Bachelor of Technology – Mechanical & Automation Engineering

FLEXILEARN

-Freedom to design your degree

Programme Structure

Curriculum & Scheme of Examination

2014

AMITY UNIVERSITY CHHATTISGARH

RAIPUR

B.Tech-Mechanical & Automation Engineering

Programme Structure

SEVENTH SEMESTER

Course Code	Course Title	Lecture (L) Hours Per week	Tutorial (T) Hours Per week	Practical (P) Hours Per week	Total Credits
MAE2701	Computer Aided Manufacturing	3	-	-	3
MAE2702	Mechatronics	3	-	-	3
MAE2703	Computer Aided Manufacturing Lab	-	-	2	1
MAE2704	Mechatronics Lab	-	-	2	1
MAE2735	Summer Internship - II (Evaluation)	-	-	-	3
Concentration Electives					**4**
MAE2705	Operations Research	3	-	-	3
MAE2706	Operations Research Lab	-	-	2	1
MAE2707	Automotive Engineering	3	-	-	3
MAE2708	Automotive Engineering Lab	-	-	2	1
MAE2709	Computer Aided Designing	3	-	-	3
MAE2710	Computer Aided Designing Lab	-	-	2	1
MAE2711	Power Plant Practices	3	1	-	4
Open Electives					**4*+3**
CSS2551	Employability Skills*	1	-	-	1
BEH2752	Relationship Management*	1	-	-	1
	Foreign Language – VII*	2	-	-	2
LAN2751	French-VII				
LAN2752	German-VII				
LAN2753	Spanish-VII				
LAN2754	Russian-VII				
LAN2755	Chinese-VII				
LAN2756	Portuguese-VII				
LAN2757	Korean-VII				
LAN2758	Japanese-VII				
	TOTAL				**22**

*** Compulsory**

Syllabus – Seventh Semester

COMPUTER AIDED MANUFACTURING

Course Code: MAE2701 **Credit Units: 03**

Course Objective:
The aim of the course is to impart the students the basic and essential concepts in using Computer Assisted Manufacturing (CAM) and Computer Numerical Control (CNC) machines. Students will learn the basic concepts of manufacturing planning and control. They will be offered hands on experience in using CAM software to design, simulate and write CNC programs.

Course Contents:

Module I
Introduction to Numerical control. Programmed automation. Nomenclature, type and features of NC machines tools. Axes designation. Point to point, straight and continuous control systems.

Module II
Machining centre and Turning centre, Automatic tool changer, Machine Tool beds and automated pallet changers**.**

Module III
Machine Control Unit, Actuation Systems, open and close loop systems, transducers for NC Systems, revolves, encoders and inductosyn.

Module IV
Manual Part Programming: Processes planning, G&M codes. Interpolation Cycles. Tool compensation, Subroutines, Introduction to Computer Aided Part Programming.

Module V
Tooling and tool presetting. Computer Aided inspection - Contact Inspection (Coordinate Measuring Machine) & Non Contact Inspection.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

Text:
- Mikell P. Groover, "Automation, Production Systems and Computer-Integrated Manufacturing", 2nd Edition, Pentice Hall, 2001.
- Rao, Kundra & Tiwari, "Computer aided Manufacturing" Tata McGraw Hill, 2007.
- Numerical Control: by Koren, Khanna Publisher.

References:
- Mikell P. Groover, Emory W. Zimmers, "CAD/CAM", Pearson Education, 2006.
- P.N. Rao, "CAD/CAM Principles and Applications", Tata McGraw Hill, 2006.

MECHATRONICS

Course Code: MAE2702 **Credit Units: 03**

Course Objective:
Mechatronics is basically combination of mechanical and electronics engineering. With growing demands of automation of different mechanical operation this subject fulfills the needs. Main objective of this course is to provide knowledge of different combinations of mechanical and electronics processes and various software used in it.

Course Contents:

Module I: Introduction
Measurement systems, control systems, Microprocessor-based controllers, Sensors and tranducers, Signal conditioning processes.

Module II: Actuation Systems
Pneumatic and hydraulic actuation systems, Directional control valves, pressure control valves, process control valves.

Module III: System Models
Mathematical models, Mechanical system building blocks, modeling dynamic systems, First order systems, Second order systems.

Module IV: Principles of Feedback & Intelligent Control
Control Systems, Open & Closed loop control Systems, Controllers, Artificial Neural Network.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:
Text:
- W. Bolton, "Mechatronics", Pearson Education Ltd., 2003.

References:

- Mohammad Ali Mazidi Janice Gillispier Mazidi, "The 8051 Microcontroller", Pearson Education Inc., 2004.
- Gary Dunning, "Introduction to Programmable Logic Controllers", Thomson Asia P. Ltd., Singapore, 1998.
- Gopal K. Dubey, "Fundamentals of Electrical Drives", Narosa Publishing House, 2001.
- Charles H. Roth, "Jr. Fundamentals of Logic Design", Jaico Publishing House, 2001.
- "HMT Mechatronics", Tata McGraw Hill Publishing Co. Ltd., 2001.
- Devdas Shetty, Richard A. Kolk "Mechatronics System Design", Thomson Asia Pvt. Ltd., Singapore, 2001.
- A.K. Tayal, "Instrumentation & Mechanical Measurements", Galgotia Publication Pvt. Ltd., 2003.
- D. Rana Durgaiah, "Fluid Mechanics & Machinery", New Age Int. Publishers, 2004.
- Nitaigour Premchand Mahalik, "Mechatronics Principles, Concepts & Application", Tata McGraw Hill Publishing Co.Ltd, 2003.
- Mikell P. Groover, "Automation, Production Systems and Computer-Integrated Manufacturing", 2nd Edition, Prentice Hall, 2001.

COMPUTER AIDED MANUFACTURING LAB

Course Code: MAE2703 **Credit Units: 01**

Course Contents:

Name of Experiments:

1. Make a sketch of CNC lathe showing major assemblies and indicate the CNC axes with designations. Make a sketch of the conventional lathe and, if it is considered as a CNC lathe, show the axes with designations.

2. Make a Kinematics diagram of CNC Lathe showing all machine sub-assemblies. Indicate bearing arrangements, ball screw arrangements with sizes, wherever available.

3. Repeat (1) on CNC machining centre and conventional milling machine.

4. Repeat (2) for CNC machining centre.

5. Study the CNC lathe. Prepare a block diagram of controls. Identify location and type of transducers and indicate on an outline of the machine. Describe how they function.

6. Repeat (5) on machining centre.

7. Study the work holding and tool holding devices in the CNC lathe and machining centre and draw up their specifications and capacities.

8. Prepare part programs for 2 specified components for CNC lathe by manual part programming. First write the machining technology in full; then prepare part program and then enter in the machine.
   Test the program in dry run and by tool path graphic simulation.
   Machine the component.
9. Do the above work for machining centre.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

MECHATRONICS LAB

Course Code: MAE2704 **Credit Units: 01**

Course Contents:

Name of Experiments:

1. To make the sequential operation
   $A^+ B^+ A^- B^-$; $A^+, B^+, B^- A^-$ using Pneumatic trainer

2. For the above write a ladder logic giving time delays

3. Design a Pneumatic Circuit for clamping type & operated by PLC

4. To make the sequential operation
   A^+, B^+, A^-, B^- ; $A^+, B^+, B^- A^-$ using Hydraulic trainer kit.

5. For the above write a ladder logic giving time delays

6. Design a Hydraulic Circuit for clamping type & operated by PLC

7. To make the ladder logic for water level control & reaction vessel to detect different levels of water and switch off the water supply.

8. Starter Control & Star Delta Starter for ¼ HP AC. Motor to demonstrate the use of PLC Motor Starting

9. Design Fan operation using PLC

10. Design n a Lift Control

11. Design a pick & Place

12 Design Sequential Switching Motors

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

SUMMER INTERNSHIP - II (EVALUATION)

Course Code: MAE2735 **Credit Units: 03**

Methodology:
Practical training is based on the theoretical subjects studied by students. An industry visit will be planned for each student and on-site practical training will be imparted with the help of the industry guide. The students are to learn various industrial, technical and administrative processes followed in the industry. On completion of the practical training the students are to present a report covering various aspects learnt by them and give a presentation on same.

Examination Scheme:

Feedback from industry/work place	20
Training Report	40
Viva	15
Presentation	25
Total	**100**

OPERATIONS RESEARCH

Course Code: MAE2705 **Credit Units: 03**

Course Objective:
In a rapidly changing environment an understanding is sought which will facilitate the choice and the implementation of more effective solutions, which, typically, may involve complex interactions among people, materials and money. Organizations may seek a very wide range of operational improvements - for example, greater efficiency, better customer service, higher quality or lower cost. Whatever the business, engineering aim, Operation Research can offer the flexibility and adaptability to provide objective help. This course introduces students to the principles of operational research.

Course Contents:

Module I: Linear Programming
Formulation of problem. Graphical and simplex method for maximization and minimization. Duality theory and sensitivity analysis

Module II: Transportation Models
Stepping stone algorithm, MODI method and Vogel‟s Approximation Method (VAM) for selfing balanced, unbalanced transportation problems and problems of degeneracy and maximization.

Module III: Assignment Models
Assignment model for maximization and traveling salesman problems, Industrial Problems

Module IV: Queuing Theory
Basic structured, Terminology, classification. Birth and death process. Sequencing: Processing in jobs through machines with the same processing order. Processing of 2 jobs through machines with each having different processing order.

Module V: Network Models
Introduction to PERT and CPM. Fundamental concept of Network models and construction of network diagrams. PERT activity, time estimate. Critical path and project time duration. Probability of completing the project on or before specified time. Float of a activity.

Module VI: Games Theory
Zero Sum two person competitive games, Minimax and maximini principle Arithmetic, algebraic, matrix algebra method,. Solution by dominance, sub game, Graphical and linear programming method.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- HM Wagner, Principles of Operations Research, Prentice Hall
- Heizer, J. & Render B., Operations Management, Pearson Education (8/e), 2006
- PK Gupta and DS Hira, Operations Research, S. Chand & Co.
- Taha, Introduction to Operation Research
- F.S. Hiller and G.I. Libermann, Introduction to Operation Research, Holden Ray.

OPERATIONS RESEARCH LAB

Course Code: MAE2706 **Credit Units: 01**

Course Contents:
Program on C or C++ for Linear Programming.

1. Program on C or C++ for Simplex Problem.
2. Program on C or C++ for Assignment Problem.
3. Program on C or C++ for Transportation Problem.
4. Program on C or C++ for PART, CPM Problem.
5. Program on C or C++ for Sequencing Problem.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

AUTOMOTIVE ENGINEERING

Course Code: MAE2707 **Credit Units: 03**

Course Objective:
This course emphasizes on constructional details of automotive vehicles which includes – Basic structure, engine, transmission systems, suspension systems, steering system, braking systems and wheels & tyres..

Course Contents:

Module I
Introduction, Components of an automobile, basic engine terminology, engine cycles, working of an IC engine. Basic engine design considerations, constructional details of C.I. and S.I. engines. crank shafts, connecting rod, piston, values, cams, manifolds, air cleaners, mufflers, radiators, and oil filters.

Module II: Transmission System
Description and working of manually operated gearboxes like sliding mesh, constant mesh, synchromesh and epicycle; hydraulic torque convertor and its construction working and performance, sem-automatic and fully automatic transmission, Hydramatic transmission, analysis of differentials, live axles, construction working and requirements of overdrive.

Module III: Steering System
Introduction, Front axle, wheel alignment, Steering geometry, steering mechanisms, Ackerman steering, center point steering, power steering.

Module IV: Suspension
Objective, requirement, function, types Shock absorbers, Independent suspension, Stabilizer, air suspension, Hydroelastic suspension, Hydragas interconnected suspension.

Module V
Principle, braking requirements, brake efficiency, fading of brakes, types of brakes, bleeding of brakes, brake fluid.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

Text:
- Kirpal Singh, "Automobile Engg.", Vol. I & II, Standard Publishers, 2004
- N.K. Giri, "Automotive Mechanics", Khanna Publishers
- Narang G.B.S., "Automobile Engg.", Khanna Publishers
- Srinivasan, "Automotive Engines", Tata McGraw Hill
- K.K. Jain & R.B. Asthana, "Automobile Engineering", Tata McGraw Hill

References:
- James D. Halderman and Chase D. Mitchell Jr., Automotive Engines- Theory and Servicing, Pearson Education, 2007
- Joseph Haitner, "Automotive Mechanics", C.B.S. Publications

AUTOMOTIVE ENGINEERING LAB

Course Code: MAE2708 **Credit Units: 01**

Course Contents:

List of Experiments:

1. Drawing Valve Timing Diagram
2. Determination of Firing Order of engine
3. Specification of engine
4. Study of different parts of engine
5. Study of Clutch
6. Study of Hydraulic Brake System
7. Study of Carburetor
8. Study of various parts of Auxiliary systems
9. Study of Wheel
10. Study of emission system
11. Study of steering system

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva

COMPUTER AIDED DESIGNING

Course Code: MAE2709 **Credit Units: 03**

Course Objective:
The objective of this course is to impart students an in-depth exposure to methods in geometric modeling and its applications in CAD/CAM. This course introduces integrated approach to CAD including: Overview of CAD, numerical techniques for CAD, Computer graphics and design, Principle and management of design data base system, finite element analysis and CAD, Design optimization. Along with the theoretical presentations, commercial CAD software are also introduced and applied to create Engineering components and assemblies.

Course Contents:

Module I
Introduction to CAD. Design process, Introduction to solid modeling and aided design of some elements/ components, hardware requirements, concurrent engineering.

Module II
Elementary Computer Graphics. Transformations, Mappings, Projections – orthographic, isometric, perspective.

Module III
Representation of surfaces. Plane surfaces, Ruled surfaces, Surfaces of revolution, Sweep surfaces, Bezier surface, Bicubic surface patch, Approximation B – spline surface, composite surfaces.

Module IV: Solid Modeling
Set theory, Graph theory, Regularized Boolean operations, B-rep modeling, Sweep representations, Spatial occupancy enumeration.

Module V: Advanced CAD
Mechanical assembly, Geometric property formulation- curve length, surface are calculations, volume calculation, centriod calculation, Tolerances representations, Animation, Simulation, Strategic factors in product design, Robust design for product, Introduction to Finite element modeling and analysis.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

Text:
- Ibrahim Zeid, "CAD/CAM Theory and Practice", Tata McGraw-Hill Publishing Company Limited, 6th Edition 1998.
- David F. Rogers and J. Alan Adams, "Mathematical Elements for Computer GraPrentice Hall Indiacs", Tata McGraw-Hill, 2nd Edition 2002.

References:
- Ibrahim Zeid, "Mastering CAD/CAM", Tata McGraw-Hill Publishing Company Limited,

COMPUTER AIDED DESIGNING LAB

Course Code: MAE2710 **Credit Units: 01**

Course Contents:

List of Experiments:

1. Analysis and design using ANSYS/Pro-E software for:
2. Flange Coupling.
3. Design Shaft.
4. Design for Key.
5. Design for Spur Gear.
6. Design for Helical Gear.
7. Parts of Thin Cylinder Pressure Vessels.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva