Final Year B. Tech Mechanical Engineering (Revised syllabus)

REFRIGERATION & AIR CONDITIONING

STRUCTURE:

Periods			Evaluation Scheme					Credits
			Sessional Exam			ESE	Total	
L	T	P	TA	PR	CT			
4	--	2	25	50	25	80	180	5

Duration of End Semester Theory Examination – 3 Hours

OBJECTIVE:

- Familiarize students with the terminologies associated with refrigeration & air conditioning.
- To cover the basic principles of psychrometry and applied psychometrics.
- Familiarise students with system analysis.
- Familiarise students with load calculations and elementary duct design
- Familiarise students with refrigerants; vapor compression refrigeration and multi-stage vapor compression systems.
- Understand the components of vapor compression systems and other types of cooling systems.

A. THEORY:

Unit	Contents	Duration	Nature
1	**Introduction:** Recapitulation of Thermodynamics, Thermodynamics process pertaining to refrigeration and air conditioning. First and Second law applied to refrigerating machines, Carnot principles, Unit of refrigeration, COP EER	02 H.	Descriptive & Analytical
2	**Air Refrigeration:** Air refrigeration cycle. Reverse Carnot cycle, Bell-Coleman cycle Numerical on above. **Air Refrigeration Systems:** Thermodynamic processes, priority criteria and suitability of air refrigeration system. Types of Air refrigeration system, Simple, Boot Strap, Regeneration, Reduced Ambient. Evaporative System. Comparison of these cycles based on DART rating. Numerical on above.	09 H.	Descriptive & Analytical
3	**Vapor Compression Cycle:** Necessity of modification of Carnot Cycle, Thermodynamic processes in VCC. Simple vapor compression system, Various conditions of vapor refrigerant in the system, Improvement in simple system. Flash Chamber, Flash Intercooler. Numerical on above syllabus. Compound vapor Compression System: Need of compound compression, Two stage compression, and various arrangements for improvement in C O P with mathematical analysis. Numericals Three Stage Compressions: Various arrangements for improvement in C O P. Numericals. Multiple Evaporator System. Requirement for multiple Evaporator, Various arrangements for improvement in C O P with mathematical analysis. Numericals.	18 H.	Descriptive & Analytical
4	**Introduction to Cryogenics:** Cascade Refrigeration, Thermodynamically analysis of Cascade systems Various arrangements. Methods of Producing and maintaining low temperature such as simple Linde, Claude, Kapitea, Heylandt cycle, Philips, Stirling machine, Thermodynamic analysis of above cycle to find yield and	07 H.	Descriptive & Analytical

	exegetic efficiency.		
5	**Non Conventional Heat Operated Systems:** Vapor absorption system, System components, Representation of system on various charts, Steam ejector system, Representation on T-s and P-V plane, Applications and Limitations, C O P	04 H.	Descriptive
6	**Refrigerants.** Desirable properties of refrigerant, R-12, R-22, R-717, R-134, Butane recent substitute for refrigerants.	02 H.	Descriptive
7	**Introduction to Psychrometry:** Need of Air Conditioning, principle of psychrometry, psychometric properties such as DBT, WBT relative humidity, specific humidity, dew point temperature, enthalpy, Thermodynamic wet bulb temperature.	04 H.	Descriptive & Analytical
8	**Applied Psychrometry:** Representation of various psychometric processes on psychometric chart and their analysis, Adiabatic mixing of streams, By pass factor, sensible heat factor, RSHF, ESHF, GSHF, ADP, Ventilation and infiltration Use of psychometric charts.	10 H.	Descriptive & Analytical
9	**Human Comfort and Air Conditioning:** Requirements of temperature, Humidity and concept of effective temperature, comfort charts. **Air Conditioners:** Air conditioning systems and their types, selection of system, Components and controls of air distribution, Window air conditioners, split air conditioners, Central air conditioners, Human comfort parameters, Load Estimation,, Infiltration, Internal heat gains	04 H.	Descriptive & Analytical

B: PRACTICALS:

1	To study working of domestic refrigerator along with wiring diagram.
2	Study of RAC tools and their applications in refrigeration workshop and Lab.
3	Study of different types of compressors.
4	To study the procedure of leak detection, evacuation and charging of refrigerant.
5	To study different types of refrigeration controls.
6	Trial on window air conditioner.
7	Trial on refrigeration test rig.
8	Trial on Air-Conditioning test rig.
9	Report on different international protocols to regulate global warming.
10	Report on visit to refrigeration establishments.

TERM WORK:

The assessment of term work shall be on the following criteria:

- Continuous Assessment
- Performing the experiments in the laboratory
- Oral examination conducted (internally) on the syllabus and the term work mentioned above

PRACTICAL EXAMINATION:

The practical examination shall consist of performing the experiments based on the practical work done during the course, the record of the experiments submitted by the candidate and Viva-voce based on the syllabus

C: RECOMMENDED TEXT BOOKS AND REFERENCES:

Sr. No.	Title of Book	Author	Publication
1	Refrigeration and Air Conditioning	Arora C. P.	Tata McGraw Hill
2	Principles of Refrigeration	Dossat R. J.	Prentice Hall
3	Refrigeration and Air Conditioning	Domkundwar	Dhanpat Rai
4	Refrigeration and Air Conditioning	Jain V.K.	
5	Refrigeration and Air Conditioning	Ballany P.L.	Khanna Publications
6	Air Conditioning System design Handbook.	---------- -	Carrier Corporation, U S A

D: DIGITAL REFERENCES:

1	www.science direct.com
2	www. Howstuffworks.com
3	www.efunda.com

PATTERN OF QUESTION PAPER

Faculty of Engineering and Technology

Final year (B. Tech) Mechanical / Production Engineering (Revised Course) Examination

November / December, May/June 200_

Refrigeration & Air Conditioning

Time: 3 Hrs **Max Marks: 80**

'Please check whether you have got the right question paper'

N.B:-

- All the questions are compulsory
- Use separate answer book for each section
- ……
- ……

SECTION A

Question no 1 **16 marks**

This question will consists of questions from all the chapters under section A mentioned in the syllabus.

This will consists of objective type, multiple choice type, short questions, concept oriented problems.

Question no 2 **12 marks**

OR

Question no 2

Question no 3 **12 marks**

OR

Question no 3

Note: 1. The questions will be memory based, application based and understanding type.
2. There should be intermixing in the questions.

SECTION B

Question no 4 **16 marks**

This question will consist of questions from all the chapters under section B mentioned in the syllabus.

This will consists of objective type, multiple choice type, short questions, concept oriented problems.

Question no 5 **12 marks**

OR

Question no 5

Question no 6 **12 marks**

OR

Question no 6

Note: 1. The questions will be memory based, application based and understanding type.
2. There should be intermixing in the questions.

Final Year B. Tech Mechanical Engineering (Revised syllabus)

HEAT TRANSFER

STRUCTURE:

Periods			Evaluation Scheme					Credits
			Sessional Exam			ESE	Total	
L	T	P	TA	PR	CT			
4	--	2	25	50	25	80	180	5

Duration of End Semester Theory Examination – 3 Hours

OBJECTIVE:

- The student should internalize the meaning of terminology and physical principles associated with the subject.
- The student should be able to delineate pertinent transport phenomenon for any process or system involving heat transfer.
- The student should be able to use requisite inputs for computing heat transfer rates and / or system involving heat transfer.
- The student should be able to develop representative models of real processes and systems and to draw conclusions concerning process / system design or performance from the attendant analysis

A: THEORY:

Unit	Contents	Duration	Nature
1	**Introduction:** Applications of heat transfer in various field from everyday life to space craft. Various modes of heat transfer, , mechanisms of different modes of heat transfer	**02 H.**	Theory & Analytical
2	**Conduction heat transfer:** Fourier's law of heat conduction, conductivity, dependence of conductivity on different factors. Three dimensional heat conduction in rectangular, cylindrical and spherical co-ordinates and simplification of the same. Electrical analogy, concept of thermal resistance. Introduction to Newton's law of cooling, Unidirectional heat conduction through material with variable conductivity and heat generation, heat conduction with convective environment, Concept of critical radius of insulation, log mean area and shape factor in conduction.	**12 H.**	Theory & Analytical
3	**Extended surfaces(Fins)**: Methods to improve/ reduce rate of heat transfer, Theory of simple pin-fin under steady state conduction without heat generation with different end conditions, Efficiency and effectiveness of fin, Use of fin Theory for rectangular and circumferential fin, application of fin theory for error estimation in temperature measurement.	**08 H.**	Theory & Analytical
4	**Unsteady state conduction heat transfer:** Single lumped heat capacity method, development of unsteady state heat transfer equation for objects with negligible internal resistance, Biot and Fourier number. Applications of the theory.	**08 H.**	Theory & Analytical

5	**Convection:** Concept of boundary layer, hydrodynamic and thermal boundary layer, Development of empirical relation using dimensional analysis for forced and natural convection. Condensation heat transfer, Nusselt theory, film wise and drop wise condensation, heat transfer in pool boiling phenomenon.	**12 H.**	Theory & Analytical
6	**Radiation Heat Transfer:** Laws of radiation : Stefen Boltzman's law Planck's distribution law, definitions of various terms used in radiation heat transfer , Concept of solid angle and intensity of radiation, shape factor, radio city irradiation, Use of electrical analogy, Response of thermocouple.	**10 H.**	Theory & Analytical
7	**Heat Exchanger:** Introduction, Classification, development of LMTD Equation for parallel and counter flow heat exchanger, correlation for other heat exchanger, effect of fouling on performance of heat exchanger, Effectiveness of heat exchanger, designing of heat exchanger including NTU method. Applications of the theory.	**08 H.**	Theory & Analytical

Section A: 1,2,3,4

Section B: 5,6,7

B: PRACTICALS

The practical work shall consist of a record of set of experiments (any nine) as listed below:

1 Experiment on heat conduction in Metal rod.
2 Experiment on heat conduction in Composite structure.
3 Experiment on heat conduction in insulating material.
4 Experiment on heat conduction in Pin fin.
5 Experiment on natural convection.
6 Experiment on forced convection.
7 Determination of emissivity of a surface.
8 Experimental verification of Steffen Bolts man's constant.
9 Experiment on heat exchangers (parallel and counter flow).
10 Experiment on Drop wise and Film wise condensation.
11 Experiment on critical heat flux and observation of boiling phenomenon.

TERM WORK:

The practical examination shall consist of performing an experiment based on the practical work during the course, viva-voce based on syllabus and term work.

C: RECOMMENDED TEXT BOOKS AND REFERENCES:

Sr. No.	Title of Book	Author	Publication
1	Heat transfer	S.P. Sukhatme	
2	Heat transfer	P.K. Nag.	Tata McGraw Hill 2002
3	Heat transfer	R C Sacdeva	

PATTERN OF QUESTION PAPER

Faculty of Engineering and Technology

Final year B. Tech Mechanical / Production Engineering (Revised Course) Examination

November / December, May/June 200_

Heat Transfer

Time: 3 Hrs **Max Marks: 80**

'Please check whether you have got the right question paper'

N.B:-

- All the questions are compulsory
- Use separate answer book for each section
- ……
- ……

SECTION A

Question no 1 **16 marks**

This question will consists of questions from all the chapters under section A mentioned in the syllabus.

This will consists of objective type, multiple choice type, short questions, concept oriented problems.

Question no 2 **12 marks**

OR

Question no 2

Question no 3 **12 marks**

OR

Question no 3

Note: 1. The questions will be memory based, application based and understanding type.
2. There should be intermixing in the questions.

SECTION B

Question no 4 **16 marks**

This question will consist of questions from all the chapters under section B mentioned in the syllabus.

This will consists of objective type, multiple choice type, short questions, concept oriented problems.

Question no 5 **12 marks**

OR

Question no 5

Question no 6 **12 marks**

OR

Question no 6

Note: 1. The questions will be memory based, application based and understanding type.
2. There should be intermixing in the questions.

Final Year B. Tech Mechanical Engineering (Revised syllabus)

AUTOMATIC CONTROL SYSTEM

STRUCTURE:

Periods			Evaluation Scheme					Credits
			Sessional Exam			ESE	Total	
L	T	P	TA	PR	CT			
4	--	2	25	50	25	80	180	5

Duration of End Semester Theory Examination – 3 Hours

OBJECTIVE:

- To understand basic principles and applications of automatic control systems.
- To know the different fundamental components which are required for design of automatic control systems.

A. THEORY:

Unit	Contents	Duration	Nature
1	**Introduction: I**ntroduction ,Review of various types of measuring instruments and transducers, Basic concepts of control systems, Classification of control systems, Open loop and Closed loop control system, Transfer Function & its significance.	4 H	Theoretical & Analytical
2	**Representation of Control System Components:** Introduction, Study of Mechanical, Electrical & Electronics components employed in construction of control systems and Mathematical equations for the same, Study of Mechanical ,Electrical, Thermal & Fluid systems and mathematical equations for the same, Analogies (Direct and Indirect) for Mechanical ,Electrical, Thermal & Fluid systems	8 H	Theoretical & Analytical
3	**Block Diagram Algebra:** Introduction, Basic rules for solving block diagrams, Representing & reducing block diagram for actual control systems like Liquid level systems, Speed control systems, Temperature control systems, Position control systems	8 H.	Theoretical & Analytical
4	**Hydraulic Systems:** Study of Hydraulic components used in Hydraulic Systems Viz. Pumps (Gear, Reciprocating, Vane Pump etc);Hydraulic Actuators (Hydraulic Cylinder, Hydraulic servo motors etc);Valves (2 way,3 way, 4way, Directional, Pressure Control Valves).	6 H	Theoretical & Analytical
5	**Pneumatic Systems:** Study of components used in Pneumatic systems viz. pneumatic cylinders, Bellows, Various types of Pressure Control Relays, Flapper nozzle system etc	4H	Theoretical &Analytical
6	**Electrical Systems:** Study of electrical motors viz. A.C., D.C., Stepper, Servomotors ;Speed control of these electrical motors by armature control, field control etc and their circuit diagrams; Study	6H	Theoretical & Analytical

	of electrical servomechanism for position control, speed control of stepper motor		
7	**Modes of Control:** Study of a) On Off Control, b) Proportional (P) Control ,c) Integral (I) Control, d) Derivative (D) Control, e) P + I, f) P + D, g) P + I + D (including mathematical representation of the same); Study of these control actions with examples of Mechanical, Hydraulic ,Pneumatic systems	6 H	Theoretical & Analytical
8	**Response Characteristics:** Introduction of various types of standard input signals ,Transient & Steady state response, Transient & Steady state response characteristics of First order and Second order systems when subjected to standard input signals	8 H	Theoretical & Analytical
9	**Analysis of Frequency Response:** Introduction, Characteristics of Frequency Response of different functions (up to Second order systems only) Graphical Method of analyzing frequency response, Bode Plot, Nyquist Plot(Polar Plot),Concept of Stability, Routh's stability criteria	10 H	Theoretical & Analytical

SECTION A- Unit 1, 2,3,4,5
SECTION B- Unit 6,7,8,9

B: PRACTICAL/DRAWING/DESIGN

TERM WORK:

(Any TEN of the following should be completed)

1	Study of various types of measuring instruments & transducers (at least ONE of each type)
2	Study of control system components (At least TEN components)
3	Study of any ONE of Hydraulic system using hydraulic servomechanism
4	Experiment on speed control of DC Motor
5	Experiment on speed control of AC Motor
6	Experiment on speed control of Stepper Motor
6	Circuit Preparation by using Hydraulic Trainer Kit
8	Circuit Preparation by using Pneumatic Trainer Kit
9	Study of Circuits for M/C Tools.
10	Experiment on Level Control System
11	Experiment on Temperature Control System
12	Experiment on Position Control using Synchros
13	Study and Design of Automatic Control System with i) Plant layout. ii) Block diagram. iii) Steady state Analysis iv) Design of controller. For various control systems like Temp. flow etc.

The assessment of term work shall be on the following criteria:

- Continuous Assessment
- Performing the experiments in the laboratory
- Oral examination conducted (internally) on the syllabus and the term work mentioned above

Assignments on unit 1, 2, 3, 9&13

PRACTICAL EXAMINATION:

The practical examination shall consist of performing an experiment based on the practical work done during the course, the record of the experiments submitted by the candidate and Viva-voce based on the syllabus

C: SUGGESTED TEXT BOOKS & REFERENCES

Sr.No.	Title	Author	Publication	Edition
1	Automatic Control Systems	Nagnath Gopal		
2	Modern Control Engg.	K. Ogata	PHI	3rd
3	Automatic Control Systems	Francis Raven	TMH	5^{th}
4	Automatic Control System	Benjamin C. Kuo.	PHI	7^{th}

Note: Distribution of Marks in question paper should be based upon the proportion of teaching hours allotted to each topic

PATTERN OF QUESTION PAPER

Faculty of Engineering and Technology

Final year B. Tech Mechanical / Production Engineering (Revised Course) Examination

November / December, May/June 200_

Automatic Control System

Time: 3 Hrs **Max Marks: 80**

'Please check whether you have got the right question paper'

N.B:-

- All the questions are compulsory
- Use separate answer book for each section
- ……
- ……

SECTION A

Question no 1 **16 marks**

This question will consists of questions from all the chapters under section A mentioned in the syllabus.

This will consists of objective type, multiple choice type, short questions, concept oriented problems.

Question no 2 **12 marks**

OR

Question no 2

Question no 3 **12 marks**

OR

Question no 3

Note: 1. The questions will be memory based, application based and understanding type.
2. There should be intermixing in the questions.

SECTION B

Question no 4 **16 marks**

This question will consist of questions from all the chapters under section B mentioned in the syllabus.

This will consists of objective type, multiple choice type, short questions, concept oriented problems.

Question no 5 **12 marks**

OR

Question no 5

Question no 6 **12 marks**

OR

Question no 6

Note: 1. The questions will be memory based, application based and understanding type.
2. There should be intermixing in the questions.

Final Year B. Tech Mechanical Engineering (Revised syllabus)

TOOL DESIGN

STRUCTURE:

Periods			Evaluation Scheme					Credits
			Sessional Exam			ESE	Total	
L	T	P	TA	PR	CT			
4	--	2	25	50	25	80	180	6

Duration of End Semester Theory Examination – 3 Hours

OBJECTIVE:

- To study and understand elements of Tooling.
- Analyses and applications of Tooling.
- Design of Jigs, Fixtures and Dies for a given component.

A: THEORY:

Unit	Contents	Duration	Nature
1	**Introduction:** Tooling-Definition, classification, AISI tool materials and their properties.	**2** H	Theoretical
2	**Elements of machining process:** Basic requirements of machining process, single point cutting tool-Geometry and tool signature, mechanics of chip formation, types of chips, effect of tool geometry and cutting condition on machining process, tool wear-types and mechanism, tool life, forces on cutting tool, merchants force circle, power requirements, design and construction details of single point cutting tool for turning, boring and shaping operations, economics based on cutting tool, cutting fluids-types, properties, Numericals	**12** H	Theoretical and Analytical
3	**Multipoint cutting tools:** Drills-classification and nomenclature, drill point geometry, selection of drills for various operation. Reamers-classification and nomenclature. Milling cutters-classification and nomenclature of end mill, plain milling cutter. Taps-classification and nomenclature. Broaches- classification and nomenclature. Hobs- classification and nomenclature. Machining volume, time and forces for drilling and milling operations	**12** H	Theoretical and Analytical
4	**Jigs and fixtures:** Principle of location, degree of freedom, 3-2-1 method of location, 4-2-1 method of location, locating devices, Drill jig-types of jig bushes, types of drill jigs, design and development procedure of jig for different components. Fixtures-setting block, tennon, clamping of fixtures, types of fixtures, design and development of milling / turning fixture for different components. Tolerances, method of dimensions and manufacturing of jigs and fixtures	**12** H	Theoretical and Analytical

5	**Design of dies:** Power presses types and construction details, die cutting operation, cutting action in die and punch, center of pressure, clearances and significance, cutting forces, methods of reducing cutting forces, method of punch support, strippers, stock stops, guide pilots, knockouts, design of blanking and piercing dies.	**10** H	Theoretical and Analytical
6	**Drawing dies:** Metal flow and factors affecting drawing, blank size calculations, drawing force, single and double acting dies, design and development of drawing dies for different components	**8** H	Theoretical and Analytical
7	**Progresses in cutting tools:** Review of recent progresses in rake angles ,tool life, carbide inserts cutting tools to improve machining performance	**4** H	Informative

Section -A Unit 1, 2, 3

Section -B Unit 4, 5, 6,7

B: PRACTICAL/ DRAWINGS / DESIGN / WORKSHOP

Term work shall consists of record book on laboratory experiments/ studies on the following(Min 9)

Sr. No.	Practical
1.	Prepare a single point cutting point cutting tool in workshop from any soft material.
2.	Demonstration of formation of various types of chips at different cutting conditions.
3.	One sheet (A1 size) on locating devices.
4.	One sheet on clamping devices
5.	One sheet on Jig design by referring design data book
6.	One sheet on Fixture design by referring design data book.
7.	One sheet on multipoint cutting tools.
8.	One sheet on die design.
9.	Numericals based on measurements of cutting time, forces, cutting power.
10.	Study of guidelines /brochure of cutting tool/ inserts of an industrial cutting tool manufacturer.
11.	Brief report on recent progresses / research in cutting tools

The assessment of term work shall be on the following criteria:

- Continuous Assessment.
- Performing the work in the laboratory / workshop.
- Practical/Oral examination conducted (internally) on the syllabus and the term work mentioned above.

C: SUGGESTED TEXT BOOKS AND REFERENCES:

1	Fundamentals of Tool Design by ASTME
2	Tool design, Cyril Donaldson *et al*, TMH Publication
3	Jig & Fixtures Second Edition, P. H. Joshi, TMH Publication

4	Introduction to Jig and Tool Design, M H A Kempster
5	Jigs and fixture design manual, Erik K Henriksen
6	Manufacturing Science by Ghosh / Mallik
7	Design Data Book, PSG
8	Handbook of Production Technology, HMT
9	Metal Cutting Theory and Practice by A.Bhattacharya

PATTERN OF QUESTION PAPER

Faculty of Engineering and Technology

Final year (B. Tech) Mechanical / Production Engineering (Revised Course) Examination

November / December, May/June 200_

Tool Design

Time: 3 Hrs **Max Marks: 80**

'Please check whether you have got the right question paper'

N.B:-

- All the questions are compulsory
- Use separate answer book for each section
- ……
- ……

SECTION A

Question no 1 **16 marks**

This question will consists of questions from all the chapters under section A mentioned in the syllabus.

This will consists of objective type, multiple choice type, short questions, concept oriented problems.

Question no 2 **12 marks**

OR

Question no 2

Question no 3 **12 marks**

OR

Question no 3

Note: 1. The questions will be memory based, application based and understanding type.
2. There should be intermixing in the questions.

SECTION B

Question no 4 **16 marks**

This question will consist of questions from all the chapters under section B mentioned in the syllabus.

This will consists of objective type, multiple choice type, short questions, concept oriented problems.

Question no 5 **12 marks**

OR

Question no 5

Question no 6 **12 marks**

OR

Question no 6

Note: 1. The questions will be memory based, application based and understanding type.
2. There should be intermixing in the questions.

Final Year B. Tech Mechanical Engineering (Revised syllabus)

ELECTIVE-III (FINITE ELEMENT ANALYSIS)

STRUCTURE:

Periods			Evaluation Scheme					Credits
			Sessional Exam			ESE	Total	
L	T	P	TA	PR	CT			
4	--	2	25	--	25	80	130	5

Duration of End Semester Theory Examination – 3 Hours

OBJECTIVES:

- To understand the basic concept of FEA and its application in different fields.
- To understand the use FEA software's.

A: THEORY:

Unit	Contents	Duration	Nature
1.	**Introduction:** Equilibrium equations in elasticity subjected to body force, traction forces, stress strain relations for plane stress and plane strain, Boundary conditions, Initial conditions, Euler's Lagrange's equations of bar, beams, Principal of a minimum potential energy, principle of virtual work, Rayleigh-Ritz method, Galerkins method., Guass elimination Numerical integration.	07 H	Conceptual
2	**Basic Procedure:** General description of Finite Element Method, Engineering applications of finite element method, Discretization process; types of elements 1D, 2D and 3D elements, size of the elements, location of nodes, node numbering scheme, half Bandwidth, Stiffness matrix of bar element by direct method, Properties of stiffness matrix, Preprocessing, post processing.	08H	Descriptive
3.	**Interpolation Models:** Polynomial form of interpolation functions- linear, quadratic and cubic, Simplex, Complex, Multiplex elements, Selection of the order of the interpolation polynomial, Convergence requirements, 2D Pascal triangle, Linear interpolation polynomials in terms of global coordinates of bar, triangular (2D simplex) elements, Linear interpolation polynomials in terms of local coordinates of bar, triangular (2D simplex) elements, CST element.	08 H	Descriptive and Analytical
4.	**Higher Order And Isoparametric Elements:** Lagrangian interpolation, Higher order one dimensional elements- quadratic, Cubic element and their shape functions, properties of shape functions, Truss element, Shape functions of 2D quadratic triangular element in natural coordinates, 2D quadrilateral element shape functions – linear, quadratic, Biquadric rectangular element (Noded quadrilateral element), Shape function of beam element.	08H	Descriptive and Analytical

	Hermit shape functions of beam element.		
5.	**Derivation Of Element Stiffness Matrices And Load Vectors:** Direct method for bar element under axial loading, trusses, beam element with concentrated and distributed loads, matrices, Jacobian, Jacobian of 2D triangular element, quadrilateral, Consistent load vector, Numerical integration.	08H	Descriptive and Analytical
6.	**Heat Transfer Problems:** Steady state heat transfer, 1D heat conduction governing equation, boundary conditions, One dimensional element, Functional approach for heat conduction, Galerkin approach for heat conduction, heat flux boundary condition, 1D heat transfer in thin fins.	08H	Descriptive and Analytical
7.	**Applications I:** Solution of bars, stepped bars, plane trusses by direct stiffness method. Solution for displacements, reactions and stresses by using elimination approach, penalty approach.	07 H.	Descriptive
8.	**Applications II:** Solution of beam problems, heat transfer 1D problems with conduction and convection. Introduction to software used in FEA(like ANSYS, NASTRAN)	06 H	Descriptive

SECTION- A Unit 1, 2, 3, 4
SECTION- B Unit 5, 6, 7, 8

B: PRACTICAL/ DRAWINGS / DESIGN:

- Two case studies (Heat transfer and design problem)using FEA software
- Stress analysis of a rectangular plate with a circular hole
- Assignments on unit 1,2,3,4,5

The assessment of term work shall be on the following criteria:

- Continuous Assessment
- Work in the practical

C. SUGGESTED TEXT BOOKS AND REFERENCES:

Sr. No.	Title	Author	Publication	Edition
1	Introduction to finite element in engineering	Chandrupatla and Belegundu	Prentice Hall of India	third
2	Concept and Application of Finite element analysis	R.D. Cook	John wiley	
3	Finite element procedures in engineering analysis	Bathe	Prentice Hall of India	
4.	A first course in the finite element method	Daryl L. logan	Thomson	third
4	Fundamentals of Finite element method	Hutton	Tata McGraw Hill	2004

5	Finite element analysis	George R. Buchanan	Schaum	
6.	Finite element analysis	C.S.Krishnamurthy	Tata McGraw Hill	1995
7.	Finite element method in engineering	S.S.Rao	Elsevier	fourth

D. DIGITAL REFERENCES

Sr. No.	**Website / Links / e-journals**
1.	**Wikipedia/**
2.	**www.ansys.com**
3.	**www.mscsoftware.com/**

PATTERN OF QUESTION PAPER

Faculty of Engineering and Technology

Final year (B. Tech) Mechanical / Production Engineering (Revised Course) Examination

November / December, May/June 200_

(Finite Element Analysis) Elective –III

Time: 3 Hrs **Max Marks: 80**

'Please check whether you have got the right question paper'

N.B:-

- All the questions are compulsory
- Use separate answer book for each section
- ……
- ……

SECTION A

Question no 1 **16 marks**

This question will consists of questions from all the chapters under section A mentioned in the syllabus.

This will consists of objective type, multiple choice type, short questions, concept oriented problems.

Question no 2 **12 marks**

OR

Question no 2

Question no 3 **12 marks**

OR

Question no 3

Note: 1. The questions will be memory based, application based and understanding type.
2. There should be intermixing in the questions.

SECTION B

Question no 4 **16 marks**

This question will consist of questions from all the chapters under section B mentioned in the syllabus.

This will consists of objective type, multiple choice type, short questions, concept oriented problems.

Question no 5 **12 marks**

OR

Question no 5

Question no 6 **12 marks**

OR

Question no 6

Note: 1. The questions will be memory based, application based and understanding type.
2. There should be intermixing in the questions.

Final Year B. Tech Mechanical Engineering (Revised syllabus)

ELECTIVE –III (AUTOMOBILE ENGINEERING)

STRUCTURE:

Periods			Evaluation Scheme					Credits
			Sessional Exam			ESE	Total	
L	T	P	TA	PR	CT			
4	--	2	25	--	25	80	130	5

Duration of End Semester Theory Examination – 3 Hours

OBJECTIVE:

- Students are expected to understand construction & working of each component of Automobile vehicle to meet the modern requirements.

A: THEORY:

Unit	Contents	Duration	Nature
1.	**Introduction:** Classification of Automobiles based on various factors, Layout of Two, three & four wheel automobile with major components, Functions of each components, General layout of all categories of vehicles, chassis , Frame section.	**05 H**	**Descriptive**
2.	**Power Plant:** Types of engines used in automobiles, introduction of high speed engine, concept of Green vehicle, use of CNG,LPG,Bio-Diesel,solar power etc.	**05H**	**Descriptive**
3.	**Transmission Systems.** **i) Clutches:** Different types of Clutches & their applications in automobile, electromagnetic Clutch, Dual Clutch Transmission etc. **ii)Gear box:** Constant mesh gear boxes ,synchromesh gear boxes, comparison of them & application ,torque converters ,automatic transmission system, Continuously variable transmission. **iii) Propeller Shafts:** Propeller shafts used in vehicles, types of universal joint, ship joint etc. **iv) Differential:** Need, Construction & working, limited slip differential its benefits and types. **v) Final drive:** Wheel assembly, tyre's , tubeless tyres, Axle and its types arrangement for live and dead axle.	**13H**	**Descriptive**
4.	**Suspension System:** Features, rigid axle suspension, Independent suspension, Armored fighting vehicle suspension, necessity types, Air suspension, hydraulic suspension system, Types of Suspension system, types of suspension spring ,shock absorber.	**08 H**	**Descriptive**
5.	**Brake system of automobiles:** Type of brakes used in automobile & study of each of them, Air brakes, regenerative brake, Antilock Braking system, brake efficiency, stopping distance.	**08 H.**	**Descriptive**
6	**Steering Systems:** Steering geometry:-Camber-Castor, King Pin inclination, toe in , toe out etc. effects of each of them and	**09 H.**	**Descriptive**

	requirements ,types of steering gears& links used in automobile, power steering types, construction & working ,electronic power steering ,steer by wire system.		
8	**Cooling System and Lubrication system.** Cooling Requirements, Air Cooling, Liquid Cooling, Thermo, water and Forced Circulation System – Radiators – Types – Cooling Fan - water pump, thermostat, Evaporating cooling – pressure sealed cooling – antifreeze solutions. Lubrication system- Types, necessity, lubrication system used in vehicle.	**12 H**	**Descriptive**

Section A: 1,2,3,4
Section B: 5,6,7,8

B: PRACTICAL

Term work shall Consists of record book on laboratory experiments studies on the following

1.	Study of automobile components/system
2.	Study of various automobile layout
3.	Study and demonstrations of automobile engine
4.	Study and demonstrations of fuel supply system of petrol/Diesel engine
5	Study and demonstrations of clutches of 2w & 4w
6	Study and demonstrations of different types of Gear box
7	Study and demonstrations of Differential and propeller shaft
8	Study and demonstrations of Final drives.
9	Study and demonstrations of suspension system.
10	Study and demonstrations of Automobile braking system system(Mech/Hyd/Pneumatic) Any one
11	Study and demonstrations of steering mechanism
12	Study and demonstrations of electrical and safety system.
13	Study and demonstrations of lubrication and cooling system

TERM WORK

The assessment of term work shall be on the following criteria

- Continuous Assessment.
- Performing the experiments in the laboratory.
- Oral examination conducted (internally) on the syllabus and term work mentioned above.

C: SUGGESTED TEXT BOOKS AND REFERENCES:

Sr. No.	**Title**	**Author**	**Publication**
1.	Automobile Engineering vol. I & II	Kripal singh	
2.	Automobile Engineering vol. I ,II&III	K.M. Gupta	Umesh publication
4.	Automobile Engineering	R.B. Gupta	

5.	Automobile Engineering	K. K. Jain & R.B. Asthana	Tata mc-Graw Hill Publication
6	Automobile Engineering theory & Practice	K.K.Ramalingam	Scitech publication
7	Automotive mechanics	Wiliam h crouse Donald l angling(Tenth Edition)	

D. DIGITAL REFERENCES

Sr. No.	**Website / Links / e-journals**
1	sciencedirect.com
2	efunda.com
3	howstuffworks.com
4	howthingsworks.com

PATTERN OF QUESTION PAPER

Faculty of Engineering and Technology

Final year (BTech) Mechanical Engineering (Revised Course) Examination

November / December, May/June 200_

Elective –III (Automobile Engineering)

Time: 3 Hrs **Max Marks: 80**

'Please check whether you have got the right question paper'

N.B:-

- All the questions are compulsory
- Use separate answer book for each section
- ……
- ……

SECTION A

Question no 1 **16 marks**

This question will consists of questions from all the chapters under section A mentioned in the syllabus.

This will consists of objective type, multiple choice type, short questions, concept oriented problems.

Question no 2 **12 marks**

OR

Question no 2

Question no 3 **12 marks**

OR

Question no 3

Note: 1. The questions will be memory based, application based and understanding type.
2. There should be intermixing in the questions.

SECTION B

Question no 4 **16 marks**

This question will consist of questions from all the chapters under section B mentioned in the syllabus.

This will consists of objective type, multiple choice type, short questions, concept oriented problems.

Question no 5 **12 marks**

OR

Question no 5

Question no 6 **12 marks**

OR

Question no 6

Note: 1. The questions will be memory based, application based and understanding type.
2. There should be intermixing in the questions.

Final Year B. Tech Mechanical Engineering (Revised syllabus)

ELECTIVE-III (PROJECT MANAGEMENT AND OPERATION RESEARCH)

STRUCTURE:

Periods			Evaluation Scheme					Credits
			Sessional Exam			ESE	Total	
L	T	P	TA	PR	CT			
4	--	2	25	--	25	80	130	5

Duration of End Semester Theory Examination – 3 Hours

OBJECTIVES:

- The objective of OR is to provide a scientific basis to the managers of an organization for solving problems involving interaction of the components of the system ,by employing a systems approach by a team of scientists drawn from different discipline, for finding a solution which is best interest of the organization
- To apply different OR techniques in solving Transportation, Assignment, Sequencing problems
- To understand use of PERT /CPM
- To understand concept of Advanced Linear programming.

A: THEORY:

Unit	Contents	Duration	Nature
1.	**Introduction:** Origin of OR and its role in solving industrial problems. General approach for solving OR problems. Classification of mathematical models, various decision making environments	03 H	Conceptual
2	**Linear Programming:** Assumption of LPP, Formulation of LP problem, Two variable Graphical methods, Types of solutions. Simplex algorithm (maximization and minimization), Big M method and two phase method, Degeneracy in simplex method. Duality in LP. Introduction to sensitivity analysis.	14 H	Descriptive and Analytical
3.	**Transportation model:** Assumption in the transportation model. Initial Basic Feasible solution and optimal solution. Variants in transportation problems(degeneracy, unbalanced problems)	07 H	Descriptive and Analytical
4.	**Assignment model:** Definition of Assignment model. Hungarian method for solution of the Assignment Problems. Variations of the Assignment problem(non-square and maximization).Travelling Salesman problem(Application in crew Assignment)	06H	Descriptive and Analytical
5.	**Game Theory:** Characteristics of Games, Game models, Definitions, Rules for Game theory, Mixed strategies(2X2 Game)	06H	Descriptive and Analytical
6.	**Queuing Model:** Queuing systems and structures, Notation, single server and multi server models, Poisson input-exponential service, constant rate service, infinite population.	06 H.	Descriptive and Analytical

7.	**Sequencing Model**: Assumptions in Sequencing Problem. Processing n jobs through one. two, three and m machines Processing of two jobs through m machines using graphical method	06 H	Descriptive and Analytical
8.	**Network Analysis:** Role of Network Techniques in Project Management, Numbering the events (Fulkerson's Rule).Probability calculation and Float calculation, Critical path method, crashing cost and crashing Network.	08 H	Descriptive and Analytical
9	**Advanced Linear Programming:** Introduction to dynamic programming .Application in practical use	04 H	Conceptual

SECTION -A Unit 1, 2, 3, 4

SECTION- B Unit 5,6,7,8,9

B: PRACTICAL/ DRAWINGS / DESIGN:

- Two case studies using OR technique
- Assignments on unit 2,3,4,5,6,7

The assessment of term work shall be on the following criteria:

- Continuous Assessment
- Work in the practical

C: SUGGESTED TEXT BOOKS AND REFERENCES:

Sr. No.	Title	Author	Publication	Edition
1	Operation Research	Prem Kumar Gupta,D.S.Hira	S.Chand	Fourth
2	Operation Research	J.K.Sharma,	Mcmillan	
3	Operation Research	H.A.Taha	Prentice Hall of India	Sixth
4	Operation Research	Hillier and Lieberman	Holden Day	1986
5	Operation Research for Management	Shennoy,Srivastava	Wiley Eastern	1994

D. DIGITAL REFERENCES

Sr. No.	Website / Links / e-journals
1.	Wikipedia/

PATTERN OF QUESTION PAPER

Faculty of Engineering and Technology

Final year (B. Tech) Mechanical / Production Engineering (Revised Course) Examination

November / December, May/June 200_

Elective –III (Project Management and Operation Research)

Time: 3 Hrs **Max Marks: 80**

'Please check whether you have got the right question paper'

N.B:-

- All the questions are compulsory
- Use separate answer book for each section
- ……
- ……

SECTION A

Question no 1 **16 marks**

This question will consists of questions from all the chapters under section A mentioned in the syllabus.

This will consists of objective type, multiple choice type, short questions, concept oriented problems.

Question no 2 **12 marks**

OR

Question no 2

Question no 3 **12 marks**

OR

Question no 3

Note: 1. The questions will be memory based, application based and understanding type.

2. There should be intermixing in the questions.

SECTION B

Question no 4 **16 marks**

This question will consist of questions from all the chapters under section B mentioned in the syllabus.

This will consists of objective type, multiple choice type, short questions, concept oriented problems.

Question no 5 **12 marks**

OR

Question no 5

Question no 6 **12 marks**

OR

Question no 6

Note: 1. The questions will be memory based, application based and understanding type.

2. There should be intermixing in the questions.

Final Year B. Tech Mechanical Engineering (Revised syllabus)

PROJECT

Periods				Evaluation Scheme					Credit
				Sessional Exam		ESE		Total	
L	T	P	Total	TA	CT	TH	PR		
-----	-----	04	04	50	-----	-----	100	150	2

OBJECTIVE:

The practical implementation of theoretical knowledge gained during your study to till date is important for Engineering Education. The student should be able implement their ideas/real time industrial problem/ current application of their engineering branch which they have studied in curriculum. This will definitely help in building the confidence in the student what he has learnt theoretically. The dependent study of the state of the art topics in a broad area of his/her specialization.

GUIDELINES FOR STUDENTS AND FACULTY:

1. Students have to finalize their project title based on Industrial Assignments.
2. The projects selected should be such so as to ensure the satisfaction of the urgent need to establish a direct link between education, national development and productivity and thus reduce the gap between the world of work and the world of study. The term work will consist of a report prepared by the student on the project allotted to them.
3. Project topics may be chosen by the student or group of students (maximum 3 students) with advice from the faculty members.
4. To design a project at adequate scale level for the following applications- It may be based (i) Entirely on study and analysis of a typical Instrumentation and Control System, (ii) Experimental verification, or (iii) Design, fabrication, testing and calibration of an Instrumentation system. The software based project can be considered based on its application for instrumentation and control purpose. The students are required to submit the report based on project work done.
5. Use appropriate tools for the preparation of the report.
6. Each student/group is required to-
    a. Submit a one page synopsis before the project talk for display on the notice board in the first week of their academic semester.
    b. Give a 10 minutes presentation through OHP, PC, and Slide projector followed by a 10 minute discussion in the second week of their academic semester.
    c. Submit a report on the project topic with a list of required hardware, software or other equipment for executing the project in the third week of their academic semester.
    d. Start working on the project and submit initial development and CPM/PERT planning drawing in the fourth week of their academic semester.
    e. Preparation of PCB layout, wiring diagram, purchase of components, software demo, flowchart, algorithm, program/code, assembling, testing, etc. should be submitted by student/s within next five/Six weeks and minimum one page report should be there for each major activity.
    f. Overall assembling, wiring, code writing, testing, commissioning, should completed within next two weeks.

g. At the last but one week of end of academic semester the internal assessment of project will be done by panel of internal faculties and they will decide marks out 25 marks for term work (TA).
h. In the last week, student/group will submit final project report to guide and thereafter guide will finalize marks out of the remaining 25 marks for term work (TA).

7. Projects are to be scheduled in the weekly scheduled time-table during the semester and any change in schedule should be discouraged.
8. Every assigned faculty/s should maintain separate file for evaluating progress of each student or group.
9. Award 50 TA, Sessional marks based on the assessment done by internal guide and panel during semester and the involvement of student/group in the work assigned related to the topic and its application.

10. The format and other guidelines for the purpose of the Project Submission in hard bound copies should be as follows,

REPORT STRUCTURE

Index/Contents/Intent
List of Abbreviations
List of Figures
List of Graphs
List of Tables
and List of if any other inclusion
1. Introduction
2. Literature survey
3. System development
4. Performance analysis
5. Conclusions
References
Appendices
Acknowledgement

1. INTRODUCTION
1.1 Introduction
1.2 Necessity
1.3 Objectives
1.4 Theme
1.5 Organization
2. LITERATURE SURVEY
Literature Survey
Related information available in standard Books, Journals, Transactions, Internet Websites *etc.* till date (More emphasis on last three to five years)
3. SYSTEM DEVELOPMENT
Model Development

- Analytical
- Computational
- Experimental

- Mathematical
- Statistical

(out of above methods at least one method is to be used for the model development) Some mathematical treatment or related information is required to be embodied

4. PERFORMANCE ANALYSIS

- Analysis of system developed either by at least two methods depending upon depth of standard
- These methods normally used are Analytical /Computational/Statistical/Experimental/ or Mathematical
- Results at various stages may be compared with various inputs
- Output at various stages with same waveforms or signals or related information/parameters
- Comparison of above results by at least two methods and justification for the differences or error in with theory or earlier published results

5. CONCLUSIONS

5.1 Conclusions

5.2 Future Scope

5.3 Applications

Contributions (if any,)

The innovative work/invention/new ideas generated from the analysis of the work which can be taken from the conclusions

REFERENCES

- Author, "Title", Name of Journal/Transactions/ Book, Edition/Volume, Publisher, Year of Publication, page to page (pp.__).

These references must be reflected in text at appropriate places in square bracket

In case of web pages complete web page address with assessing date has to be enlisted

List of references should be as per use in the text of the report

APPENDICES

Related data or specifications or referred charts, details computer code/program, *etc*.

(1 Page)

Expression of gratitude and thankfulness for helping in completion of the said task with name

Signed by the candidate

- General Guidelines
  Text should be printed on front and correct side of the watermark on quality bond paper
  Paper size- A4, 75 to 85 gsm paper
  Left Margin-1.5"
  Right Margin-3/4"
  Top Margin-1"
  Bottom Margin-1"
- First page of first chapter need not be printed anywhere ,second page onwards at right hand corner at ½ inch from right and top side from second chapter onwards starting page number of chapter should be printed at bottom center place report total pages –around.
  All Greek words must be italic

Report Heading -All Capital—16 Font
Chapter heading -All Capital—14 Font
Subchapter –title case-12 Font
Sub-Subchapter –First Alphabet Capital case-12 Font
Page numbers for Index/Contents/Intent should be in roman
Title of the Report should not be more than two lines
Text pages should be in times new roman
The page of the Index/Contents/Intent heading should be below the words for appropriate sub chapter or sub-sub chapter as shown in sample copy
Cover page should have (Mission statement of Institute) in inverted commas, Symbol of Institute, Name of Department, and Institute

Suitable flap with name of the candidate, Department and Institute name and symbol can be used with nylon strip.

For more information and sample of hard copy please contact the respective Head of the Department

Semester VIII

IN PLANT TRAINING

(a)	**Rationale:** The techniques and processes of production of goods and services do not demand only technical skills, but also a cluster or conglomerate of skills. A significant part of which is related to the total humanistic growth of the man. Such conglomerate skills technical and humanistic can not obviously be acquired through pure academic learning of concepts in formalized and institutional courses and in isolation of the actual work situation. It, therefore, naturally follows that no technical education will be complete till it has two components, one learning of concepts vis-a vis acquiring conceptual skill and other application of the concepts in real work situation vis-a vis acquiring manipulative or practicing skills. Technical education needs to have a complement of learning of the techniques of applying the concepts within the industry and business.
(b)	**Objective:** 1) The students of B.Tech course shall get an opportunity to work on live problems of the industry. 2) He/She shall apply his leaving concepts in the real work situation. 3) He/She shall get an exposure to the industrial environment and thereby enable himself/herself to appreciate the other related aspects of industry vis, human, economic, commercial and regulatory. 4) He/She shall identify career paths taking into account their individual strengths and aptitude. 5) He/She shall contribute for the achievement of economic goals and aspirations of the industry and our country as a whole.
	The curriculum for B.Tech students of final Year Course of Part-II shall consist of; 1) In plant training for a period of one full term, and the period of the term shall be as prescribed by the university from time to time. 2) A project on live problems of the industry shall be undertaken by the student/group of students undergoing atraining in the same establishment. 3) The term work shall consist of the in plant training record-daily diary, work diary, progress report, a record containing the literature survey in the field of appropriate branch of Engineering, a preliminary report related to project work etc. 4) Seminars will be arranged after successful completion of period specified in the scheme of semester VIII of B.Tech. The date and times will be decided according to the convenience of guide and student.
	General Provisions, Rules And Regulation Of In-Plant Training **1. Definition** • In-plant training means a course of training in any industry or establishment undergone in pursuance of memorandum of understanding between industry and institute and under the prescribed terms and conditions of Dr. Babasaheb Ambedkar Marathwada University, Aurangabad. • Institution means an academic Institution of higher learning associated and admitted under the privileges of university, I.e. Maharashtra Institute of Technology, affiliated to Dr. Babasaheb Ambedkar Marathwada University, Aurangabad. • Industry means any industry or business in which any trade, occupation or subject field in engineering or technology may be specified as a designated trade. • Establishment includes any place where any industry is carried on. • University means any of the universities mentioned in the schedule of Maharashtra University Act, 1994 i.e. Dr. Babasaheb Ambedkar Marathwada University, Aurangabad. • Collaboration means collaborative academic activity of the Institute with industry. • Student means a B Tech Course student.

	2. Memorandum of understanding: Maharashtra Institute of Technology, Aurangabad will enter into an agreement with the industry through 'Memorandum of Understanding' for creating facilities of in-plant training in the appropriate branch of Engineering according to the Course Curriculum and keep this agreement for a period of 10 years to foster a healthy industry- institute interaction for mutual benefits of both.
	3. Admission to in-plant training: No student will be deputed for in-plant training unless he produces testimonial of having kept one term for the subject under B Tech Semester –VIII of final year course satisfactorily in Maharashtra Institute of Technology after passing the TY B Tech Examination (in the appropriate branch).
	4. Period of in-plant training: The period of in-plant training will be the period of one term for the subject under B Tech course semester-VIII, which will be notified by Dr. Babasaheb Ambedkar Marathwada University, Aurangabad.
	5. Contract of In-plant Training : • The student of Maharashtra Institute of Technology shall enter into a contract of in-plant training with the employing industry. • The in-plant training shall be deemed to have commenced on the date, on which the contract of in-plant training has been entered into. • Every contract of in-plant training will contain the Terms and Conditions to be agreed by both the parties. • Every contract of in-plant training shall be registered with the Maharashtra Institute of Technology within 15 days from entering into the contract.
	6. Violation of contract: Where an employer, with whom a contract for in-plant training has been entered into, is for any reason, unable to fulfill his obligation under the contract, the contract end with the consent of Maharashtra Institute of Technology. It is agreed between the employer, the student and any other employer that the student shall be engaged as an "in-plant trainee" under the other employer till the expiry period of the in-plant training. The agreement on registration with Maharashtra Institute of Technology shall be deemed to be the contract of in-plant training between the student and other employer, and from the date of such registration, the contract of in-plant training with the first employer shall terminate and no obligation under that contract shall be enforceable at the instance of any party to contract against the other party thereto.
	7. Termination of Contract: The contract of in-plant training shall terminate on the expiry of the period of in-plant training. Either party to the contract of in-plant training make an application to Maharashtra Institute of Technology, Aurangabad for the termination of the contract. After considering the content of the application, and objection, Maharashtra Institute of Technology by order in writing, will terminate the contract, if it is satisfied that the parties to the contract have/has failed to carry out the Terms and Conditions of the contract. Provided that where a contract is terminated-

	• For the failure on the part of the Employer, Maharashtra Institute of Technology will depute students to another Employer for providing facilities of in-plant training to the remaining period of training. • For the failure on the part of the student, the student will not be allowed to continue his/her in-plant training in that term. The student shall be deputed for in-plant training in the next coming term.
	8. Expectation from the Employer/Industry: The following expectations are derived for effective in-plant training. • To provide legitimate facilities for the training and learning of all the processes. • To guide the student for understanding a project of immense importance to industry and to help him/her for his/her career advancement.
	9. Obligation of Students: • To learn his/her subject field in Engineering or Technology conscientiously and diligently at his place of training. • To carry out all orders of his Employer and the Superior in the establishment. • To abide by the Rules and Regulations of the Industry/Establishment in all matters of conduct and discipline. • To carry out the obligation under the contract of in-plant training. • The student shall maintain a report of his work during the period of his in-plant training in a proforma Annexure. • Except in case of extreme urgency, the B.Tech student shall submit an application for all other leaves except the medical leave to the Manager/Gen. Manager (Personnel) of the concerned industry, where he is undergoing an in-plant training and obtain sanction before the leave is taken. In case of Medical Leave, he shall submit an application to Maharashtra Institute of Technology, Aurangabad. The shortage in attendance will be subjected to extending the period of in-plant training in which case, the student may not be allowed to appear for the test, project seminar and assessment of term work etc. which will be held immediately after successful completion of the in-plant training.
	10. Maintenance of Record: Every student of B.Tech course shall maintain a daily record of the work done by him/her relating to the in-plant training in the proforma (Annexure).
	11. Industry Sponsored Student Projects: The scheme envisages working out suitable programme for B.Tech students. They are required to complete their in-plant training in a given period. During this period, they shall be familiar with the understanding of the shop process and activities. The students can be asked to solve the mini-shop problem, which will make them think and try out short experiments as an improvement in the process, tools and equipment. The student here is not expected to acquire the skills in operating machines values. He should appreciate the application of theory learnt. The students in a group alone can undertake a project of immense importance for the benefit of the industry and also useful for the students for their advancementof career. Industry staff and Maharashtra Institute of Technology facultycan plan in advance to effectively complete the practical training with the project for preliminary studies on the floor. The projects should aim mainly- • Cost reduction • Reducing cycle time • Enhancing productivity

	• Energy conservation measures • Process Improvement technique • Inventory control • Quality control Technique • Improvement in Material handling system • Bottlenecks in material flow system and so on.
	12. What will form a good project? Through the project, it is hoped to provide the students an exciting experience in solving line problems under practical constraints. Hence it is desired that the project should be a well defined problem, which can be completed and implemented within the project period. It may be a problem, evolving analysis, design, fabrication and/or testing.
	13. Time Schedule for the Project: The following time schedule should be planned by each student or groups of students, who undertake the project. • Proposal to be received before specifies date. • Project acceptance before. • Commencement of the project. • Completion of the project.
	14. Commitment on the part of the Institute: • Providing a faculty member to supervise the project. • Providing the Institute facilities to complete the project. • Coordinator from industry will be invited to participate in the stage wise assessment of the students performance.
	15. Assistance for completion of the Project: All the projects undertaken by the students are time bound. Although, every attempt results may not be achieved within the period available for the student. In such cases, the services of the associated faculty members can be sought for the completion of the same on mutually agreed terms.
	16. Monitoring of In-Plant Training: The B.Tech students are expected to follow all the rules and discipline of the industry. However, because of other academic requirements and the nature of the project, the student may have to work in other places outside the industry. The faculty and Industry supervisor will work out a suitable arrangement to review the progress of the work from time to time. Maharashtra Institute of Technology, Aurangabad will monitor the progress of in-plant training in association with industry authority.
	17. Conduct and Discipline: In all matters of the conduct and discipline, B.Tech student shall be governed by the rules and regulations (applicable to employees of the corresponding category) in the Establishment, where he/she is undergoing a training.
	18. B.Tech Students are Trainees and not Workers: • Every B.Tech student undergoing an in-plant training in the respective branch of Engineering & Technology in any Establishment shall be treated as a trainee and not a worker and- • The provision of any law with respect to labour will not apply to such a trainee.

	19. Settlement of Disputes: Any disagreement or dispute between an industry and a B.Tech student trainee arising out of the contract of in-plant training shall be resolved both by Maharashtra Institute of Technology and the industry with mutual cooperation. The decision of both Maharashtra Institute of Technology and the industry shall be final.
	20. Holding of Test and Grant of Certificate: The progress in in-plant training of every student shall be assessed by the industry and Maharashtra Institute of Technology faculty from time to time. Every B.Tech student undergoing an in-plant training shall be issued a certificate of Proficiency on completion of his training to the satisfaction of the industry.
	21. Offer of Stipend / Other Welfare Activities and Employment: It shall not be obligatory on the part of the Employer / Industry to offer any stipend and other welfare amenities available, if any, to the students of B.Tech courses undergoing an in-plant training. However, if the industry desirous to do so, at will be a privilege for the students and also for Maharashtra Institute of Technology in view of the bonding of better understanding and cooperation forever.
	PRACTICAL EXAMINATION The Practical examination will be conducted after successful completion of the in-plant training for which guide will be internal examiner and external examiner will be appointed by the university. The date of practical examination will be same for the students of a branch and will be notified by the university. The assessment of the practical examination shall consist of 1. Seminar Performance 2. An oral on the project work done. 3. Assessment of the term work. **Note:** A 'Guide Note' on In-Plant training approved by the University is prepared and made available in each faculty of B.Tech course.

Revised Syllabus Structure for Final Year B.Tech (Mechanical Engineering)

Part -I

Sr. No.	Course Code.	Subjects	Periods			Evaluation Scheme			
			L	T	P	TA	PR	CT	ESE
1		Refrigeration and Air Conditioning	4	--	2	25	50	25	80
2		Heat Transfer	4	--	2	25	50	25	80
3		Automatic Control System	4	--	2	25	50	25	80
4		Tool Design	4	--	2	25	50	25	80
5		EL-III	4	--	2	25		25	80
6		Project			4	50	100		
			20	**--**	**14**	**175**	**300**	**125**	**400**

Part - II

1	Inplant Training and Project Seminar (After completion of training of @ 8 weeks)	75	75		
2	Inplant Training and Project Seminar (After completion of training of @ 14 weeks)	75	75		
3	Inplant Training and Project Seminar (After completion of training of @ 20 weeks)	100	200		
	Total of Semester VIII	250	350		
	Grand Total of VII & VIII	**425**	**650**		

Periods

L : Lecture Hours per week

T : Tutorial Hours per week

P : Practical Hours per week

Evaluation Scheme

TA : Teachers Assessment

CT : Class Test

PR: Practical Exam

TOT : Total for Sessional exam of evaluation scheme

ESE : End Semester Examination

Class Test Duration :

Elective-III

1)Finite Element Analysis

2)Automobile Engineering

3)Project Management and Operation Research

Grand Total	Credits
180	5
180	5
180	5
180	5
130	5
150	2
1000	**27**

150	
150	
300	
600	
1600	

I Hour