Google assistant based GPIO control.	7Hrs
Unit 4	
Data Analytics Matplotlib library: introduction, plotting curves from file data, plotting points, plotting bar chart and multiple bar charts, plating pie chart, histogram, plotting sensor data, update a Graph in Real Time, Speeding Up the Plot Animation.	7Hrs
Unit 5	
Database management SQLite introduction, database structure, creation and deletion of database, Using SQL to access databases, SQL creation of tables, Inserting Data into a Table, Retrieving Data, use of Python to Initialize SQLite DB, getting real time data from sensor to database.	7Hrs
Unit 6	
IIoT and Industry 4.0 IIoT: Defining Industrial IoT, Industrial IoT-layers, IIoT reference architecture, Case study: Smart Factory, Healthcare, smart building. Industry 4.0: Defining Industry 4.0, characteristics of Industry 4.0, Industry 4.0 Design principles, Building blocks of Industry 4.0.	6Hrs

Books:

1. Internet of Things: A Hands-On Approach- Arsheep Bahga, Vijay Madiseti
2. The Industrial Internet of Things — Alasdair Gilchrist
3. Micropython for the Internet of Things by Charles Bell, Apress Publication
4. Matplotlib plotting cookbook by alexandre Devert, PACKT Publication
5. Python Cookbook by David Beazley and Brian Jones, O'reilly Publication
6. Introduction to SQLite for mobile developers, Jesse Feiler, Apress publication.
7. "Quick reference for ESP8266" Documentation of MicroPython on official website: micropython.org

List of Practical: Any 8 out of following Experiments:

1. To study and perform Installing new firmware on NodeMCU and basic microPython programming
2. Perform Interfacing of analog sensor and digital sensor to NodeMCU using microPython
3. Perform Pulse width modulation using MicroPython
4. Perform Controlling devices via internet using NodeMCU
5. Perform Controlling devices using triggers to automate action
6. Study and Perform Data transfer using TCP and UDP protocol
7. To study and perform to control devices using google assistance on Raspberry Pi
8. To study and perform Node-red programming to control GPIO of raspberry Pi
9. To Study and Perform Data transfer between Raspberry pi and NodeMCU using MQTT protocol

Section A: Unit 1,2,3

Section B: Unit 4,5,6

PATTERN OF QUESTION PAPER

Six units in the syllabus shall be divided into equal parts i.e. three units in each part. Question paper shall be having two sections A and B, as per weightage of units. Section A question shall be set on first part and section B on second part. Question paper should cover entire syllabus.

For 80 Marks Paper:

1. Section A and section b should be of 40 Marks each.
2. Five Question in each section
3. Out of five questions asked should be of 15 marks and one asked should be 10 Marks.
4. 10 Marks question will be compulsory.