राष्ट्रीय प्रौद्योगिकी संस्थान रायपुर
National Institute of Technology Raipur
(Institute of National Importance)
G. E Road, Raipur-492010., (C.G.)

Phone: (0771) 2254200
Fax : (0771) 2254600
Website : www.nitrr.ac.in

Basic Structure of the 4 years B. Tech. Mechanical Engineering Program

Courses For Semester-VIII (Year 4)`

National Institute of Technology Raipur (C.G.)												
Course of Study and Scheme of Examination				B. Tech. **VIII Semester**								
S.No.	Board of Studies	Sub.Code	Subject Name	Periods/week			Examination Scheme					Total Marks	Credits L+(T+P)/2
				L	T	P	TA	FE	SE	T.C.A.	ESE		
1	Mech.Engg	ME 0801	Computer Aided Design & Manufacturing	3	1		20	15	15	50	70	120	4
2	Mech.Engg	ME 0802	Machine Design - II	3	1		20	15	15	50	70	120	4
3	Mech.Engg	ME 0803	Production Management	3	1		20	15	15	50	70	120	4
4	Mech.Engg	ME 0804	Elective-III	4	1		20	15	15	50	70	120	5
5	Mech.Engg	ME 0805	CAD & CAM lab			3	30			30	20	50	2
6	Mech.Engg	ME 0806	Machine Design Lab			3	30			30	20	50	2
7			Major Project			16	100			100	100	200	8
8			Discipline				50			50		50	1
			Total	**13**	**4**	**22**	**290**	**60**	**60**	**410**	**420**	**830**	**30**

* **TA- Teachers Assessment, FE- First Exam, SE- Second Exam, T. C. A- Total Continuous Assessment**

Note: For attendance of a student in every theory and practical class, the teachers are supposed to keep records ultimately in the following format which will be included in the semester mark-sheets.

Format for attendance			
Attendance			Category
>85	→	'G"	Good
>70 &<85	→	'F"	Fair
>60 &<70	→	'S"	Satisfactory
<60 & >45	→	'P"	Poor
<45	→	'V"	Very Poor

राष्ट्रीय प्रौद्योगिकी संस्थान रायपुर
National Institute of Technology Raipur
(Institute of National Importance)
G. E Road, Raipur-492010., (C.G.)

Phone: (0771) 2254200
Fax : (0771) 2254600
Website : www.nitrr.ac.in

DEPARTMENT OF MECHANICAL ENGINEERING
COURSE OUTLINE

Subject: Computer Aided Design and Manufacturing

Subject Code	**ME 0801**		
Semester	VIII	Board of Studies	Mechanical Engg.
Maximum Marks	**70**	Minimum Marks	**25**
Type of course	Compulsory	Contact Hours	44
L+T+P	3+1+0	Credits	4
Prerequisite	Computer Graphics		

COURSE OUTCOME-
Upon completing the course, the student will be able to:

1. Perceive the concepts of CAD/CAM as well as be able to model analytic and synthetic curves, surfaces and solid models.
2. Compile the NC system and various part programming techniques.
3. Demonstrate group technology and data base management system.
4. Acquire the concepts of design and synthesis of planer mechanisms using computer based applications

SYLLABUS

UNIT-I
Introduction: Introduction of CAD/CAM, Definition of CAD & CAM Tools, CAD/CAM Tools based on their constituents and their implementation in a design environment, Benefits of CAD/CAM. 2D & 3D Transformations, Perspective and Parallel Projection, Hidden surface Removal.
Geometric Modelling of Curves: Parametric and Non parametric, Explicit and Implicit, Representation of curves. **Analytical Curve**: Line, Circle, Conics. **Synthetic curve**: Hermite Cubic Splines, Bezier Curves, B- Spline Curves.

UNIT –II
Representation of Surface: Parametric Representation of surfaces, Equation of surface, Tangent vector, Normal vector, Twist vector, Parametric patches and surfaces, Analytical surfaces: Ruled surface, surface of revolution, Tabulated cylinder. Synthetic surface: Hermit bi-cubic surface, Bezier bi-cubic surface, B-spline bi- cubic surface, Coon's surface.
Solid Modeling: Solid modeling techniques, Geometric and Topology, Valid solid, Types of solid modeling, Algorithms, Basic set theory, Solid Representation Schemes. CSG representation, 3D base primitives, Unary Operation, Boolean's Operation, Sweeping Operation and CSG tree.

UNIT-III
Numerical Control: Introduction to numerical control, Basic component of an NC System, The NC Procedure, NC coordinate systems, NC motion control system, Application of

NC, Introduction to Computer Control in
NC, Problem with Conventional NC, Computer Numerical control, Direct Numerical control, Combined DNC/CNC System, Adaptive control system. NC Part Programming, Introduction to NC Part programming,
Manual Part Programming, Computer assisted part programming APT language, G&M codes and examples, Introduction to Rapid Prototyping.

UNIT IV

Group Technology: Introduction to group technology, Part families, Part and classification, Three Parts
Classification & Codes system, Group technology Machine cell design, Benefits and Limitation of Group technology.
Data base Management: Design Database concept, Objective, Data structures, Creation of Data Files in application Program and relational Database management system.

UNIT-V

Computer Aided Design of Planer Mechanism: Kinematic synthesis, Type, Number, **Dimension Synthesis:** Function generation, Path generation, Motion generation, Approximate synthesis and Tchebyshev's spacing of accuracy points, Freudenstein's equation for four bar link mechanism and slider crank mechanism by displacement method and vector method; Angular velocities and acceleration, coupler curves.

Text book:

1. CAD/CAM Theory and Practice-Ibrahim Zeid-Tata McGraw Hill Publications
2. CAD/CAM-Milkell P. Groover, Emory W. Zimmer-Pearson Education
3. Theory of mechanism and Machine-Ghosh and Malik-EWP

Reference Books:

1. Computer numeric control- T. Jeyapoovan, Robert Quesada-Pearson Education
2. Kinematic Synthesis of linkages-Richard S Hartenberg, Jacques Denavit-McGraw Hill
3. CAM/CAD principle & Applications-P. N. Rao- Tata McGraw Hill Publications.

राष्ट्रीय प्रौद्योगिकी संस्थान रायपुर
National Institute of Technology Raipur
(Institute of National Importance)
G. E Road, Raipur-492010., (C.G.)
Phone: (0771) 2254200
Fax : (0771) 2254600
Website : www.nitrr.ac.in

Subject: Machine Design-II

Subject Code	**ME 0802**		
Semester	VIII	Board of Studies	Mechanical Engg.
Maximum Marks	**70**	Minimum Marks	**25**
Type of course	Compulsory	Contact Hours	44
L+T+P	3+1+0	Credits	4
Prerequisite	Machine Design-I		

COURSE OUTCOME-

At the end of this course, students will be able to

1. Design springs under static and fluctuating loading conditions
2. Design brakes and clutches
3. Perform design and selection of transmission elements
4. Design and suggest selection of bearings.

SYLLABUS

UNIT-1

Spur gears: Introduction, Types of failure, design requirements, gear terminology, design analysis, stress concentration, dynamic load, surface compressive stress, beam strength, plastic deformation, gear materials, design procedure, design as recommended by AGMA. Gear Lubrication.

UNIT-2

Helical Gears: Terminology of Helical Gears, Virtual number of teeth, Tooth proportions, Force analysis, Beam strength, Effective Load on gear tooth, design procedure. **Bevel Gears:** Terminology of Bevel Gears, Force Analysis, Beam strength, effective load on gear tooth, design procedure, design as recommended by AGMA.

UNIT-3

Rolling Contact Bearings: Types of ball and roller bearing, Selection of bearing for radial and axial load,
Bearing life, design procedure, mounting and lubrication.
Plain or Journal Bearings: Types of lubrication, Viscosity, Hydrodynamic theory of lubrication, Somerfield number, Heat balance, design procedure. Self-contained bearings, bearing materials.

UNIT-4

Spring: Spring Materials and their Mechanical Properties, Equation for stress and deflection, Helical coil springs of circular section for tension, compression and torsion, Dynamic loading, Fatigue loading, Wahl line. Leaf spring and disc springs.

UNIT-5

Brakes: Introduction, Block Brake, design procedure, Internal Expanding Shoe Brake, design procedure, Band brakes, design procedure, Disc brake, design procedure.

राष्ट्रीय प्रौद्योगिकी संस्थान रायपुर
National Institute of Technology Raipur
(Institute of National Importance)
G. E Road, Raipur-492010., (C.G.)

Phone: (0771) 2254200
Fax : (0771) 2254600
Website : www.nitrr.ac.in

Clutches: Introduction, Friction materials, Torque transmitting capacity, Single & Multiple plate clutch, Centrifugal clutches, Cone clutch.

Text Books :-

1. Machine Design by T. V. Sunderarajamoorthy and N. Shanmugam – Anuradha Agencies.
2. Mechanical Engineering Design by J. E. Shigley – Mc Graw Hill Publication.
3. Machine Design by P. C. Sharma and D. K. Agrawal – Kataria & Sons Publications.

Reference Books :

1. Machine Desing An Inntegrarated Approach, Rodert L –Norton published by Addison Wesley Longman (Singapore)
2. Design of Machine elements by V. B. Bhandari, Tata McGraw Hill Publicatins.
3. Machine Design by Mobin – Mir Publishers.

राष्ट्रीय प्रौद्योगिकी संस्थान रायपुर
National Institute of Technology Raipur
(Institute of National Importance)
G. E Road, Raipur-492010., (C.G.)

Phone: (0771) 2254200
Fax : (0771) 2254600
Website : www.nitrr.ac.in

Subject: Production management

Name of the Subject	**Production Management**	Subject Code	ME 0803
Semester	VIII	Board of Studies	Mechanical Engg.
Maximum Marks	**70**	Minimum Marks	**25**
Type of course	Compulsory	Contact Hours	44
L+T+P	3+1+0	Credits	4
Prerequisite	NIL		

COURSE OUTCOME-

At the end of this course, the students are expected to be able to

1. Understand the objectives, scope, benefits of production management
2. Plan for product which either make within industry or buy from the outside.
3. Apply production management policies (like material management, procurement, store keeping etc.) for the service sector as well as manufacturing firms.
4. Use new strategies in production system like SCM, JIT, MRPI and MRPII etc.
5. Evaluate the decision related to fore casting, inventory, quality control problems etc. for the industries.

SYLLABUS

UNIT-I

Production Management: Definition, Objectives, Scope, Benefits, Functions of production management, Place of production management in an organization, Types of production system, Product life cycle, Product design and development, production cycle.

Costing and Cost Analysis: Elements of costs, Break even analysis, Incremental costs, make or buy decision.

Sales Forecasting: Purposes, Methods – Delphi, Linear regression, Economic indicators, Time-series analysis, Adjustment for seasonal variations, Moving average, Exponential smoothing.

UNIT-II

Material Management: Objectives and functions of materials management, Organization of materials management, MRP I and MRP II.

Procurement: Objectives of purchase department, Purchase responsibilities and organization, Types of purchasing, Purchase procedures, Import and Export.

Stores Keeping: Stores management, Functions of stores, Classification of materials, Standardization of materials, Identification and maintenance of layout of stores, Physical control of materials, Pricing of stores, Issuing of stores.

UNIT-III

Production Planning and Control: Functions, Organization, Master Scheduling, Aggregate planning and strategies, Materials requirement planning, Product structure tree, Routing, Loading, Scheduling – forward and backward, Dispatching – priority rules, Sequencing, Johnson's algorithm for n jobs and two machines, Gantt's chart, Bar chart, Flow process chart.

Phone: (0771) 2254200
Fax : (0771) 2254600
Website : www.nitrr.ac.in

Materials Handling: Principles of materials handling, Unit load, Types of materials handling equipment, Relation between materials handling and plant layout.

UNIT – IV

Inventory Control: Objective, Scope and functions of inventory control, Inventory control techniques, Economic ordering quantity, Periodic ordering quantity, A.B.C. analysis, General idea regarding inventory control under risk and uncertainty.

Supply Chain Management: Introduction, Definition of supply Chain, Major derivers of supply chain, Supply

Chain Strategies, A model for strategy formulation in SCM. Information Systems in supply chain.

UNIT – V

Quality Control : Difference between inspection and quality control, Acceptance sampling, Procedure's risk and Consumer's risk, Operating characteristic curve for single sampling plan, AOQL Quality of conformance, Quality of design, Economics of quality, SQC charts for variables and attributes.

Text Books:

1. Production and operation Management – By P. Ramamurty – New Age International Publication.
2. Industrial Engineering & Production Management – Martand Telsang – S. Chand & Co.,
3. Supply Chain Management – R. P. Mohanty & S G Deshmukh, SBiztantra Publications.

Reference Book:

1. Production and operation Management – By R. Mayer – Tata McGraw Hill publication.
2. Quality Planning and Analysis, Juran and Gryna
3. Production and operations Management by – Adam and Ebert – PHI –
4. Production planning and Control – By Samuel Eilon, Navneet Prakashan Ltd., Bombay.

राष्ट्रीय प्रौद्योगिकी संस्थान रायपुर
National Institute of Technology Raipur
(Institute of National Importance)
G. E Road, Raipur-492010., (C.G.)

Phone: (0771) 2254200
Fax : (0771) 2254600
Website : www.nitrr.ac.in

Subject: RAC System Design (Elective-III)

Subject Code	**ME 20836 ME**		
Semester	VIII	Board of Studies	Mechanical Engg.
Maximum Marks	**70**	Minimum Marks	**25**
Type of course	Elective	Contact Hours	55
L+T+P	4+1+0	Credits	5
Prerequisite	Refrigeration and Air-condition		

COURSE OUTCOME-

At the end of this course, the students are expected to be able to

1. Evaluate cooling and heating load because of solar radiation, ventilation and infiltration.
2. Evaluate heat gain or loss through opaque or transparent surface of any building.
3. Judge and choose suitable type of air conditioning system among various types of thermal distribution to any building.
4. Design transmission of air in air conditioning system through various types of ducts and design methods.
5. Analyze different types of space air distribution techniques of air conditioning system and induced or forced ventilation for cooling.

SYLLABUS

UNIT-I

Cooling and Heating Load Calculations: Estimation of Solar Radiation

Solar radiation, Constant and irradiation, geometry, Latitude, all basic and derived angles, vertical and tilted surfaces, Calculation of direct, diffuse and reflected radiation using ASHRAE solar radiation model.

Solar radiation through fenestration Ventilation and Infiltration

Need, effects of fenestration, Estimation of heat transfer rate, Solar heat Gain Factor(SHGF) and Shading Coefficient, external shading, shaded area of fenestration, heat transfer rate through windows with overhangs, ventilation, Infiltration, heat transfer rate due to infiltration and ventilation.

UNIT-II

Heat Transfer through Buildings – Fabric Heat Gain/Loss

One-dimensional, steady state heat transfer through homogeneous, non-homogeneous walls, air spaces, composite walls of the buildings, unsteady heat transfer through opaque walls and roofs, analytical method to
solve the 1-D, transient heat transfer problem, numerical methods used to solve the transient heat transfer problem, semi-empirical method based on Effective temperature, Difference or Cooling Load Temperature difference CLTD.

UNIT-III

Selection of Air Conditioning Systems

Thermal distribution systems and their functions, Selection Criteria for air conditioning systems, Classification of air conditioning systems, Working principles, Advantages,

Disadvantages and applications of all air systems, namely: Single duct, (constant volume, single zone systems, multi zone systems, variable air volume (VAV) systems), Dual duct, constant volume and variable volume systems, Outdoor air control in all air systems, all water systems, air-water systems, unitary refrigerant based systems.

UNIT-IV

Transmission of Air in Air Conditioning Ducts

Air Handling Unit (AHU) and it's functions, need, airflow through ducts, Bernoulli and modified equations, Static, dynamic, datum and total head, Fan Total Pressure (FTP) and power input, pressure loss, frictional pressure drop, dynamic pressure drop in various types of fittings, Static regain.

Design of Air Conditioning Ducts

Requirements, Rules for duct design, Classification, Commonly used methods, Principle of velocity, equal friction, and static regain methods, Performance of duct systems, System balancing and optimization, fans and fan laws, Interaction between fan and duct.

UNIT-V

Space Air Distribution

Requirements, Performance Index and space Diffusion Effectiveness Factor, Design buoyancy effects, deflection of air jets, Behavior of free-stream jets, Definitions of drop, throw, Spread and entrainment ratio, Behavior of circular jets, rectangular jets, Characteristics of different types of air distribution devices, Return air inlets, Airflow pattern inside conditioned spaces.

Ventilation for cooling

Use, comparison between natural and mechanical ventilation, Characteristics of natural ventilation, airflow rate due to wind and stack effects, general guidelines, forced ventilation using electric fans, interior air movement, unit ventilators, whole house fans and solar chimneys.

Text Books:

1. Refrigeration and Air Conditioning by C. P. Arora, TMH Publication.
2. Refrigeration and Air Conditioning by R.K. Rajput Katson Publication.
3. Refrigeration and Air Conditioning by Arora & Domkundwar, Dhanpat Rai and Sons.

Reference Books:

1. Refrigeration and Air Conditioning by Stooker W.F.
2. Refrigeration and Air Conditioning by Ahmadul Ameen, PHI Publication
3. Hand Book of Air Conditioning and Refrigeration by Shan K. Wang , Tata McGraw Hill Publications.