## Option form for Departmental Elective (DE) Courses for Session 2015-16

### Mechanical Engineering (Winter Semester 2015-16)

<table>
<thead>
<tr>
<th>Group</th>
<th>Course no</th>
<th>Course title</th>
<th>Slot</th>
<th>Nature of course</th>
<th>Choice</th>
</tr>
</thead>
<tbody>
<tr>
<td>DE1</td>
<td>ME455</td>
<td>Applied Computational Fluid Dynamics</td>
<td>T4</td>
<td>APPLIED</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ME438</td>
<td>Gas Dynamics</td>
<td>T4</td>
<td>BASIC</td>
<td></td>
</tr>
<tr>
<td>DE2</td>
<td>ME453</td>
<td>Numer. Control of Machine Tools</td>
<td>T2</td>
<td>BASIC</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ME429</td>
<td>Refrigeration &amp; Cryogenics Engg.</td>
<td>T2</td>
<td>APPLIED</td>
<td></td>
</tr>
</tbody>
</table>

**Note:**

1. **Nature of course:**
   - (i) 'APPLIED' indicates the courses which are of applied nature and are designed for preparing the students who wants to work directly in the industry.
   - (ii) 'BASIC' indicates the courses which are of basic nature and are designed for preparing the students for higher studies.

2. Exercise your choice by giving preference numbers "1, 2, 3, 4" etc against the courses in a group.

3. Every student will be allocated two DE out of which one can be dropped after one week of classes.

4. Allocation shall be made on the basis of class performance.

5. Form can be obtained from http://www.amu.ac.in/shownotice.jsp?did=34 or from the department office.

6. The student can drop one of the electives after allocation, last date of which will be notified separately.

**Last Date for Submission of Choices in the Department Office is 18. 03. 15**
Course Title: Applied Computational Fluid Dynamics
Course Number: ME455

Course Objectives

1. Set up the most appropriate CFD model (in terms of boundary conditions, material properties, solution control parameters, solution monitor, etc.) for the problem in hand
2. Set up the most appropriate turbulence model for their particular applications
3. Explain how to conduct both Steady state and Transient (time dependent) fluid flow simulations
4. Explain how to solve for both isothermal and non-isothermal thermo-fluid applications, by including all the necessary modes of heat transfer i.e. conduction, convection and radiation, in their CFD model set up.
5. Explain how to solve for both Incompressible and Compressible fluid flow applications
6. Explain how to solve for Fluid Structure Interactions
7. Describe how and extract the required results and plots from the wealth of information available at the solution stage

Course Outcomes

After taking this course the students should be able to

1. Propose the most appropriate CFD model for the problem in hand and use commercial CFD packages.
2. Model most appropriate turbulence prediction methodology for their particular applications.
3. Conduct both Steady state and Transient fluid flow simulations.
4. Evaluate design data for both isothermal and non-isothermal thermo-fluid applications, by including all the necessary modes of heat transfer and coupled structure problems
5. Propose numerical simulation to design and improve experiments and equipments.
6. Generate, describe, present and derive numerical data faithfully.

Course Title: Gas Dynamics
Course Number: ME438

Course Objectives

The students will be able to learn design internal and external supersonic diffusers
1. They will be able to learn basics of Fanno and Rayleigh flows
2. They learn the basics of normal and oblique shocks.
3. They are conversant with design of converging-diverging nozzles.
4. They learn the basics of subsonic (linear) and transonic (non-linear) velocity potential approach.

Course Outcomes

After taking this course the students should be able to

1. Design internal and external supersonic diffusers
2. Design ramjet and scramjet combustors and nozzles using Fanno and Rayleigh flows
3. Explain design process of supersonic airfoils using shock wave theory.
4. Explain design of converging-diverging nozzles.
5. Describe the basics of acoustics theory based on linearized velocity potential approach.
Course Title: Numerical Control of Machine Tool  
Course Number: ME453

**Course Objectives**

1. This is a departmental elective course designed to provide necessary knowledge for the operation and programming of numerical control machines.
2. Instruction in Programming using G-Code will be provided. Demonstrations using both onboard programming software and CAM software (Swansoft CNC) will be given to the students.
3. Use will be made of the MTAB MAXTURN PLUS lathe.

**Course Outcomes**

1. Investigate; understand new and ongoing developments in the area of numerical control of machine tool.
2. Understand basic concepts of machines operated through numerical control.
3. Understand the principles of computer numerical control (CNC) and machine Structures.
4. Be able to interpret a component specification and produce an operational plan for its manufacture.
5. Develop simple part programs with the help of programming languages and manufacture a component.

Course Title: Refrigeration and Air Conditioning  
Course Number: ME429

**Course Objectives**

1. The purpose of this course is to impart adequate knowledge in both practice and theory.
2. The course structures covers various types of Refrigeration Systems to familiarize the students with the fundamentals of Refrigeration and Cryogenic Systems.
3. After the completion of this course the students will be acquainted with the operation and maintenance/repair of different components of Refrigeration Systems.

**Course Outcomes**

After taking this course the students should be able to

1. Explain different types of Basic Refrigeration cycles and its applications in multi compressor and multi evaporator systems.
2. Describe the methods for low temperature refrigeration (Cryogenics) and Liquefaction of different gases.
3. Propose the selection and design of different components of Refrigeration systems.
4. Describe functioning of different kind of heat energy operated vapour absorption systems.