COURSE STRUCTURE & SYLLABUS OF
BACHELOR OF TECHNOLOGY (B.TECH)

In
MECHANICAL

Course Structure

Fourth Year

Eighth Semester

Paper Code	Name of the Subject
BEME6	Refrigeration & Air- Conditioning
BEME7	Machine To ol Design
BEME8	Jigs and Fixture design
BEME9	Project
BEME6 P	Refrigeration & Air-conditioning Practical

BEME6 : REFRIGERATION AND AIR-CONDITIONING

CHAPTER 1: REFRIGERATION

1. Theory of Refrigeratio n machines
2. Reversed carnot cycle
3. Cold air refrigeration machine
4. Co-eff. of performance
5. Applications of air cycles for cooling aircraft cabins
6. Vapor compression machines
7. Refrigeration effects per kg of working substance-primary and secondary refrigerants
8. Multistage compression and expansion systems, with flash inter coo ling
9. Cascade system of refrigeration
10. Vapor absorption machine
11. Commercial ice making plant
12. Househo ld refrigerators, cryogenics
13. Liquefaction of gases, manufacturing of dry ice

CHAPTER 2: AIR-CONDITIONING

1. Thermodynamic properties of air-water vapor mixtures
2. Psychorometry, use of psycho rometric charts of various types, study of heating, cooling, humidification and dehumidification
3. Processes on air-water-vapor mixtures
4. Adiabatic mixing of air streams
5. Reheatin g and bypassing of air
6. Room apparatus dew point, coil app aratus dew point
7. Sensible heat facto r, coil bypass factor, inside and outside design, comfort air conditioning, comfort zone, effective temperature
8. Air conditio ning load calculations

CHAPTER 3: AIR DISTRIBUTION

1. High and low velocity ducts
2. Duct design, zoning, fans and blowers (applications only)

CHAPTER 4: COLD STORAGES

1. Cold storages-load calculations
2. Optimum insulation
3. Design conditio ns for storage of various commodities
4. Air circulation
5. Types of evap orators
6. defrostin g
7. Controls in air conditioning plants
8. refrigerant feed control
9. safety controls
10. H.P. and L.P. switches
11. Oil pressure failure switch
12. Interlocking control
13. Humidity and temperature measurement and control
14. Air velocity measurement
15. Electric, pneumatic circuits fo r refrigeration plant used in air-conditioning

CHAPTER 5:

1. Construction, Layouts, operation and maintenance of air-conditioning plants
2. Noise and vibration control, fault location, causes and remedies, preventive maintenance

CHAPTER 6:

1. Application of summer, winter and weather air-conditio ning plants
2. Testing of air conditioning plants

BEME7 : Machine Tool Design

Metal Cutting; Machine Tools; Mechanism for Transmissions of Motions in Machine Tools; Mechanical Drives for Providing Rotational Movements; Strength and Rigidity of Machine Tool Structure; Analysis of Spindle Bearings, Slides and Guides; Automatic Drives fo r Machine Tools; Economics of Machine Tool Selection; Trends of Developments of Future Machine Tools.

BEME8 :- JIG AND FIXTURES DESIGN

Section I

BASIC TYPES AND FUNCTIONS OF JIGS AND FIXTURES

1 PURPOSE OF TOOL DESIGN

Objectives, Tool Design, Tool Design Objectives, Tool Design in Manufacturing,
Planning the Design, Challenges to the Tool Designer Requirements to become a Tool Designer

2 TYPES AND FUNCTIONS OF JIGS AND FIXTURES

Objectives, Jigs and Fixtures, Classes of Jigs, Types of Jigs, Types of Fixtures, Classification of Fixtures

3 SUPPORTING AND LOCATING'PRINCIPLES

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Objectives, Referencing, Basic Rules for Locating, Planes o f Movement, Locating the Wo rk

4 CLAMPING AND WORKHOLDING PRINCIPLES

Objectives, Workholders, Basic Rules of Clamping, Types of Clamps, Non-Mechanical Clamping, Special Clamp ing Operations, Clamping Accessories

5 BASIC CONSTRUCTION PRINCIPLES

Objectives, Tool Bodies, Preformed Materials, Drill Bushings, Set Blocks, Fastening Devices

Section II

CONSIDERATIONS OF DESIGN ECONOMICS

6 DESIGN ECONOMICS

Objectives, Considerations of Design Econo mics Design Economics, Design Econo my:
Economic Analysis, Comparative Analysis

7 DEVELOPING THE INITIAL DESIGN,

Objectives, Predesign Analysis, Designing Around the Human Element, Previous Machining Operations, Developing Tooling Alternatives

8 TOOL DRAWINGS

Objectives, Tool Drawings versus Production Drawings, Simplified Drawings, Making the Initial Drawing, Dimensioning Tool Drawings, Millimeter and Inch Dimensioning
Geometric Dimensioning and Tolerancing, Supplemen tary Symbols, Geometrically Dimensioned and Toleranced Tool Drawings, Computers in Tool Design

Section III

DESIGNING AND CONSTRUCTING JIGS AND FIXTURES

9 TEMPLATE JIGS

Objectives, Template Jigs, Variations of Template Jigs, Design Procedures, Tool Design Application

10 VISE-HELD AND PLATE FIXTURES

Objectives, Vise-Held Fixtures, Designing a Vise-Held Fixture, Plate Fixtures, Designing a Plate Fixture, Calculating Cam Clamp s, Tool Design Application Cam Design Application

11 PLATE JIGS

Objectives, Plate Jigs, Designing a Plate Jig, Designing a Table Jig, Designing a Sand wich Jig or a Leaf Jig , Tool Design Application

12 ANGLE-PLATE JIGS AND FIXTURES

Objectives, Variations and Applications, Designing an An gle-Plate Jig, Designing an Angle-Plate Fixture, Tool Design Application

13 CHANNEL AND BOX JIGS

Objectives, Channel Jigs, Designing a Channel Jig, Box Jigs, Designing a Box Jig Tool Design

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14 VISE-JAW JIGS AND FIXTURES

Objectives, The Machine Vise, Locating Work in Vise-jaw Workholders, Designing a Vise-jaw Jig, Designing a Vise-jaw Fixture, Tool Design Application

Section IV
SPECIALIZED WORKHOLDING TOPICS

15 POWER WORKHOLDING

Objectives, Types of Power- Workholding Systems, Basic Operation of Power- Workholding Systems, Benefits of Power Workholding

16 MODULAR WORKHOLDING

Objectives, Modular Fixturing Systems, Modular Fixturing Applications

17 WELDING AND INSPECTION TOOLING

Objectives, Too ling for Welding Operation s, Modular Fixturing for Welding, Inspection Fixtures

18 LOW-COST JIGS AND FIXTURES

Objectives, Chucks and Ch ucking Accesso ries, Collets and Collet Accessories Vises and Vise Accessories, Specialty Clamps and Workholding Devices

19 TOOLING FOR NUMERICALLY CONTROLLED MACIDNES

Objectives, Introduction, Basic N/C Operation, The Cartesian Coord inate System Incremental and Absolute Programming, Types of N/C Systems, Tooling Requirements for Numerical Control, Types of Workholders

20 SETUP REDUCTION FOR WORKHOLDING

Objectives, Benefits of Setup Reduction, The Setup Reduction Process

21 TOOL MATERIALS

Objectives, Properties of Tool Materials, Ferrous Tool Materials, Nonferrous Tool Materials, Nonmetallic Tool Materials, Designing with Relation to Heat Treatment

Pro ject Guideline

Thinking up a Project

You are ex pected to come up with your own idea for a project. A wide range of topics is acceptable so long as there is substantial computing content and project is predominantly of a practical, problem-solving nature. You migh t take up an interest which you already have in your stream of engineering. You may do your project in any reputed organization or a dep artment. Individually or a group of maximum 4 students can take up a project. The project is a vehicle for you to demonstrate th e required level of competence in your chosen field of Bachelors.

Start thinking about your project right in the beginning. If you want to do the project in industrial environment start your correspondence fairly early to find an organization, which is ready to accept you You must submit an outline of your project (two or three

pages) to your guide within one month of start of the project work. This must include the Title, Objective, Methodology (main steps to carry out a project), ex pected output and organization where you intend to carry out the project.

Arranging a Guide

When you have an idea of your project, even a tentative one, approach a suitable person who has interest and expertise in that area. The Guide may be a person with M.E. / M.Tech or a B.E./ B.Tech having a working experience of 3 years in relevant field.

Working with the Guide

The Guide's role is to provide support and encou ragement to direct the student's attention to relevant literature, to provide technical assistance occasionally, to read and comment on the draft report and to give guidance on the standard and amount of work required. The Guide is not responsible to teach an y new skills and language required for project work or for arran ging any literature or equipment. . Rest you can workout your own arran gement. The students, who are content to carr y out their work largely without supervision, should keep their Guide in touch with what they are doing. A student should not remain silent for months and then appear with a complete project work unknown to supervisor. In such circu mstances, the Guide cannot be counted on to give an automatic seal of his approval. If a project produces a piece of software, the Guide would normally expect to see a demonstration of the software in action.

The main purpose of the report is to explain what you did in your project. The reader should be able to see clearly what you set out to do and what you achieved. It should describe the problem addresses and explain why you tackled it in the way you did. It should include your own assessment of how successful the project was.

Resist temptation to include pages of padding. If the project consists of developing an application in area with which a computer scientist would not be familiar – such as chemical testing, stock & shar es – it might be necessary to include some explanatory company/ organization profile for whom you h ave done the work must not appear in chapters and must go to appendix part.

The work that is presented for examiners should be your own. The presentation of another person's work, design or program as though they are your o wn is a serious examination offence. Direct quotation form the work of others (published or un published) must always be clearly identified as such b y bein g placed in quotation marks, it is essential that reader should be able to see wh ere the other work ends and your begins.

Sometimes a project containing good work is marred by a report, which is turgid, obscure and simply ungrammatical. In such cases, it is very difficult to find out the work done during the project. An examiner cannot be kind enough to look properly on a project that is almost unreadable.

Some important points for carrying out a project

The organizations or companies offer you a placement for project work out of good will or to get some useful work done. Usually the companies do not provide you everything required by you. You must settle this right in the b eginning of the project with the business that what will you get from them and what you have to arran ge yourself.

Some times a complication arises due to the fact that some aspect of your project work is considered confidential by the company. If this is so, it is your responsibility to get whatever clearance is necessar y from th e organization righ t in the beginning as essential parts like system analysis and design, flow charts etc. can not be missing from a project report.

Make sure you allow enough time for writing report. It is strongly recommended that do some writing work as you carry out the project rather than leaving write up until the end. You must allow at least a month to finally write the report. There has to be enough time for the supervisor to read and comment on it and for student to make changes (sometimes ex tensive) on the basis of the comments. You may have to prepare two or three drafts before the final submission. Remember that it is mainly the p roject reports that get examined. An external supervisor receives a pile of project reports written by people who he does not know. If a project produced some software he even may not get time to see it running. In most cases he forms his judgment purely on the basis of the report. Please make your report as readable as possible content wise as well as presentation wise.

1. **Introduction:** This must contain background, any previous work done in the area of your project, your objective and other relevant material that may be helpful to further explain your project work.
2. **The existing system:** The study of the present system; problems in existing system.
3. **System design:** The proposed system; Any specific problem encountered at how you handled them.
4. **Implementation of the system:** Implementation issues and their justification.
5. **Conclusions:** Any shortcoming; your assessment of your work; comparison of your work with similar works; silent featu res of your work any feature modification. Real times applications of your project work.

References must be given at the end following any standard way of giving references.

For example:

Lan gd rof, ‘Theor y of Alternating Current Machiner y” Tata McGraw Hill, July 2003.

Finally, your project work is your brainchild and nobody knows about it more than you. Be confident to explain your work at the time of viva and be honest to accept any short falls.

The Project Report Details

The report should be prepared with the Word Processing software. They should be printed on A4 size (Executive Bond) paper. A margin of 1.5 inches must be allowed on left hand side fo r binding. The pages should be numbered. The report should be typed in the 12-font size with vertical spacing of 1.5

A report should be h ard bound (light green cover with golden print on the cover). The title of the project should be clearly visible on the cover.

The cover page should be as figures below. The first page should be title page containing the title, the candidates name, Enrolment Number, and Name of University. Second page is a certificate from the supervisor. The 3rd page is for the acknowledgement. Fourth page gives the contents of the project report. Fifth page should be an abstract of the project followed by the chapters. You must ensure that all pages are legible. Where the project has produced software for a personal computer, you should include a CD inside the back cover of the report, along with instructions in the report how to run it.

Cover Page
Project Title
A Project Report

Submitted in partial
fulfillment of the degree of
Bachelor of Technolo gy

Supervisor’s Name Student’s Name

LOGO

Sai Nath University
Ranchi, Jharkhand.

(Year)

Certificate by Supervisor Acknowledgment

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Contents Abstract

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