

ONE CREDIT COURSES

Curriculum & Syllabi (2015-2016)

About One Credit Course

The Value Added Education Courses aim to provide additional learner centric graded skill oriented technical training with the primary objective of improving the employability skills of engineering students of MCET.

There is a spectrum of ways in which practical technical skills can be developed through curricula. Here the plan is to bridge the perceived technical competency gaps of students by providing training in employability enhancing technical subjects through mandatory one credit courses and additional training through optional courses. The courses focus on skill development and more than 50% of the time is spent on practical training and problem solving, to provide the requisite understanding towards application of academic topics from engineering disciplines into real world engineering projects.

The main objectives of the program are:

- To provide students an understanding of the expectations of industry.
- To improve employability skills of engineering students of MCET.
- To bridge the skill gaps and make students industry ready.
- To provide an opportunity to students to develop inter-disciplinary skills.

Since the individual capabilities, aptitudes and needs of students vary widely, and since only 30 hours is available during regular contact hours for such value added courses, a two-pronged strategy is proposed to achieve the objectives outlined above.

It is proposed to conduct one credit courses of 30 hours duration each semester for four semesters, as part of the curriculum. Every student should opt for a minimum of four one credit courses. No additional fees or charges will have to be paid by the students for these mandatory courses.

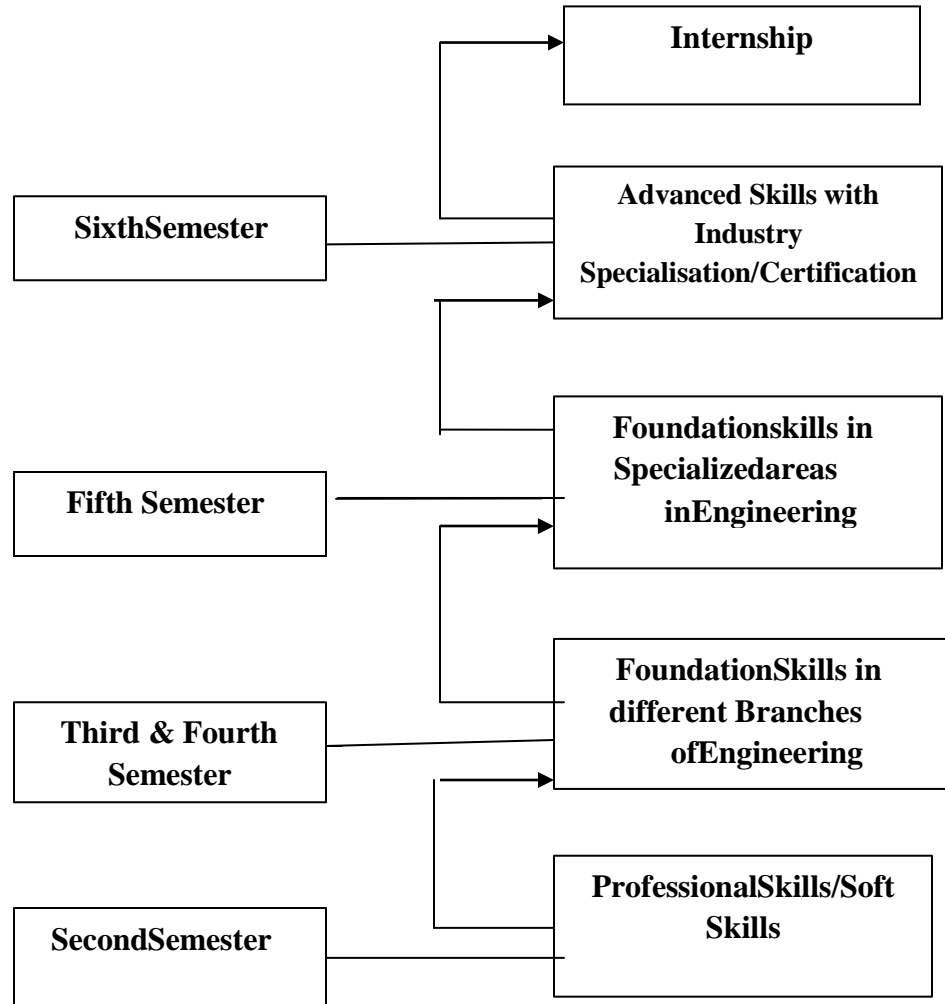
In addition to this, other **optional VAE courses** that will further improve the employability prospects of the students will be offered outside regular contact hours on optional basis, and interested students can join these courses by paying the fees fixed for it.

These courses will be offered as per clause 4.6 and 3.1.1 of UG and PG regulations respectively.

A VAE Course Management Committee shall be constituted for each stream, consisting of two HoDs from that stream as Stream Co-ordinator and Deputy Stream Co-ordinator respectively, the OCC Faculty Co-ordinator as Convener, the OCC Faculty Advisers of each Department under that stream and two student co-ordinators from each Department under that stream. This Committee shall meet atleast once every month to discuss the various issues related to Planning, Development and Conduct of OCC and VAE Courses of the concerned stream.

The scheme of assessment and distribution of marks for each course is decided by the course faculty, and the details shall be provided in the proposal for each course in the course design template. The system of evaluation shall normally be continuous internal assessment by the course faculty and there will be no end semester examination. An exam at the end of the course may be conducted by the course faculty, as proposed in the scheme of assessment for that course.

Framework for One Credit Courses (OCC)



Courses Offered & Syllabi - Core Stream (Odd Semesters)

| Year/ Semester | Course Code | Course Title |
|-------------------|-------------|---|
| II/III | 140CR5111 | Basic Solid Modelling using CATIA-V6 |
| | 140CR5112 | Basics and Applications of MATLAB |
| | 140CR5113 | Machinability studies in LATHE using Tool Dynamometer |
| | 140CR5114 | Solid edge – 2D drafting and 3D modelling fundamentals |
| | 140CR5115 | Fundamentals of C programming |
| | 140CR5116 | Automotive Sales and Service |
| | 140CR5117 | Welding Technology |
| | 140CR5118 | Site Supervision (Building Materials and Components) |
| | 140CR5119 | Layout and Building Approval |
| | 140CR5120 | Revit Architecture |
| III/V | 11CR011 | Basic Finite Element Analysis using ANSYS-APDL |
| | 11CR012 | Composite Material Characterization and Preparation |
| | 11CR013 | Factory Automation |
| | 11CR014 | Gear Engineering |
| | 11CR015 | Design and assembly of offroad vehicle |
| | 11CR016 | Performance and emission analysis in a multi-fuel VCR CI engine |
| | 11CR017 | Embedded C Programming |
| | 11CR018 | Open source programming using Linux |
| | 11CR019 | Site Supervision (Quality Control) |
| | 11CR020 | Reinforcement Detailing and Bar Bending Schedules |
| | 11CR021 | Building Service Practices -MEPI |

III -SEMESTER

140CR5111

BASIC SOLID MODELING USING CATIA V6

1. Title of the Course:

Basic Solid Modeling using CATIA V6

2. Aim:

To impart basic knowledge in modeling, assembly and drafting of the different machine components.

3. Prerequisites:

- Basic knowledge in Engineering graphics and Machine Drawing.
- Basic knowledge in AUTOCAD.
- Exposure to commands for modeling and assembly.

4. Course Outcomes:

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

- Model simple components.
- Sketch any type of 3D assemblies for a wide range of mechanical engineering processes.
- Apply solution to model complex and intelligent products through the systems engineering approach.

5. Teaching Strategies:

| S.No | Description | Teaching Methods |
|------|-------------|---|
| 1. | Unit 1 | PPTs, Videos and demo of tool |
| 2. | Unit 2 | PPTs, Videos and Practices on CATIA V6 software |
| 4. | Unit 3 | PPTs, Videos and Practices on CATIA V6 software |
| 5. | Unit 4 | PPTs, Videos and Practices on CATIA V6 software |
| 6. | Unit 5 | PPTs, Videos and Practices on CATIA V6 software |

6. Syllabus:

Unit I Introduction

3

Basics of CATIA – Commands of CATIA – field of Operation – Comparison of CATIA V5 and CATIA V6 – Industrial application.

Unit II Sketcher

9

Introduction of sketching – workbench coordinate system - Profile creation tools for creating 2D sketch – modifying the sketch created – setting units – construction – creating basic sketch operation – Trim options – making positions.

Unit III Part Modeling

9

Concept of 3D and part design terminology – creating base features – creating reference – fillet and orientation.

Unit IV Assembly, wireframe and surface design

9

Assembly – document assigning properties – product tools – saving assembly – viewing product structure – introduction to wireframe and surface design – splines – sweep – extracting edges – checking connection between curves

Unit V drafting

6

Introduction – workbench & defining sheet size – adjusting drawing sheets – use predefined drafting styles – scaling the drafted view.

Theory: 9 Hrs
Practical: 21 Hrs
Total: 30 Hrs

7. Course Plan:

| No. of Hrs | Topic |
|-------------------|---|
| 2 | Basics of CATIA – Commands of CATIA – field of Operation – Comparison of CATIA V5 and CATIA V6 – Industrial application |
| 1 | Introduction of sketching – workbench coordinate system - Profile creation tools for creating 2D sketch |
| 1 | Creating basic sketch operation – Trim options – making positions. |
| 1 | Tutorials |
| 1 | Tutorials |
| 2 | Concept of 3D and part design terminology – creating base features |
| 1 | Tutorials |
| 1 | Tutorials |
| 1 | Tutorials |
| 2 | Assembly – document assigning properties , Introduction to wireframe and surface design |
| 1 | Tutorials |
| 1 | Tutorials |
| 1 | Tutorials |
| 3 | Introduction – workbench & defining sheet size |
| 3 | Tutorials |
| 2 | Tutorials |
| 5 | Mini Project |

8. Course Assessment :

| S. No | Description | Max. Marks |
|--------------|---|-------------------|
| 1. | Continuous Assessment I (Assignment/Modeling) | 30 |
| 2. | Continuous AssessmentII(Assignment/Modeling) | 30 |
| 3. | Final Assessment (Test) | 40 |
| Total Marks | | 100 |

9. References:

Study Material -- Manuals

10. Resource requirement:

CATIA Software Version 6

140CR5112 BASICS AND APPLICATIONS OF MATLAB

1. Title of the Course :

Basics and applications of MATLAB

2. Aim:

- To provide the students with the opportunity to improve their programming skills using MATLAB environment.
- To use the MATLAB as a tool in solving engineering problems.

3. Prerequisites:

- Familiarity with mathematics
- Basics of Engineering Mechanics and Strength of Materials
- Knowledge about working of various systems in automobile vehicle
- The ability to formulate an engineering problem in a mathematical form appropriate for subsequent computational treatment and to choose an appropriate numerical approach.
- General interpretation skills

4. Course Outcomes:

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

- Write simple program modules to implement simple numerical methods and algorithms
- Solve engineering problems using standard numerical methods
- Develop MATLAB scripts implementing programming solutions for a problem.
- Interpret data using 2D and 3D visualization methods.

5. Teaching Strategies:

- Lecture
- Power point presentation
- Tutorials / Assignments
- Encouraging Co-operating Learning

6. Syllabus:

MATLAB: Starting with MATLAB - Mathematical operations with array – Script files
- Two dimensional plots. Function – Programming – Polynomials, Curve fitting and interpolations - Three dimensional plots – Numerical Methods Application.

Theory : 10Hrs
Tutorials : 20Hrs
Total : 30 Hrs

7. Course Plan:

| No of Hrs | Topic |
|-----------|--|
| 3 | Working in the command window ,Arithmetic operations with scalars ,Display formats ,Elementary math built-in functions Defining scalar variables,Useful commands for managing variables |
| 3 | Creating a one-dimensional array (vector) ,Creating a two-dimensional array (matrix) ,The zeros, ones and eye commands ,The transpose operator Array addressing ,Built-in functions for handling arrays ,Strings and strings as variables. |
| 3 | Addition, subtraction, Array multiplication, Array division, Element-by-element operations,Using arrays in Matlab built-in math functions Built-in functions for analyzing arrays ,Generation of random numbers |
| 3 | Creating and saving a script file,Running a script file ,Global variables Input to a script file ,Output commands |
| 3 | Tile plot command,Plot of Given Data ,Function ,The fplot command Plotting multiple graphs in The SAME PLOT ,Formatting a plot Plots with logarithmic axes,Plots with special Graphics,Plotting multiple plots on the Same Page |
| 3 | Creating a Function File ,Structure of Function File |
| 3 | Examples of Simple Function Files,Comparison between Script Files and Function Files |
| 3 | Polynomials, Curve Fitting, and Interpolation,Three-Dimensional Plots |
| 3 | Applications in Numerical Analysis |
| 3 | Tutorial,Test |

8. Course Assessment :

| S. No | Description | Max. Marks |
|-------------|--|------------|
| 1. | Continuous Assessment I (Assignment/Test) | 30 |
| 2. | Continuous Assessment II (Assignment/Test) | 30 |
| 3. | Final Assessment (Test) | 40 |
| Total Marks | | 100 |

9. References:

<http://www.mathworks.in/services/training/courses>

1. Rao V. Dukkipati, MATLAB for Mechanical Engineers”, New Age Science, Limited, 2009
2. Amos Gilat,” MATLAB An Introduction with applications”, John Wiley & Sons, 2004.

10. Resource Requirements:

Software - MATLAB

140CR5113 MACHINABILITY STUDIES IN LATHE USING TOOL DYNAMOMETER**1. Title of the Course:**

Machinability studies in LATHE using Tool Dynamometer

2. Aim:

To impart knowledge in conducting machinability studies and understanding the effect of tool geometry on cutting forces.

3. Prerequisites:

- Basic knowledge in Machine Drawing and Engineering graphics.
- Knowledge in Manufacturing process and machine tools.

4. Course Outcomes:

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

- Apply knowledge of theory of metal cutting in the shop floor.
- Grind the cutting tool to required tool geometry using Tool and Cutter Grinder.
- Understand the effect of tool geometry on the cutting forces.
- Measure the cutting forces using tool Dynamometer.
- Analyze the experimental results.

5. Teaching Strategies:

| S.No | Description | Teaching Methods |
|------|-------------|--|
| 1. | Theory | PPTs, Videos |
| 2. | Practical | Using Tool and Cutter Grinder & Tool Dynamometer |

6. Syllabus:

| S.No. | Topic | Hrs |
|-------|--|-----|
| 1. | Review of theory on metal cutting | 3 |
| 2. | Effect of tool geometry on cutting forces | 3 |
| 3. | Preparation of HSS tools with two different geometry to the tool angles given in the recommended range | 6 |
| 4. | Calculation of cutting forces (Theoretical calculations) | 3 |
| 5. | Actual measurement of cutting forces using tool dynamometer | 6 |
| 6. | Measurement of cutting time, tool wear, surface finish, material removal rate. | 3 |
| 7. | Analysis of experimental result | 6 |

Theory : 9 Hrs
Practical : 21 Hrs
Total : 30 Hrs

7. Course Plan:

| No. of Hrs | Topic |
|-------------------|--|
| 2 | Review of theory on metal cutting |
| 2 | Effect of tool geometry on cutting forces |
| 4 | Preparation of HSS tools with two different geometry to the tool angles given in the recommended range |
| 4 | Calculation of cutting forces (Theoretical calculations) |
| 6 | Actual measurement of cutting forces using tool dynamometer |
| 6 | Measurement of cutting time, tool wear, surface finish, material removal rate. |
| 6 | Analysis of experimental result |

8. Course Assessment:

| S. No | Description | Max. Marks |
|--------------|--|-------------------|
| 1. | Continuous Assessment I (Assignment/Test) | 30 |
| 2. | Continuous Assessment II (Assignment/Test) | 30 |
| 3. | Final Assessment (Test) | 40 |
| Total Marks | | 100 |

9. References:

Study Material – User Manual

10. Resource Requirements:

MCET – Machine shop

140CR5114 SOLID EDGE 2D DRAFTING AND 3D MODELING FUNDAMENTALS

1. Title of the Course :

Solid Edge 2D Drafting and 3D Modeling Fundamentals

2. Aim:

Learn how to create and edit 2D and 3D drawings using Solid Edge ST5.

3. Prerequisites:

Basic knowledge in Engineering Graphics and Computer Aided Drafting.

4. Course Outcomes:

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

- Develop 2D layouts and a visual representation of the product in 3D.
- Understand engineering drawings and Solid Edge ST5 software.

5. Teaching Strategies:

Each session will be interactive with hands-on practice on 2D/3D drawings. By practicing each exercise students will demonstrate their ability to understand, and create drawings

6. Syllabus:

1. Part modeling – Sketching: Tool bars – Draw, Feature & Relationship toolbars, Smart Dimensioning & Modifying Dimensions, and Applying Constraints, Patterning

2. Part modeling – 3D modeling: Planes, Feature toolbar, Protrusion, Revolve, loft, sweep, Cutout, Ribbon toolbar, Modifying 3D Model -Round, chamber, Rib, hole, etc., Reference Planes, coordinate system, Edit Definition, Edit Profile, Dynamic edit, Advanced Modeling Techniques – Thin wall, Mirror copy Feature, Patterning, Draft, Constriction display, Physical Properties

3. Assembly: Creating relationship – mate, align, insert, connect, angle, flash fit Construction display, Activate part, Occurrence properties, Floating offset, fixed offset, Lock/Unlock relationship.

4. Drawing Production: Drawing Views toolbar, Drawing Wizard, Creating Different Views - Principle views, auxiliary views, section & detail views, Draw Sketch, Activate

Part, Part list, Text, leader annotation & weld symbols, Balloons. Retrieve dimension and Use of symbols.

7. Course Plan:

| No. of Hrs | Topic |
|------------|-----------------------------|
| 6 | Part modeling – Sketching |
| 6 | Part modeling – 3D modeling |
| 6 | Assembly |
| 6 | Drawing Production |
| 6 | Project |

8. Course Assessment :

| S. No | Description | Max. Marks |
|-------------|--|------------|
| 1. | Continuous Assessment I (Quiz/Assignment/Test) | 30 |
| 2. | Continuous Assessment II (Modeling /Test) | 30 |
| 3. | Final Assessment (Modeling / Assembling/Test) | 40 |
| Total Marks | | 100 |

9. References:

- Solid Edge ST5 self-paced training offered by Siemens
- <http://support.industrysoftware.automation.siemens.com/training/se/en/SESPT.cfm>
- Softcopy materials will be made available as appropriate.

10. Resource Requirements:

The resources are available at the Siemens Centre for Digital Manufacturing

140CR5115 FUNDAMENTALS OF C PROGRAMMING

1. Title of the Course:

Fundamentals of C programming

2. Aim of the Course:

- To develop and execute error free C programs.
- To understand the mechanisms for controlling flow statements.
- To learn about functions, pointers and Structures.

3. Prerequisites:

NIL

4. Learning Goals/Outcomes:

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

- Attempt algorithmic solutions to problems
- Design and code a medium application
- Read, understand and modify code written by others

5. Teaching Strategies:

| S.No | Description | Teaching Methods |
|------|---------------------------------|--------------------|
| 1. | Introduction To 'C' Language | PPTs and Practices |
| 2. | Functions And Arrays | PPTs and Practices |
| 3. | Pointers, Structures And Unions | PPTs and Practices |

6. Syllabus:

INTRODUCTION TO 'C' LANGUAGE (12)

Design Style, coding style, functions and operators.

FUNCTIONS AND ARRAYS (10)

Functions definition and declaration- function types, Actual and formal arguments, Recursion array notation and Declaration, Processing with arrays, Array and Function.

POINTERS, STRUCTURES AND UNIONS (8)

Pointer Declaration ,Pointer Arithmetic, Pointer And Functions, Structure- Union-Bitfields- Typedef –Enumerations

Theory : 10 Hrs
Practical : 20 Hrs
Total : 30 Hrs

7. Course Plan:

| No. of Hrs | Topic |
|------------|---|
| 3 | C Introduction ,Character Set,Variables And Identifiers |
| 3 | Data Types, Operators And Expressions, Arrays |
| 3 | Basic Input/Output Statement, Decision Making Within A Program, Conditions |
| 3 | Conditional And Looping Statements |
| 3 | Functions Definition And Declaration- Function Types, Actual And Formal Arguments |
| 3 | Recursion Array Notation And Declaration |
| 3 | Processing With Arrays, Array And Functions |
| 3 | Pointerdeclaration,Pointer Arithmetic, Pointer And Functions |
| 3 | Structure & Union, Bitfields-Typedef , Enumerations |
| 3 | Tutorial |

8. Course Assessment:

| S. No | Description | Max. Marks |
|-------|--|------------|
| 1. | Solving a Problem,Logic for a Problem,Algorithm Development, Choosing appropriate concepts for solving the problem | 60 |
| 2. | Practical Test - FUNCTIONS AND ARRAYS | |
| 3. | Practical Test - POINTERS, STRUCTURES AND UNIONS | 40 |
| Total | | 100 |

9. References:

- <http://www.tutorialspoint.com/java/>
- <http://academy.javacodegeeks.com/course/advanced-java/>
- Herbert Schildt,**Java The Complete Reference, Seventh Edition:** The Complete Reference, Seventh Edition
- Raymond Gallardo, Scott Hommel, SowmyaKannan, Joni Gordon, Sharon BioccaZakhour, **The Java Tutorial: A Short Course on the Basics** ,sixth edition

10. Resource Requirements:

Turbo C++

140CR5116 AUTOMOTIVE SALES AND SERVICE

1. Title of the Course:

Automotive sales and service

2. Aim:

To enhance the practical skills in automotive vehicle technology

3. Perquisites:

Basic knowledge on motor vehicles.

4. Course Outcomes:

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

- Learn the fundamentals of vehicle maintenance
- Learn Brake, steering, wheel balancing and suspension systems according to vehicle performance Characteristics
- Gain knowledge about various shop floor equipments

5. Teaching Strategies:

The teaching mode will contain both theory as well as practical classes. Additionally the seminars to be delivered by experts from industry will give more details about emerging trends in the field. Also the students should undergo a training program in various service centres.

6. Syllabus:

Chapter -1 –Introduction Requirements and importance of maintenance, types of maintenance, Preparation of check lists, Inspection schedule, maintenance of records, Safety precautions in maintenance, Motor vehicle acts, insurance etc and traffic rules, Vehicle body maintenance, minor and major repairs. Door locks and window glass actuating system maintenance

Chapter -2-Engine maintenance Dismantling of engine components and cleaning, cleaning methods, Visual and dimensional inspections, Minor and major reconditioning of various components, Reconditioning methods, Engine assembly, Special tools used for maintenance Overhauling, Engine tune up

Chapter -3 - Chassis Components Maintenance Mechanical and automobile clutch, fluid flywheel, torque converter, Automatic transmission and gear box, servicing and maintenance. Maintenance, servicing of propeller shaft and differential system. Maintenance and servicing of

suspension systems. Maintenance and servicing of Brake systems, Maintenance and servicing of Steering systems, Wheel alignment, computerized alignment and wheel balancing.

Chapter -4-Electrical And Electronic System Maintenance – Servicing Testing methods for checking electrical and electronic components, Servicing of battery, starter motor, charging systems, Maintenance and servicing of alternator, ignitions system, lighting systems. Fault diagnosis and maintenance of modern electronic controls, Checking and servicing of dash board instruments.

Chapter-5-Maintenance Of Fuel / Cooling / Lubrication System-Servicing and maintenance of fuel system of different types of vehicles, Calibration and tuning of engine for optimum fuel supply. Cooling systems, water pump, radiator, thermostat, Anticorrosion and antifreeze additives. Lubrication maintenance, lubricating oil changing, greasing of parts.

7. Course plan:

| No of Hrs | Topic |
|-----------|--|
| 1 | Basic Engine Principles |
| 1 | Engine Removal |
| 1 | Engine Disassembly |
| 1 | Valve Train And Cylinder Head Reconditioning |
| 1 | Engine Crankshaft, Bearings And Oil Pump |
| 1 | Cylinder And Piston Reconditioning |
| 1 | Engine Reassembly |
| 1 | Engine Installation |
| 1 | Cooling System |
| 1 | Engine Lubrication System |
| 1 | Exhaust System |
| 2 | Fuel System |
| 1 | Clutch Assembly |
| 2 | Standard Transmission |
| 1 | Rear Axle |
| 1 | Transfer Case Diagnosis And Removal |
| 2 | Transfer Case Disassembly, Cleaning, Adjustment And Reassembly |
| 1 | Basic Electrical Theory |
| 1 | Battery Service |
| 1 | Charging System |
| 1 | Starting System |
| 1 | Ignition System |

| | |
|---|----------------|
| 1 | Wheel Bearings |
| 2 | Brake Systems |
| 2 | Disc Brakes |

8. Course Assessment:

| S. No | Description | Max. Marks |
|-------------|--|------------|
| 1. | Continuous Assessment I (Quiz/Practicals/Test) | 30 |
| 2. | Continuous Assessment II (Quiz/Practicals/Test) | 30 |
| 3. | Final Assessment (Test / viva voce) | 40 |
| Total Marks | | 100 |

9. References:

- Automotive Mechanics by Crouse and Angelin , McGraw Hill publication
- Service Manuals from Different Vehicle Manufacturers
- Automotive Technology, James Helderma, Pearson Education
- Automotive Technology by Jack Erjavec, Yesdee Publication

10. Resource Requirements:

ABT MARUTI Service centers.

140CR5117 WELDING TECHNOLOGY

1. Title of the Course:

Welding Technology

2. Aim:

To impart the students with basic knowledge and skill in welding metals using SMAW, GMAW and GTAW welding process.

3. Prerequisites:

- Basic knowledge in welding process and its applications.
- Knowledge on different fabrications methods.

4. Course Outcomes:

At the end of the course the student will be able to

- List down the different types of welding process
- Explain the different positions of welding
- Operate SMAW, GMAW and GTAW machines
- Acquire skills in welding metals using SMAW, GMAW and GTAW process.

5. Teaching Strategies:

| S.No | Description | Teaching Methods |
|------|-------------|---|
| 1. | Unit 1 | PPTs, Videos and demo |
| 2. | Unit 2 | PPTs, Videos and demo |
| 3. | Unit 3 | Hands on training using the SMAW, GMAW and GTAW process to variable joints and position |
| 4. | Unit 4 | |
| 5. | Unit 5 | |

6. Syllabus:

Unit I Welding Introduction

3

Introduction to welding – Development of welding technology – Difference between welding, brazing and soldering – Classification of welding - Melting point of materials - Welding Safety – Welding safety equipment – welding accessories - Open Circuit Voltage (OCV) – Duty cycle – Polarity - Welding arc - SMAW process description – Constant Current (CC) process welding parameters -Welding Positions – types welding passes - Equipment Setup - Welding defects - Welding parameters - Electrode

designation- electrode types - storage of electrodes – application - Advantages and disadvantages.

Unit II Types of welding process

3

Classification of metal joining processes, Methods of joining, Mechanical methods, Metallurgical in welding, Brazing and soldering.

Unit III Welding using SMAW process

8

Hands on training using the SMAW process for various joints and positions

Unit IV Welding using GMAW process

8

Hands on training using the GMAW process for various joints and positions

Unit V Welding using GTAW process

8

Hands on training using the GTAW process for various joints and positions

Theory
:
Practical : 24 Hrs
Total : 30 Hrs

7. Course Plan:

| No. of Hrs | Topic |
|-------------------|---|
| 3 | Introduction to welding – Development of welding technology – Difference between welding, brazing and soldering – Classification of welding - Melting point of materials - Welding Safety – Welding safety equipment – welding accessories - Open Circuit Voltage (OCV) – Duty cycle – Polarity - Welding arc - SMAW process description – Constant Current (CC) process welding parameters -Welding Positions – types welding passes - Equipment Setup - Welding defects - Welding parameters - Electrode designation- electrode types - storage of electrodes – application - Advantages and disadvantages. |
| 3 | GMAW Process description, GMAW Gun description, GMAW Welding wire, Gases used in GMAW process, GMAW process application, welding technique Advantages and disadvantages of processes. GTAW Process description, GTAW torch description, GTAW filler wire, Gases used in GMAW process, GMAW process application, welding technique, Advantages and disadvantages of processes. |
| 3 | SMAW process Machine Demo and Hands on training Build Up Welding 1G Hands on training 1G Hands on training |
| 3 | 2G Hands on training |
| 3 | 3G Hands on training |
| 3 | 4G Hands on training |

| | |
|---|---|
| 3 | GMAW process Machine Demo and Hands on training Build Up Welding, 1G Virtual Simulator training, 1G Hands on training |
| 3 | 2G, 3G Hands on training |
| 3 | 2F & 4F Hands on training |
| 3 | GTAW process Machine Demo and Hands on training Build Up Welding, 1G Hands on training |
| 3 | 1G Hands on training |
| 3 | 2G Hands on training |

8. Course Assessment:

| S. No | Description | Max. Marks |
|-------------|--|------------|
| 1. | Continuous Assessment I (Quiz/Practicals/Test) | 30 |
| 2. | Continuous Assessment II (Quiz/Practicals/Test) | 30 |
| 3. | Final Assessment (Test / viva voce) | 40 |
| Total Marks | | 100 |

9. References:

- Techniques of electric Welding, Author Dietmar Muhs - German
- GMAW / MIG – Welding, Author Dietmar Muhs - German
- GTAW / TIG – Welding, Author Dietmar Muhs – German
- Welding Symbol Basics, Author J.P. Christein and Pamela Coates
- Consumables classification Tables, www.weldingwire.com
- <http://www.BOOnline.co.uk>
- <http://www.nimionlinelearning.gov.com>

10. Resource Requirements:

Welding laboratory with SMAW, TIG and MIG machines

140CR5118 SITE SUPERVISION (BUILDING MATERIALS AND COMPONENTS)

1. Title of the Course:

Site Supervision (Building Materials and Components)

2. Aim:

This course aims to give a basic knowledge of various construction materials and components and teach the manufacturing process of basic civil engineering materials.

3. Prerequisites:

A theoretical Knowledge on the following subjects

- Construction Materials and Methods I

4. Course Outcomes:

At the end of this course students will be able to

- Understand the field works in different construction practice.
- Identify the various kinds of resources involved in the construction practice.
- Gain the knowledge of the execution practices
- Verify the quality and standards of materials and construction work.
- Understand the manufacturing process of basic civil engineering materials like cement , Brick, TMT bars , Paver blocks etc.,

5. Teaching Strategies:

The teaching Methodology includes

- Site Visit/Field Work
- PowerPoint Presentations/seminar on construction activities and structures by the internal Faculty
- Assignments on different tasks which is to be followed, learned by the students from construction site.

- Collection of data/reports at the end of every activity and discussing the same

6. Syllabus:

Unit 1 – Introduction 4

Types of Buildings – components of a building – Specification for each component

Unit 2 –Civil Engineering Materials - Bricks 7

Raw materials required – Manufacturing process of civil engineering materials – Bricks

Aggregate, Bricks, Paver Blocks, Hollow blocks – Specifications – Quality control

Unit 3 – Civil Engineering Materials – Cement 6

Cement – Manufacturing process of cement – properties of cement of cement –

Specifications -Quality control

Unit 4 – Construction Practice 7

Masonry – Stone and brick masonry- classification- dressing- Joints – safe permissible load on masonry – walls –load bearing & Non load bearing walls- cavity & partition walls

Unit 5 – Form Work & Scaffolding**6**

Types of scaffoldings – components – formwork for columns, lintels, roof slabs, beams – detailing in formworks – Plastering: Ceiling, Wall – precautions

Total (L+P) = 4+26 = 30 hours**7. Course Plan:**

| No. of Hrs | Topic |
|-------------------|---|
| 1 | Introduction about the Course |
| 2 | Lectures on Field Visit and Model Reports |
| 3 | Field Work – on learning about building components with dimensions and material specifications including cost in detail |
| 4 | Field Work – on learning the manufacturing process of Bricks, Hollow blocks, Paver blocks, Cement and its quality controls and specifications. |
| 4 | Field Work – on learning the manufacturing of steel and concrete |
| 4 | Field Work – on learning sequence of construction activities as followed in construction site, study of building plan and construction practices in Masonry |
| 4 | Field Work – on learning different types of flooring, lintel, Stairs landings, Roof, Doors, windows ,Basic on concreting |
| 4 | Field Work –on learning different types of scaffoldings, formwork, Plastering |
| 5 | Seminar/PPT Presentation |

Proposed hours (30 hours)**8. Course Assessment:**

The Assessment includes

- Attendance (Reporting in College)
- Attendance sheet signed by Project manager or Project engineer in construction site
- Report Submission
- Assignment 1 – Collecting the Photo proof of components of structures

- Assignment 2 – Poster presentation about the manufacturing of basic civil engineering materials.
- Assignment 3 – Presenting seminar about their course of learning and report submission

The Grading Pattern will be as Follows:

| S.No | Particulars | Marks |
|--------------|--|------------|
| 1 | Assignment No.1 / Tasks / Case Studies | 20 |
| 2 | Assignment No.2/ Tasks / Case Studies | 20 |
| 3 | Report submission and Seminar | 20 |
| 4 | Test | 40 |
| Total | | 100 |

9. References:

- Building Construction, S.P Arora and Bindra
- <http://www.bmtpc.org/> - Building materials and technology promotion council
- <https://law.resource.org/pub/in/bis/S03/is.sp.62.1997.pdf> - SP 62 -hand book on Building construction practice

10. Resource Requirements:

Access / Permission for a Construction Site to learn the practical Knowledge.

140CR5119 LAYOUT AND BUILDING APPROVAL

1. Title of the Course:

Layout and Building Approval

2. Aim:

To give basic knowledge on various rules and regulations regarding layout and building approval.

3. Prerequisites:

Students should have a working knowledge of AutoCAD as well as of Microsoft Windows XP or newer.

4. Course Outcomes:

At the end of this course students will be able to

- Learn the various procedures involved in approval of layouts and buildings
- Understand the difference in layout and building approval procedure.
- Know how to plan and prepare layouts according to the town and country planning acts
- Practice in field after graduation, student must be able to serve their clients with proper guidance to get approval for their site for construction of buildings or to prepare layouts.

5. Teaching Strategies:

| S.No | Description | Teaching Methods |
|------|-------------------|------------------|
| 1. | Introduction | PPT |
| 2. | Building approval | PPT |
| 3. | Layout approval | PPT |

6. Syllabus:

Introduction:

DTCP – Types of Building – NBC – Basic Amenities – Building By Laws

Building Approval:

TN_District_Municipalities_Building_Rules_1972&TN_Panchayat_Building_Rules_1997

Layout Approval:

Processing of Layout Papers by the CLPA/NTDA Offices - Layout applications - Approval by the Regional Office - Approval by DTCP - Sub-division and amalgamation of plots - Scrutiny by Local body (Layout applications) - Follow up action by local body on receipt of technical approval for layout proposals

Theory: 10 Hrs

Practical: 20 Hrs

Total: 30Hrs

7. Course Plan:

| No. ofHrs | Topic |
|-----------|-----------------------------|
| 4 | Introduction |
| 3 | Assignment Number 1 |
| 1 | Building Approval |
| 4 | Building Approval |
| 1 | Building Approval |
| 3 | Assignment Number 2 |
| 4 | Layout Approval |
| 2 | Layout Approval |
| 2 | Assignment Number 3 |
| 1 | Assignment Number 3 |
| 3 | Project Work |
| 4 | Project Work |
| 4 | Project Work - Presentation |

8. Course Assessment:

The Grading Pattern will be as Follows:

| S.No | Particulars | Marks |
|--------------|--|------------|
| 1 | Assignment No.1 / Tasks / Case Studies | 20 |
| 2 | Assignment No.2/ Tasks / Case Studies | 20 |
| 3 | Report submission and Seminar | 20 |
| 4 | Test | 40 |
| Total | | 100 |

9. References:

- <http://www.microsurvey.com/products/construction-solutions.htm?gclid=CJiS5p-vb4CFRVvvAodtwEAkA>
- <http://www.tn.gov.in/tcp/>
- <http://www.tn.gov.in/tcp/approvals.html>

10. Resource Requirements:

ZWCAD is needed for doing project

140CR5120 REVIT ARCHITECTURE

1. Title of the Course: Revit Architecture

2. Aim:

To give a good working knowledge of creating Buildings in a 3-Dimensional view with modeling applications using Revit Architecture software.

3. Prerequisites:

A Practical Knowledge on the following subjects

- Computer Aided Engineering Drawing Lab
- Building Drawings

4. Course Outcomes:

At the end of this course students will be able to

- View and study the building components in all the possible views.
- Apply the various anthropometrics for proper planning of building drawings.
- Prepare the building plans in 3-D views.
- Create the building models in software.
- Apply the landscape and architectural views for the building plans.

5. Teaching Strategies:

The teaching Methodology includes

- PowerPoint Presentations/seminar on applications of Revit Architecture and its demo videos by the internal Faculty.
- Exercise of creating building models in software.
- Conducting tests and Evaluation.

6. Syllabus:

Unit 1 – Introduction 2+0

Building information modeling - Revit architecture History – Features - Default project template - Revit file types - Building element - Revit element and families - Starting a project

Unit 2 – Drawing Aids

2+1

Project units – Levels - Adding levels - Modification levels - Remove level lines - Drawing a plan as per dimension – Practice

Unit 3 – Creation of Building Components

4+6

Walls - Doors: Door properties - Placing doors – Windows: Windows properties - Placing window – Components - Loading component - Placing component – Floors: Creating floors – Roofs: Roofs by foot print – Creating Stairs - Practice

Unit 4 – Editing Commands

2+1

Move – Copy – Paste - Editing pasted elements – Rotate – Mirror - Trim/extend - Edit modification properties

Unit 5 - Materials application

2+10

Rendering – Walkthrough - Simple project modeling - Practices on Revit modeling – Tutorials – Evaluation

Total (L+P) = 12+18= 30 hours

7. Course Plan:

| No. of Hrs | Topic |
|-------------------|--|
| 1 | Introduction about Revit architecture and its features – BIM |
| 1 | Starting a Project |
| 4 | Drawing Aids – Units, Level, Dimensions |
| 2 | Building Components Creation – Wall, Door, Windows |
| 4 | |
| 2 | Loading & Placing Components, Floor, Roofs, Staircase |
| 2 | |
| 2 | Editing Commands – Move, Copy, Rotate, Mirror, Trim/Extend |
| 2 | |
| 2 | Material Application – rendering, walkthrough |
| 3 | |
| 3 | Simple project Modeling |
| 2 | Model Creation |

8. Course Assessment:

| S.No | Particulars | Marks |
|--------------|--|--------------|
| 1 | Assignment No.1 / Tasks / Case Studies | 20 |
| 2 | Assignment No.2/ Tasks / Case Studies | 20 |
| 3 | Report submission and Seminar | 20 |
| 4 | Test | 40 |
| Total | | 100 |

9. References:

- revit.downloads.autodesk.com/download/.../GSGArchitectureENU.pdf
- www.sdcpublications.com/pdfs/sample/978-1-58503-694-3-2.pdf
- <http://www.allbookez.com/pdf/91zw5mf/>

10. Resource Requirements:

Revit Architecture Software

V -SEMESTER

11CR011 BASIC FINITE ELEMENT ANALYSIS USING ANSYS APDL

1. Title of the Course:

Basic Finite Element Analysis using ANSYS-APDL

2. Aim:

This course aims to give a good working knowledge of creating 2D and 3D components using Ansys and analysis by applying static loads.

3. Prerequisites:

Students with basic knowledge in the subject of Engineering mechanics, Strength of materials and Finite Element Analysis can undergo this program .

4. Course Outcomes:

At the end of the course students will be able to

- Analyse the component using Finite element method.
- Develop their skills in Strength of materials, FEA and ANSYS14 software.

5. Teaching Strategies:

Each session will be interactive with hands-on practice on 2D/3D analysis. By practicing each exercise student will demonstrate their ability to understand, and create drawings

6. Syllabus:

Stress analysis of rectangular plate-Stress analysis of rectangular plate with hole-Stress analysis of L bracket.-Stress analysis of beams (Cantilever, Simply supported, Fixed ends)-Mode frequency analysis of beams. (Cantilever, Simply supported, Fixed ends)-Harmonic analysis of a 2D component.-Two Dimensional Trusses.-Bicycle Space Frame.-Plane Stress Bracket

7. Course Plan:

| No of Hrs | Topic |
|------------------|--|
| 3 | Stress analysis of rectangular plate |
| 3 | Stress analysis of rectangular plate with hole |
| 3 | Stress analysis of L bracket |
| 3 | Stress analysis of beams beams (Cantilever, Simply supported, Fixed ends) |
| 3 | Mode frequency analysis of beams. (Cantilever, Simply supported, Fixed ends) |
| 3 | Harmonic analysis of a 2D component |
| 3 | Two Dimensional Trusses |
| 3 | Bicycle Space Frame |

| | |
|---|----------------------|
| 3 | Plane Stress Bracket |
| 2 | Revision |

8. Course Assessment:

| S. No | Description | Max. Marks |
|-------------|--|------------|
| 1. | Continuous Assessment I (Quiz/Practicals/Test) | 30 |
| 2. | Continuous Assessment II (Quiz/Practicals/Test) | 30 |
| 3. | Final Assessment (Test / viva voce) | 40 |
| Total Marks | | 100 |

9. References:

- <http://training.altairuniversity.com/>
- <http://altair-india.com/edu/students/html/browseresources.htm>

10. Resource Requirements:

- Software: ANSYS 14.0

11CR012 COMPOSITE MATERIAL PREPARATION & CHARACTERIZATION

1. Title of the Course:

Composite material preparation & characterization

2. Aim:

To impart knowledge in manufacturing and characterization of composite materials.

3. Prerequisites:

- Basic knowledge in material science.
- Basic knowledge in manufacturing process.
- Basic knowledge in strength of materials

4. Course Outcomes:

At the end of the course students will be able to

- Prepare the composite materials.
- Evaluate the composition and properties of composite materials.

5. Teaching Strategies:

| S.No | Description | Teaching Methods |
|------|-------------|--|
| 1. | Unit 1 | PPTs, Videos |
| 2. | Unit 2 | PPTs, Videos |
| 3. | Unit 3 | Practical's on Processing of PMC- Hand layup process, - Compression Moulding process and Processing of MMC-stir casting method |
| 4. | Unit 4 | Performance on Static Mechanical Properties – Fatigue and Impact Properties |

6. Syllabus:

Unit I Introduction to composites and fibers (9)

Definition – Need – General Characteristics, Applications. Fibers – Glass, Carbon, Ceramic, Aramid fibers and Natural fibers.

Unit II Matrix materials (9)

Matrices – Polymer, Graphite, Ceramic and Metal Matrices – Characteristics of fibers and matrices.

Unit III Manufacturing (6)

Processing of PMC Hand layup process-Compression Moulding process. Processing of MMC-stir casting method.

Unit IV Performance (6)

Static Mechanical Properties – Fatigue and Impact Properties

Theory : 9 Hrs
Practical : 21 Hrs
Total : 30 Hrs

7. Course Content:

| No of Hrs | Topic |
|-----------|--|
| 1 | Introduction to composite materials |
| 1 | General Characteristics, Applications of composite materials |
| 3 | Fibers – Glass, Carbon, Ceramic, Aramid fibers and Natural fibers. |
| 3 | Matrices – Polymer, Graphite, Ceramic and Metal Matrices |
| 2 | Characteristics of fibers and matrices. |
| 3 | Processing of PMC -Hand layup process |
| 3 | Processing of PMC- Hand layup process |
| 2 | Processing of PMC- Compression Moulding process |
| 3 | Processing of PMC Hand layup process-Compression Moulding process |
| 3 | Processing of MMC-stir casting method |
| 3 | Processing of MMC-stir casting method |
| 3 | Static Mechanical Properties – Fatigue and Impact Properties |

8. Course Assessment :

| S. No | Description | Max. Marks |
|-------------|--|------------|
| 1. | Continuous Assessment I (Quiz/Practicals/Test) | 30 |
| 2. | Continuous Assessment II (Quiz/Practicals/Test) | 30 |
| 3. | Final Assessment (Test / viva voce) | 40 |
| Total Marks | | 100 |

9. R

eference :

- Mallick, P.K., “Fiber Reinforced Composites: Materials, Manufacturing and Design”, Marcel Dekker Inc, 1993
- Autar K. Kaw, “Mechanics of Composite Materials” CRC Press, 2006

10. Resource Requirements:

Strength of Materials Lab

<http://www.cantab.net/users/bryanharris/Engineering%20Composites.pdf>

11CR013 FACTORY AUTOMATION

1. Title of the Course:

Factory Automation

2. Aim:

To impart knowledge in automation technologies used in Automobile Industries, Packaging Industries, CNC, Home, Factory, Agriculture etc.

3. Prerequisites:

- Basic knowledge in hydraulics and pneumatics
- Basic knowledge in Analog/Digital circuits and electrical drives
- Principles and operations of sensors and transducers
- Basic knowledge in microprocessor based systems

4. Course Outcomes:

At the end of the course students will be able to

- Understand the basics of hydraulics, electro hydraulics and its circuits
- Understand the basics of pneumatics, electro pneumatics and its circuits
- Develop an automation system with suitable sensors
- Interface the electrical drives and sensors with PLC

5. Teaching Strategies:

| S.No | Description | Teaching Methods |
|------|-----------------------------------|---|
| 1. | Hydraulics and Electro Hydraulics | PPTs, Videos and Practices using Hydraulic Instruments |
| 2. | Pneumatics and Electro Pneumatics | PPTs, Videos and Practices using Pneumatic Instruments |
| 4. | Sensorics | PPTs and Practices on different Sensors |
| 5. | Mechatronics | PPTs, Videos and Practices on Bosch Mechatronics System |
| 6. | PLC Programming | PPTs, Videos and Practices on Rexroth PLC |

6. Syllabus:

Unit I Hydraulics

9

Basics of Hydraulics - Components of hydraulics - Types of valves – DCVs - operations - hydraulic Circuits – Electro hydraulics - Solenoids - Relays - Electrical logic circuits - Applications of electro hydraulics - Practices on different types of electro hydraulic circuits.

Unit II Pneumatics

9

Basics of Pneumatics - Components of Pneumatics - Types of valves - DCVs - operations - Pneumatic circuits – Electro pneumatics - Electrical Logic circuit – Relay ladder logic - Applications of electro pneumatics - Practices on different types of electro pneumatic circuits.

Unit III Sensorics

6

Introduction to sensorics - Closed loop system - Types of Proximity sensors - construction - principle of operation - Applications proximity sensors - electrical connections - Practices on all types of proximity sensors

Unit IV Automation System

6

Introduction to Mechatronics system – over view of Automation System – Types of Automation – role of sensors in automation system. Introduction to PLC H/W - Architectural evolution - Role of PLC in Automation - Ladder Logic - Basics of digital logic - Latching - Timers – counters - Selections of PLC - Practices on Ladder logic using PLC.

Theory : 09Hrs
Practical : 21 Hrs
Total : 30 Hrs

Course Plan:

| No. of Hrs | Topic |
|-------------------|--|
| 2 | Basics of Hydraulics, Components and types of valves, Solenoids and relays |
| 4 | Practices on Hydraulic circuits |
| 2 | Practices on Electro Hydraulic circuits |
| 2 | Practical Test – Hydraulic/Electro Hydraulic circuits |
| 1 | Basics of Pneumatics, Components and types of Directional control valves |
| 4 | Practices on Pneumatic circuits |
| 2 | Practices on Electro Pneumatic circuits |
| 2 | Practical Test – Pneumatic/Electro Pneumatic circuits |
| 1 | Types and operations of Proximity sensors |
| 2 | Practices on different types of proximity sensors |
| 2 | Overview of Automation systems, role of sensors and electrical drives |
| 1 | Demo – Mechatronics System |
| 2 | Overview of PLC, H/W structure |
| 1 | Basic digital logic and relay ladder logic |
| 2 | PLC Programming – LD and ST |

8. Course Assessment:

| S. No | Description | Max. Marks |
|--------------|--|-------------------|
| 1. | Continuous Assessment I (Quiz/Practicals/Test) | 30 |
| 2. | Continuous Assessment II (Quiz/Practicals/Test) | 30 |

| | | |
|--------------------|------------------------------------|------------|
| 3. | Final Assessment (Practicals/Test) | 40 |
| Total Marks | | 100 |

9. References:

- Bosch Rexroth User Manuals
- Esposito Anthony, “Fluid Power with Applications”, Pearson Education Inc., New York, 2003.
- W. Bolton “Mechatronics” Pearson education, second edition, fifth Indian Reprint, 2010
- DevadasShetty and Richard A.Kolk, “Mechatronics systems design”, PWS Publishing company 2007.

10. Resource Requirements:

The resources are available at the MCET-BOSCH Rexroth Centre of Excellence.

1. Title of the Course:

Gear Engineering

2. Aim:

To impart knowledge on basics of Gear engineering.

3. Prerequisites:

- Basic knowledge in Kinematics of Machinery
- Engineering drawing
- Engineering Mechanics
- Knowledge in Trigonometry

4. Course Outcomes:

At the end of the course students will be able to

- Understand the gear nomenclature and involuetry
- Understand the gear tooth action
- Develop the spur gear tooth profile.
- Distinguish the various failure modes in gear
- Design the spur and helical gears using AGMA and ISO standards.
- Know the industrial practices in gear manufacturing processes

5. Teaching Strategies:

| S.No | Description | Teaching Methods |
|------|-------------|---|
| 1. | Unit 1 | PPTs, Videos |
| 2. | Unit 2 | PPTs |
| 4. | Unit 3 | PPTs and problem solving |
| 5. | Unit 4 | PPTs and journal reading and interpretation |
| 6. | Unit 5 | Industrial visit |

6. Syllabus:**Unit I****6 Hours**

Review on gear tooth nomenclature, law of gearing interference and undercutting, contact ratio. Gear tooth action, Gear tooth profiles –cycloidal and involute profile, Involuetry, involute profile generation. Addendum modification factor, tipping and topping, backlash

Unit II**6 Hours**

Gear tooth failure modes, Derivation of tooth bending stress and contact stress equations.
Influence of various gear parameters on bending and contact stresses

Unit III**6 Hours**

Introduction to AGMA and ISO standards for spur and helical gear design, Design of spur and helical gear using AGMA and ISO standards for power transmission applications

Unit IV**12 Hours**

NCR , HCR and asymmetric gears and related Journal paper reading and interpretation

Unit V**6 Hours**

Industrial visit and report submission on manufacturing methods and heat treatment process

Theory : 09 Hrs**Practical : 21Hrs****Total : 30 Hrs****7. Course Plan:**

| No of Hrs | Topic |
|------------------|--|
| 3 | Review on gear tooth nomenclature |
| 3 | Design of spur gear using AGMA and ISO |
| 3 | Design of helical gear using AGMA |
| 3 | Development of spur gear profile |
| 3 | Derivation of tooth bending stress and contact stress equations. |
| 3 | Gear tooth failure modes |
| 3 | Introduction to AGMA and ISO standards |
| 3 | NCR , HCR and asymmetric gears |
| 3 | Journal reading , interpretation and Industrial visit report |
| 3 | Heat treatment process |

8. Course Assessment:

| S. No | Description | Max. Marks |
|-------------|--|------------|
| 1. | Continuous Assessment I (Quiz/Practicals/Test) | 30 |
| 2. | Continuous Assessment II (Quiz/Practicals/Test) | 30 |
| 3. | Final Assessment (Practicals/Test) | 40 |
| Total Marks | | 100 |

9. References:

- Hand book of gear design by GitinM .Maitra, 2nd edition,
- AGMA-2001-D04, fundamental rating factor and calculation methods for involute spur and helical gear teeth, AGMA,2001.
- AGMA-908-B89, Geometric factor for determining the pitting resistance and bending strength of spur gear, helical and herringbone gear teeth, AGMA,1989.
- ISO-6336, calculation of load capacity of spur and helical gears
- ISO-6336-2 Calculation of load capacity of spur and helical gears-Part2: Calculation of surface durability(pitting), ISO, 2004

10. Resource Requirements:

- MCET - Machine shop

11CR015 DESIGN AND ASSEMBLY OF OFF ROAD VEHICLE

1. Title of the Course:

Design and Assembly of off road vehicle

2. Aim:

To design the OFF road vehicle based on the load condition and application.

3. Prerequisites:

- Basic knowledge in construction of OFF road vehicles
- Basic knowledge in Engineering Mechanics
- Basic knowledge in Design of machine elements
- Basic knowledge in machine mechanism

4. Course Outcomes:

At the end of the course students will be able to

- Select appropriate subsystem based on dynamic condition
- Calculate various stress behavior on subsystem components

5. Teaching Strategies:

Each session will be interactive with hands-on practice.

- Lecture
- Dismantling and assemblage of subsystems

6. Syllabus:

Construction layout, capacity and applications. Power Plant, Chassis and Transmission – Design of chassis frame and subsystems – suspension and transmission – selection of braking system and Tyres

7. Course Plan:

| No of Hrs | Topic |
|-----------|---|
| 6 | Construction layout, capacity and applications. Power Plant, Chassis and Transmission |
| 5 | Design of chassis frame |
| 5 | Suspension and transmission system calculation |
| 5 | Braking system calculation and selection of subsystem components |
| 4 | Presentation |
| 5 | Assemblage of subsystem components |

Theory : 9Hrs
Practical : 21 Hrs
Total : 30 Hrs

8. Course Assessment:

| S. No | Description | Max. Marks |
|-------------|--|------------|
| 1. | Continuous Assessment I (Quiz/Practicals/Test) | 30 |
| 2. | Continuous Assessment II (Quiz/Practicals/Test) | 30 |
| 3. | Final Assessment (Practicals/Test) | 40 |
| Total Marks | | 100 |

9. References :

- <https://www.youtube.com/watch?v=ViYzgxi3M3g>
- “Automotive chassis” – Rein Paul
-

10. Resource Requirements:

OFF road vehicle system

11CR016 PERFORMANCE AND EMISSION ANALYSIS IN A MULTI-FUEL VCR CI ENGINE

1. Title of the Course:

Performance and Emission analysis in a multi-fuel VCR CI engine.

2. Aim:

- To analyze the engine performance and exhaust emissions under varying load conditions for fixed compression ratio.
- To study the effect of varying the compression ratio on the performance and exhaust emissions of the engine.

3. Prerequisites:

- Basic knowledge in IC engines and air standard cycles.

4. Course Outcomes:

At the end of the course students will be able to

- Gain good knowledge on the performance and emission analysis of IC engines.
- Develop skills for critically analyzing the effect of various design and operating parameters on the engine performance and emissions.

5. Teaching Strategies:

| S.No | Description | Teaching Methods |
|------|-------------|---|
| 1. | Unit I | Black board, PPTs and Videos. |
| 2. | Unit II | Experiments |
| 3. | Unit III | Experiments |
| 4. | Unit IV | Experiments, PPTs, Videos and Practices |

6. Syllabus:

Unit I

6

Combustion phenomenon-Normal and abnormal combustion, factors affecting combustion in CI engines, air motions, Concept of Variable Compression Ratio (VCR) in CI engines.

Unit II

9

Performance and Emission analysis in CI engine with fixed compression ratio.

Unit III

9

Compression ratio variation and its effects on Diesel engine parameters.

Unit IV

6

Analysis of Heat release rate from p- θ curve, Trouble shooting and maintenance.

Theory : 06 Hrs

Practical : 24 Hrs

Total : 30 Hrs

7. Course Content:

| No. of Hrs | Topic |
|-------------------|--|
| 3 | Combustion phenomenon-Normal and abnormal combustion |
| 3 | Factors affecting combustion in CI engines |
| 3 | Air motions , Concept of Variable Compression Ratio (VCR) in CI engines. |
| 3 | Performance and Emission analysis in CI engine with fixed compression ratio |
| 3 | Performance and Emission analysis in CI engine with fixed compression ratio |
| 3 | Performance and Emission analysis in CI engine with fixed compression ratio |
| 3 | Compression ratio variation and its effects on Diesel engine parameters. |
| 3 | Compression ratio variation and its effects on Diesel engine parameters. |
| 3 | Analysis of Heat release rate from p- θ curve, Trouble shooting and maintenance |
| 3 | Analysis of Heat release rate from p- θ curve, Trouble shooting and maintenance |

8. Course Assessment :

| S. No | Description | Max. Marks |
|--------------------|--|-------------------|
| 1. | Continuous Assessment-I (Test / Quiz / Assignment) | 30 |
| 2. | Continuous Assessment-II (Assignment /Test-Analysis using VCR) | 30 |
| 3. | Final Assessment (Test & Viva voce) | 40 |
| Total Marks | | 100 |

9. References:

- Internal Combustion Engine Fundamentals by John Heywood, McGraw Hill Publishers.Computer Simulation of Compression-Ignition Engine Processes by V.Ganesan
- An Introduction to Combustion, Concepts and Applications, S.R.Turns, McGraw-Hill, New York, 1996; Second Edition, 2000

- IC Engines: Combustion and Emissions, B. P. Pundir, Alpha Science International Limited, 2010.

10. Resource Requirements:

Computerized VCR Engine

11CR017 EMBEDDED C PROGRAMMING

1. Title of the Course:

Embedded C programming

2. Aim:

The purpose of this course to impart knowledge in design of embedded control software for the ECU

3. Prerequisites:

- The students must have the basic knowledge about C language
- The students should have the basic knowledge on Electronics

4. Course Outcomes:

At the end of the course Students will be able to

- Write embedded C programs
- Design embedded control software for the ECU

5. Teaching Strategies:

- Lecture
- Power point presentation
- Tutorials

6. Syllabus:

Introduction to Embedded systems-C programming-Data types, Conditional statements and branching-Control structures, Arrays and pointers ,I/O port interfacing-Interrupt programming-ADC interfacing-PWM

7. Course Content

| No of Hrs | Topics |
|-----------|---|
| 3 | Introduction to Embedded systems |
| 4 | C programming -Data types and branching |
| 3 | Conditional statements |
| 3 | Control structures |
| 3 | Arrays and pointers |
| 4 | I/O port interfacing |
| 3 | Interrupt programming |
| 3 | ADC interfacing |
| 4 | PWM |

8. Course Assessment :

| S. No | Description | Max. Marks |
|-------------|--|------------|
| 1. | Continuous Assessment I (Quiz/Practicals/Test) | 30 |
| 2. | Continuous Assessment II (Quiz/Practicals/Test) | 30 |
| 3. | Final Assessment (Practicals/Test) | 40 |
| Total Marks | | 100 |

9. References:

- www.microchip.com
- www.frescale.com
- Embedded systems Architecture, Programming and design by Raj kamal
- Design of Embedded systems by using 8051 microcontroller by Mazid Ali

10. Resource Requirements:

Keil IDE evaluated version

11CR018 OPEN SOURCE PROGRAMMING USING LINUX

1. Title of the Course:

Open source programming using Linux

2. Aim of the Course:

To give introduction about basic file systems and process commands in Linux operating systems.

3. Prerequisites:

- Basic knowledge in DOS and C programming

4. Course Outcomes:

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

- Install Linux OS by partitioning the hard disk
- Control the systems through commands
- Manage the files through file operation commands
- Controlling the process through process commands

5. Teaching Strategies:

| S.No | Description | Teaching Methods |
|------|------------------------------------|--------------------|
| 1. | Linux introduction and file system | PPTs and Practices |
| 2. | Commands for files and directories | |
| 3. | Processes in linux | |
| 4. | Shell programming | |

6. Syllabus

Unit I

7 hours

Linux introduction and file system–Basic features, advantages, installing requirement, basic architecture of UNIX/Linux system, Kernel, Shell.

Unit II

8 hours

Commands for files and directories cd, cp, mv, rm, mkdir, more, less, creating and viewing files, using cat, file comparisons, View files, disk related commands, checking disk free spaces, Essential linux commands.

Unit III

8 hours

Processes in linux –process fundamentals, connecting processes with pipes, Redirecting input output, manual help, Background processing, managing multiple processes, changing process priority, scheduling of processes at command, batch commands, kill,

ps, who,sleep, Printing commands, grep, fgrep , find, sort, cal,banner, touch, file, file related commands–ws, sat, cut,grep, dd, etc.

Unit IV

7 hours

Shell programming: Shell programming basic, various types of shell, shell programming in bash, conditional and looping statements, case statements, parameter passing and arguments, shell variables, shell keywords, creating simple shell programs

Theory : 10 Hrs
Practical : 20 Hrs
Total : 30 Hrs

7. Course Plan:

| No. of Hrs | Topic |
|------------|--|
| 2 | Basic features, advantages, installing requirement |
| 3 | basic architecture of UNIX/Linux system |
| 2 | Kernel, Shell. |
| 2 | cd, cp, mv, rm, mkdir ., Essential linux commands. |
| 2 | creating and viewing files, using cat, file comparisons, View files, |
| 4 | disk related commands, checking disk free spaces |
| 3 | process fundamentals, connecting processes with pipes |
| 2 | Redirecting input output, manual help, Background processing |
| 3 | managing multiple processes, changing process priority, |
| 1 | Shell programming basic, various types of shell |
| 2 | shell programming in bash, conditional and looping statements, case statements |
| 3 | creating shell programs for automate system tasks and report printing |
| 1 | use of grep in shell, awk programming |

8. Course Assessment :

| S. No | Description | Max. Marks |
|--------------------------------------|-----------------------------------|------------|
| 1. | Installing Linux – Lab Exercise | 15 |
| 2. | Linux commands Presentation | 15 |
| 3. | Test on Linux Commands | 30 |
| 5. | Practical Test –Shell Programming | 40 |
| Total (A) | | 100/2 = 50 |
| Problem solving Skill - Interview(B) | | 20 |
| Online Test | | 30 |
| Total Marks (A+B+C) | | 100 |

9. References :

- Linux: The Complete Reference, Sixth Edition ,Richard Petersen .
- <http://www.linux.org/lessons/beginner/>
- <http://www.linux.org/lessons/interm/index.html>
- Peterson , “The Complete Reference Linux” Tata McGRAW HILL .

10. Resource Requirements:

Linux OS

11CR019 SITE SUPERVISION (QUALITY CONTROL)

1. Title of the Course

Site Supervision (Quality Control)

2. Aim:

This course aims to give a basic knowledge of quality control of various construction activities.

3. Prerequisites:

A theoretical Knowledge on the following subjects

- Construction Materials and Methods I
- Construction Materials and Methods II
- Concrete Technology

4. Course Outcomes:

At the end of this course students will be able to

- Understand the Quality Control in different construction activities.
- Experience the various kinds of resources involved in the construction practice.
- Gain knowledge of the quality execution practices
- Verify the quality and standards of materials and construction work.
- Learn the quality ensure process of basic civil engineering materials like cement , Brick, TMT bars , Paver blocks etc.,

5. Teaching Strategies:

The teaching Methodology includes

- Site Visit/Field Work
- PowerPoint Presentations/seminar on construction activities and structures by the internal Faculty
- Assignments on different tasks which is to be followed, learned by the students from construction site.
- Collection of data/reports at the end of every activity and discussing the same

6. Syllabus:

Unit 1 – Introduction

4

Quality Control – list of activities - Factors affecting good quality of construction - Importance of quality on a project in the context of global challenges.

Unit 2 – Materials

7

Raw materials required –Quality of materials – specifications requirements – quality control tests – IS specifications.

Unit 3 – Concrete

6

Mix design of concrete – Tests for quality assurance - slump and compaction factor – Admixture – Strength assurance - workability.

Unit 4 – Construction Practice

6

Water proofing –Building Finishes - Plastering - Painting – pointing – Distempering – Quality control – Steel works – wooden works quality.

Unit 5 – Documentation**7**

Quality manual – Importance, contents, documentation. Importance of check-lists in achieving quality. Typical checklist for concreting activity, formwork activity, steel reinforcement activity.

Total (L+P) = 4+26 = 30 hours

7. Course Plan:

| No. of Hrs | Topic |
|------------|---|
| 1 | Introduction about the Course |
| 2 | Lectures on Field Visit and Model Reports |
| 4 | Field Visit – on learning about material specifications and their quality maintenance |
| 4 | Field Work – on learning the Concreting and its quality controls and specifications |
| 5 | Field Work – on learning sequence of construction activities as followed in construction site, study of building plan and construction practices and their quality control in Masonry |
| 5 | Field Work – on learning water proofing ,steel works and wooden works |
| 4 | Field Work –on learning about documentation related to quality control |
| 5 | Seminar/PPT Presentation |

8. Course Assessment:

The Assessment includes

- Attendance (Reporting in College)
- Attendance sheet signed by Project manager or Project engineer in construction site
- Report Submission
- Assignment 1 – Collecting the Photo proof of components of structures
- Assignment 2 –presentation about the field visit learning
- Assignment 3 – Presenting seminar about their course of learning and report submission
-

The Grading Pattern will be as Follows:

| S.No | Particulars | Marks |
|--------------|--|------------|
| 1 | Assignment No.1 / Tasks / Case Studies | 20 |
| 2 | Assignment No.2/ Tasks / Case Studies | 20 |
| 3 | Report submission and Seminar | 20 |
| 4 | Test | 40 |
| Total | | 100 |

9. References:

- Building Construction, S.P Arora and Bindra
- <http://www.bmtpc.org/> - Building materials and technology promotion council

- <https://law.resource.org/pub/in/bis/S03/is.sp.62.1997.pdf> - SP 62 -hand book on Building construction practice

10. Resource Requirements:

Access / Permission for a Construction Site to learn the practical Knowledge.

11CR020 REINFORCEMENT DETAILING AND BAR BENDING SCHEDULES

1. Title of the Course

Reinforcement Detailing and Bar Bending Schedules

2. Aim:

This course aims impart knowledge to understand the drawings, prepare a bar bending schedule indicating the grade of steel, its diameter and length of the bar, number of bars to be cut to fabricate them into the desired shape.

3. Prerequisites:

Theoretical Knowledge on

- Mechanics of solids
- Basic structural Design
- Design of Reinforced Concrete Elements

4. Course Outcomes:

At the end of this course students will be able to

- Identify the behaviour of structural members based on loading
- Identify the failure modes of member without reinforcement.
- Evaluate the reinforcement to overcome the structural failure
- Provide adequate reinforcement in failure zones
- Study the BBS and be able to check the reinforcements in field

5. Teaching Strategies:

The teaching Methodology includes

- Designing the various structural elements.
- Reinforcement detailing for structural elements.
- Designing the various special concrete structures like water tank, footings etc.
- Reinforcement detailing for special concrete structures.

6. Syllabus:

Unit 1 – Introduction

3

Need for reinforcement – finding reinforcement zones – studying about the reinforcement materials

Unit 2 – Design and Detailing of Beams

8

Designing and detailing of main and shear reinforcements on types of beams based on its requirements – singly reinforced beams - doubly reinforced beams – T beams – Spandrel beams

Unit 3 – Design and Detailing of Columns

8

Designing and detailing of main and shear reinforcements on types of columns based on its requirements – Axially loaded columns - uniaxially loaded columns - biaxially loaded columns

Unit 4 – Design and Detailing of Slabs and Staircases

8

Designing and detailing of types of slabs and staircases based on its requirements – One way and Two way slabs – Dog legged staircases, Waist slabs

Unit 5 – Design and Detailing of Footings**8**

Designing and detailing of types of footings- isolated footing – combined footing – raft footing – foundation on expansive soils

Total = 30 hours**7.Course Plan:**

| No. of Hrs. | Topic |
|--------------------|--|
| 1 | Need for reinforcement |
| 1 | Finding reinforcement zones |
| 1 | Studying about the reinforcement materials |
| 3 | Designing and detailing of singly reinforced beams |
| 3 | Designing and detailing of doubly reinforced beams |
| 3 | Designing and detailing of T beam |
| 3 | Designing and detailing of Spandrel beam. |
| 3 | Designing and detailing of main and shear reinforcements in Axially loaded and uniaxially loaded columns |
| 3 | Designing and detailing of One way and Two way slabs |
| 3 | Designing and detailing of types of stair cases |
| 3 | Designing and detailing of isolated footings |
| 3 | Designing and detailing of combined footings |

8. Course Assessment:

| S.No | Particulars | Marks |
|--------------|--|--------------|
| 1 | Assignment No.1 / Tasks / Case Studies | 20 |
| 2 | Assignment No.2/ Tasks / Case Studies | 20 |
| 3 | Report submission and Seminar | 20 |
| 4 | Test | 40 |
| Total | | 100 |

10. References:

- Design of RC elements by P.C.Varghese
- Design of Reinforced concrete structures by pillai and manon
-

11. Resource Requirements:

Class room, Equipments

1. Title of the Course:

Building Service Practices –Mechanical, Electrical, Plumbing and Interior

2. Aim:

This course aims to train students who are keen to acquire skills in design, installation, operation and monitoring of the mechanical, electrical, and public health systems, and also to impart knowledge on construction materials and building codes required for the safe, comfortable and environmentally friendly operation of modern buildings

3. Prerequisites:

Basic Knowledge on materials and tools used for standard residential plumbing projects, CADD drawings, calculations involved in supply and collection of waste waters and National Building Codes

4. Course Outcomes:

At the end of this course students will be able to

- Describe the components and assembly techniques required for electrical services.
- Describe the components and assembly techniques required for the construction of standard piping and water supply systems.
- Describe the application and installation of standard plumbing fixtures and water-based appliances.
- Create a strong foundation in the basic principles and elements of design, drawing and color in order to develop a non-verbal design language, visual logic, and fluency of expression
- Learn to think critically about a design problem before, during and after creating a design solution
- Develop skills in applying design principles in a wide variety of residential and non-residential projects;
- Develop the ability to solve and present problems clearly, creatively and quickly

5. Teaching Strategies:

| S.No | Description | Teaching Methods |
|------|-----------------------------------|------------------------------------|
| 1. | Water supply and drainage systems | PPT / Lecture Notes/ Demonstration |
| 2. | Electrical services | PPT / Lecture Notes/ Demonstration |
| 3. | Layout of simple buildings | Using the Software ZWCAD 2011 |
| 4. | Interior architecture and design | PPT / Demonstration |

6. Syllabus:**UNIT-1 Water Supply And Drainage Systems**

Pipes - Types and sizes of pipes, special installation in multistoried buildings. Material, types of fixtures and fitting for a contemporary bathroom– taps – quarter turn, half turn, ceramic, foam flow etc. Rainwater harvesting -sizes of rainwater pipes Principles of

drainage, surface drainage, shape and sizes of drains and sewers, storm water over flow chambers, Types of fixtures and materials: sinks, shower tray, shower temple, bath tub, Jacuzzi, water closets, flushing cisterns, sinks , wash basins, bidet

UNIT-2 Electrical Services

Electrical systems– Basic of electricity – single/Three phase supply– protective devices in electrical installation – Earthing for safety – Types of earthing– ISI Specifications. Electrical installations in buildings – Types of wires, Wiring systems and their choice – planning electrical wiring for building – Main and distribution boards.

UNIT-3 Layout Of Simple Buildings

Application of above studies in current design problems and preparing design layout and details - Plumbing layout of residential and public buildings. Electrical layout of a simple residential, school and commercial building

UNIT -4 Interior Architecture And Design

Introduction to interior design – Basic design – Design Principles – Geometric constructions – Dimensioning – plan – elevation and sectioning – perspective – pencil rendering – Design process – Design elements – Space planning – human Dimensions – Interior Landscaping – Estimation and specification – Professional Practice – Design Process.

7. Course Plan:

| No. of Hrs | Topic |
|-------------------|---|
| 2 | Pipes - Types and sizes of pipes, special installation in multistoried buildings. Material, types of fixtures and fitting for a contemporary bathroom– taps – quarter turn, half turn, ceramic, foam flow etc. Rainwater harvesting -sizes of rainwater pipes Principles of drainage, surface drainage, shape and sizes of drains and sewers, storm water over flow chambers, |
| 2 | Types of fixtures and materials: sinks, shower tray, shower temple, bath tub, Jacuzzi, water closets, flushing cisterns, sinks , wash basins, bidet, etc. |
| 2 | Collection of Various materials required for different types of buildings |
| 4 | Electrical systems– Basic of electricity – single/Three phase supply– protective devices in electrical installation – Earthing for safety – Types of earthing– ISI Specifications |
| 4 | Electrical installations in buildings – Types of wires, Wiring systems and their choice – planning electrical wiring for building – Main and distribution boards. |
| 4 | Application of above studies in current design problems and preparing design layout and details - Plumbing layout of residential and public buildings Electrical layout of a simple residential, school and commercial building |
| 3 | Drawing the layout for different types of buildings |
| 4 | Introduction to interior design – Basic design – Design Principles – Geometric constructions – Dimensioning – plan – elevation and sectioning – perspective – pencil rendering |

| | |
|---|--|
| 2 | Design process – Design elements – Space planning – human Dimensions – Interior Landscaping – Estimation and specification – Professional Practice – Design Process. |
| 3 | Drawing different views and pencil rendering for different types of buildings |

8. Course Assessment:

| S.No | Particulars | Marks |
|--------------|--|--------------|
| 1 | Assignment No.1 / Tasks / Case Studies | 20 |
| 2 | Assignment No.2/ Tasks / Case Studies | 20 |
| 3 | Report submission and Seminar | 20 |
| 4 | Test | 40 |
| Total | | 100 |

9.References:

- Interior Architecture and Design – Reference Guide 1 & 2
- Water, Sanitary and Waste Services for buildings – A.F.E .Wise and J.A.Swaffield
- Building Services Handbooks
- National Building code
- For practical session materials required for plumbing such as different types and sizes of pipes, equipments required for threading are required. For drawing plumbing and
- electrical layouts plan of various residential, industrial buildings are required

10.Resource Requirements:

- ZWCADDSoftware.

COURSES OFFERED & SYLLABI – CORE STREAM (EVEN SEMESTERS)

| Year/ Sem | Course Code | Course Title |
|--------------|-------------|---|
| II/IV | 140CR5111 | Basic Solid Modeling using CATIA-V6 |
| | 140CR5117 | Welding Technology |
| | 14ocr5121 | Basic Finite Element Pre-processing using Hypermesh |
| | 140CR5114 | Solid edge – 2D drafting and 3D modelling fundamentals |
| | 140CR5115 | Fundamentals of C programming |
| | 140CR5112 | Basics and Applications of MATLAB |
| | 140CR5116 | Automotive Sales and Service |
| | 140CR5122 | Site Supervision (Building Construction) |
| | 14CR5123 | Surveying using Total Station |
| | 14OCR5124 | Construction Sequence of Residential Buildings |
| III/VI | 11CR016 | Performance and emission analysis in a multi-fuel VCR CI engine |
| | 11CR022 | Micro structural characterization of materials |
| | 11CR014 | Gear Engineering |
| | 11CR023 | Automotive Air-conditioning System |
| | 11CR024 | Vehicle Body Engineering |
| | 11CR015 | Design and Assembly of offroad vehicle |
| | 11CR025 | Engineering Analysis using Ansys-workbench |
| | 11CR013 | Factory Automation |
| | 11CR017 | Embedded C Programming |
| | 11CR026 | Automotive Electrical and Electronics |
| | 11CR027 | Site Supervision (Project Quantity Surveying) |
| | 11CR028 | Industrial Safety and Environmental Audit |

| | | |
|--|---------|-----------|
| | 11CR029 | STAAD Pro |
|--|---------|-----------|

IV -SEMESTER

140CR5111 BASIC SOLID MODELING USING CATIA V6

1.Title of the Course:

Basic Solid Modeling using CATIA V6

2. Aim:

To impart basic knowledge in modeling, assembly and drafting of the different machine components.

3. Prerequisites:

- Basic knowledge in Engineering graphics and Machine Drawing.
- Basic knowledge in AUTOCAD.
- Exposure to commands for modeling and assembly.

4. Course Outcomes:

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

- Model simple components.
- Sketch any type of 3D assemblies for a wide range of mechanical engineering processes.
- Apply solution to model complex and intelligent products through the systems engineering approach.

5. Teaching Strategies:

| S.No | Description | Teaching Methods |
|------|-------------|---|
| 1. | Unit 1 | PPTs, Videos and demo of tool |
| 2. | Unit 2 | PPTs, Videos and Practices on CATIA V6 software |
| 4. | Unit 3 | PPTs, Videos and Practices on CATIA V6 software |
| 5. | Unit 4 | PPTs, Videos and Practices on CATIA V6 software |
| 6. | Unit 5 | PPTs, Videos and Practices on CATIA V6 software |

6. Syllabus:

Unit I Introduction

3

Basics of CATIA – Commands of CATIA – field of Operation – Comparison of CATIA V5 and CATIA V6 – Industrial application.

Unit IISketcher

9

Introduction of sketching – workbench coordinate system - Profile creation tools for creating 2D sketch – modifying the sketch created – setting units – construction – creating basic sketch operation – Trim options – making positions.

Unit III Part Modeling**9**

Concept of 3D and part design terminology – creating base features – creating reference – fillet and orientation.

Unit IV Assembly, wireframe and surface design**9**

Assembly – document assigning properties – product tools – saving assembly – viewing product structure – introduction to wireframe and surface design – splines – sweep – extracting edges – checking connection between curves

Unit V drafting**6**

Introduction – workbench & defining sheet size – adjusting drawing sheets – use predefined drafting styles – scaling the drafted view.

Theory: 9 Hrs Practical: 21 Hrs Total: 30 Hrs

7. Course Plan:

| No. of Hrs | Topic |
|------------|---|
| 2 | Basics of CATIA – Commands of CATIA – field of Operation – Comparison of CATIA V5 and CATIA V6 – Industrial application |
| 1 | Introduction of sketching – workbench coordinate system - Profile creation tools for creating 2D sketch |
| 1 | Creating basic sketch operation – Trim options – making positions. |
| 1 | Tutorials |
| 1 | Tutorials |
| 2 | Concept of 3D and part design terminology – creating base features |
| 1 | Tutorials |
| 1 | Tutorials |
| 1 | Tutorials |
| 2 | Assembly – document assigning properties , Introduction to wireframe and surface design |
| 1 | Tutorials |
| 1 | Tutorials |
| 1 | Tutorials |
| 3 | Introduction – workbench & defining sheet size |
| 3 | Tutorials |
| 2 | Tutorials |
| 5 | Mini Project |

8. Course Assessment :

| S. No | Description | Max. Marks |
|-------|--|------------|
| 1. | Continuous Assessment I (Assignment/Modeling) | 30 |
| 2. | Continuous Assessment II (Assignment/Modeling) | 30 |
| 3. | Final Assessment (Test) | 40 |

| | |
|-------------|-----|
| Total Marks | 100 |
|-------------|-----|

9. References:

Study Material and Manuals on CATIA16

10. Resource requirements:

CATIA Software Version 6

140CR5117 WELDING TECHNOLOGY

1. Title of the course:

Welding Technology

2. Aim:

To impart the students with basic knowledge and skill in welding metals using SMAW, GMAW and GTAW welding process.

3. Prerequisites:

- Basic knowledge in welding process and its applications.
- Knowledge on different fabrications methods.

4. Course Outcomes:

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

- List down different types of welding processes
- Explain the different positions of welding
- Operate SMAW, GMAW and GTAW machines
- Acquire the skills in welding metals using SMAW, GMAW and GTAW processes.

5. Teaching Strategies:

| S.No | Description | Teaching Methods |
|------|-------------|---|
| 1. | Unit 1 | PPTs, Videos and demo |
| 2. | Unit 2 | PPTs, Videos and demo |
| 4. | Unit 3 | Hands on training using the SMAW, GMAW and GTAW process to variable joints and position |
| 5. | Unit 4 | |
| 6. | Unit 5 | |

6. Syllabus:

Unit I Welding Introduction

3

Introduction to welding – Development of welding technology – Difference between welding, brazing and soldering – Classification of welding - Melting point of materials - Welding Safety – Welding safety equipment – welding accessories - Open Circuit Voltage (OCV) – Duty cycle – Polarity - Welding arc - SMAW process description – Constant Current (CC) process welding parameters -Welding Positions – types welding passes - Equipment Setup - Welding defects - Welding parameters - Electrode designation- electrode types - storage of electrodes – application - Advantages and disadvantages.

Unit II Types of welding process

3

Classification of metal joining processes, Methods of joining, Mechanical methods, Metallurgical in welding, Brazing and soldering.

Unit III Welding using SMAW process

8

Hands on training using the SMAW process for various joints and positions

Unit IV Welding using GMAW process

8

Hands on training using the GMAW process for various joints and positions

Unit V Welding using GTAW process

8

Hands on training using the GTAW process for various joints and positions

Theory: 06 Hrs Practical: 24 Hrs Total: 30 Hrs

7. Course Plan:

| No. of Hrs | Topic |
|------------|---|
| 3 | Introduction to welding – Development of welding technology – Difference between welding, brazing and soldering – Classification of welding - Melting point of materials - Welding Safety – Welding safety equipment – welding accessories - Open Circuit Voltage (OCV) – Duty cycle – Polarity - Welding arc - SMAW process description – Constant Current (CC) process welding parameters -Welding Positions – types welding passes - Equipment Setup - Welding defects - Welding parameters - Electrode designation- electrode types - storage of electrodes – application - Advantages and disadvantages. |
| 3 | GMAW Process description, GMAW Gun description, GMAW Welding wire, Gases used in GMAW process, GMAW process application, welding technique Advantages and disadvantages of processes. GTAW Process description, GTAW torch description, GTAW filler wire, Gases used in GMAW process, GMAW process application, welding technique, Advantages and disadvantages of processes. |

| | |
|---|--|
| 3 | SMAW process Machine Demo and Hands on training Build Up Welding 1G Hands on training 1G Hands on training |
| 3 | 2G Hands on training |
| 3 | 3G Hands on training |
| 3 | 4G Hands on training |
| 3 | GMAW process Machine Demo and Hands on training Build Up Welding, 1G Virtual Simulator training, 1G Hands on training |
| 3 | 2G, 3G Hands on training |
| 3 | 2F & 4F Hands on training |
| 3 | GTAW process Machine Demo and Hands on training Build Up Welding, 1G Hands on training |

8. Course Assessment:

| S. No | Description | Max. Marks |
|-------------|--|------------|
| 1. | Continuous Assessment (Assignment, model making) | 30 |
| 2. | Continuous Assessment (Assignment, model making) | 30 |
| 3. | Final Assessment (model making) | 40 |
| Total Marks | | 100 |

9. References:

- Techniques of electric Welding, Author Dietmar Muhs - German
- GMAW / MIG – Welding, Author Dietmar Muhs - German
- GTAW / TIG – Welding, Author Dietmar Muhs – German
- Welding Symbol Basics, Author J.P. Christein and Pamela Coates
- Consumables classification Tables, www.weldingwire.com
- <http://www.BOOnline.co.uk>
- <http://www.nimionlinelearning.gov.com>

10. Resource Requirements:

Welding laboratory with SMAW, TIG and MIG machines

14OCR5121 BASIC FINITE ELEMENT PRE-PROCESSING USING HYPERMESH

1.Title of the Course:

Basic Finite Element Pre-processing using Hypermesh

2. Aim:

- To learn how to model 1D,2D and 3D components using toHypermesh import a CAD model from the CAD software in IGES format.
- To generate meshes.
- To do a stress analysis on the component by applying static loads on the contact surfaces.
- To do Post Processing by means of simulation.

3. Prerequisites:

Students with basic knowledge in the subject of Engineering mechanics, Strength of materials and Finite Element Analysis can undergo this program .

4. Course Outcomes:

At the end of the course students will be able to:

- Develop analysis for today's customers – not limited to analysis, but also a virtual simulation of how the product reacts to the particular type of load in 3D.
- Develop their skills in understanding Strength of materials, FEA and Ansys14.
- Work independently on similar CAE software, adopt CAE in their project work, compete in CAE contests and identify a career in CAE.

5. Teaching Strategies:

Each session will be interactive with hands-on practice on 2D/3D analysis. By practicing each exercise student will demonstrate their ability to understand, and create drawings

6. Syllabus:

Introduction to Finite Element Analysis-GUI of Hyper mesh-Geometry Input and Clean up, Geometry Input and Cleanup-1 D connectivity-2D Meshing-Quality Check-3D Meshing

Theory : 9Hrs
Practical : 21 Hrs
Total : 30 Hrs

7. Course Plan:

| No of Hrs | Topic |
|------------------|---|
| 3 | Introduction to Finite Element Analysis |
| 1 | GUI of Hyper mesh |
| 1 | Geometry Input and Clean up |
| 3 | Geometry Input and Clean up |
| 1 | 1 D connectivity |
| 3 | 1 D connectivity |
| 1 | 2D Meshing |
| 3 | 2D Meshing |
| 3 | 2D Meshing |
| 1 | Quality Check |
| 3 | 3D Meshing |
| 3 | 3D Meshing |
| 3 | 3D Meshing |
| 1 | Course Assessment test |

8. Course Assessment :

| S. No | Description | Max. Marks |
|--------------|---|-------------------|
| 1. | Continuous Assessment(Quiz, Assignment, Test) | 30 |
| 2. | Continuous Assessment (Modeling, Test) | 30 |
| 3. | Final Assessment(Analysis, Simulation, Test) | 40 |
| Total Marks | | 100 |

9. References:

- <http://training.altairuniversity.com/>
- <http://altair-india.com/edu/students/html/browseresources.htm>

10. Resource Requirements:

Software-Hypermesh- The following resources are available at the ALTAIR Centre of Excellence

140CR5114 SOLID EDGE 2D DRAFTING AND 3D MODELING FUNDAMENTALS

1. Title of the Course :

Solid Edge 2D Drafting and 3D Modeling Fundamentals

2. Aim:

Learn to create and edit 2D and 3D drawings with the use of Solid Edge ST5.

3. Prerequisites:

Students with basic knowledge in the subject of Engineering Graphics and Computer Aided Drafting can undergo this program - II Year Automobile/Mechanical, IV Semester students.

4. Course Outcomes:

At the end of the course students will be able to,
Develop 2D layout and also view a visual representation of the product in 3D.
Improve their skills in understanding engineering drawings and Solid Edge ST5 software.

5. Teaching Strategies:

Each session will be interactive with hands-on practice on 2D/3D drawings. By practicing each exercise student will demonstrate their ability to understand, and create drawings

6. Syllabus:

1. Part modeling – Sketching: Tool bars – Draw, Feature & Relationship toolbars, Smart Dimensioning & Modifying Dimensions, and Applying Constraints, Patterning
2. Part modeling – 3D modeling: Planes, Feature toolbar, Protrusion, Revolve, loft, sweep, Cutout, Ribbon toolbar, Modifying 3D Model -Round, chamber, Rib, hole, etc., Reference Planes, coordinate system, Edit Definition, Edit Profile, Dynamic edit, Advanced Modeling Techniques – Thin wall, Mirror copy Feature, Patterning, Draft, Constriction display, Physical Properties
3. Assembly: Creating relationship – mate, align, insert, connect, angle, flash fit Construction display, Activate part, Occurrence properties, Floating offset, fixed offset, Lock/Unlock relationship.
4. Drawing Production: Drawing Views toolbar, Drawing Wizard, Creating Different Views - Principle views, auxiliary views, section & detail views, Draw Sketch, Activate Part, Part list, Text, leader annotation & weld symbols, Balloons. Retrieve dimension and Use of symbols.

7. Course Plan:

| No. of Hrs | Topic |
|------------|-----------------------------|
| 6 | Part modeling – Sketching |
| 6 | Part modeling – 3D modeling |
| 6 | Assembly |
| 6 | Drawing Production |
| 6 | Project |

8. Course Assessment :

Students' progress is assessed based on their ability to use and create 2D/3D modeling in Solid Edge software. Each session will include one or the other type of drawings and students should aim to complete the drawing within allotted duration.

| S. No | Description | Max. Marks |
|-------------|---|------------|
| 1. | Continuous Assessment(Quiz, Assignment, Test) | 30 |
| 2. | Continuous Assessment (Modeling, Test) | 30 |
| 3. | Final Assessment(Modeling, Assembly, Test) | 40 |
| Total Marks | | 100 |

9. References:

- Solid Edge ST5 self-paced training offered by Siemens
- <http://support.industrysoftware.automation.siemens.com/training/se/en/SESPT.cfm>
- Softcopy materials will be made available as appropriate

10. Resource Requirements:

The following resources are available at the Siemens Centre for Digital Manufacturing.

1. Title of the Course:

Fundamentals of C programming

2. Aim of the Course:

- To develop and execute error free C programs.
- To understand the mechanisms for controlling flow statements.
- To learn about functions, pointers and Structures.

3. Prerequisites:

NIL

4. Learning Goals/Outcomes

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

- Attempt algorithmic solutions to problems
- Design and code a medium application
- Read, understand and modify code written by others

5. Teaching Strategies:

| S.No | Description | Teaching Methods |
|------|---------------------------------|--------------------|
| 1. | Introduction To 'C' Language | PPTs and Practices |
| 2. | Functions And Arrays | PPTs and Practices |
| 3. | Pointers, Structures And Unions | PPTs and Practices |

6. Syllabus:**INTRODUCTION TO 'C' LANGUAGE****(12)**

Design Style, coding style, functions and operators.

FUNCTIONS AND ARRAYS**(10)**

Functions definition and declaration- function types, Actual and formal arguments, Recursion array notation and Declaration, Processing with arrays, Array and Function.

POINTERS, STRUCTURES AND UNIONS**(8)**

Pointer Declaration ,Pointer Arithmetic, Pointer And Functions, Structure- Union-Bitfields- Typedef –Enumerations

Theory : 10 Hrs**Practical : 20 Hrs****Total : 30 Hrs**

7. Course Plan:

| No. of Hrs | Topic |
|------------|---|
| 3 | C Introduction ,Character Set,Variables And Identifiers |
| 3 | Data Types, Operators And Expressions, Arrays |
| 3 | Basic Input/Output Statement, Decision Making Within A Program, Conditions |
| 3 | Conditional And Looping Statements |
| 3 | Functions Definition And Declaration- Function Types, Actual And Formal Arguments |
| 3 | Recursion Array Notation And Declaration |
| 3 | Processing With Arrays, Array And Functions |
| 3 | Pointerdeclaration,Pointer Arithmetic, Pointer And Functions |
| 3 | Structure & Union, Bitfields-Typedef , Enumerations |
| 3 | Tutorial |

8. Course Assessment:

| S. No | Description | Max. Marks |
|--------------|--|------------|
| 1. | Solving a Problem,Logic for a Problem,Algorithm Development, Choosing appropriate concepts for solving the problem | 60 |
| 2. | Practical Test - FUNCTIONS AND ARRAYS | |
| 3. | Practical Test - POINTERS, STRUCTURES AND UNIONS | 40 |
| Total | | 100 |

9.References:

- <http://www.tutorialspoint.com/java/>
- <http://academy.javacodegeeks.com/course/advanced-java/>
- Herbert Schildt,**Java The Complete Reference, Seventh Edition:** The Complete Reference, Seventh Edition
- Raymond Gallardo, Scott Hommel, SowmyaKannan, Joni Gordon, Sharon BioccaZakhour, **The Java Tutorial: A Short Course on the Basics** ,sixth edition

10.Resource Requirements:

Turbo C++

140CR5112 BASICS AND APPLICATIONS OF MATLAB

1.Title of the Course :

Basics and applications of MATLAB

2.Aim:

- To provide the students with the opportunity to improve their programming skills using MATLAB environment.
- To use the MATLAB as a tool in solving engineering problems.

3. Prerequisites:

- Familiarity with mathematics
- Basics of Engineering Mechanics and Strength of Materials
- Knowledge about working of various systems in automobile vehicle
- The ability to formulate an engineering problem in a mathematical form appropriate for subsequent computational treatment and to choose an appropriate numerical approach.

4. Course Outcomes:

At the end of the course students will be able to

- Write simple program modules to implement simple numerical methods and algorithms
- Solve engineering problems using standard numerical methods
- Develop MATLAB scripts implementing programming solutions for a problem.
- Interpret data using 2D and 3D visualization methods.

5.Teaching Strategies:

- Lecture
- Power point presentation
- Tutorials / Assignments
- Encouraging Co-operating Learning

6. Syllabus:

MATLAB: Starting with MATLAB - Mathematical operations with array – Script files
- Two dimensional plots. Function – Programming – Polynomials, Curve fitting and interpolations - Three dimensional plots – Numerical Methods Application.

Theory : 10 Hrs

Tutorials : 20 Hrs

Total : 30 Hrs

7.Course Plan:

| No of Hrs | Topic |
|-----------|--|
| 3 | Working in the command window ,Arithmetic operations with scalars ,Display formats ,Elementary math built-in functions Defining scalar variables,Useful commands for managing variables |
| 3 | Creating a one-dimensional array (vector) ,Creating a two-dimensional array (matrix) ,The zeros, ones and eye commands ,The transpose operator Array addressing ,Built-in functions for handling arrays ,Strings and strings as variables. |
| 3 | Addition, subtraction, Array multiplication, Array division, Element-by-element operations,Using arrays in Matlab built-in math functions Built-in functions for analyzing arrays ,Generation of random numbers |
| 3 | Creating and saving a script file,Running a script file ,Global variables Input to a script file ,Output commands |
| 3 | Tile plot command,Plot of Given Data ,Function ,The fplot command Plotting multiple graphs in The SAME PLOT ,Formatting a plot Plots with logarithmic axes,Plots with special Graphics,Plotting multiple plots on the Same Page |
| 3 | Creating a Function File ,Structure of Function File |
| 3 | Examples of Simple Function Files,Comparison between Script Files and Function Files |
| 3 | Polynomials, Curve Fitting, and Interpolation,Three-Dimensional Plots |
| 3 | Applications in Numerical Analysis |
| 3 | Tutorial,Test |

8.Course Assessment :

| S. No | Description | Max. Marks |
|-------------|---|------------|
| 1. | Continuous Assessment I (Assignment /Test) | 30 |
| 2. | Continuous Assessment II (Assignment /Test) | 30 |
| 3. | Final Assessment (Test) | 40 |
| Total Marks | | 100 |

9.References:

<http://www.mathworks.in/services/training/courses>

3. Rao V. Dukkipati, MATLAB for Mechanical Engineers”, New Age Science, Limited, 2009

4. Amos Gilat," MATLAB An Introduction with applications", John Wiley & Sons, 2004.

10.Resource Requirements:

Software - MATLAB

140CR5116 AUTOMOTIVE SALES AND SERVICE

1. Title of the Course:

Automotive sales and service

2. Aim:

To enhance the practical skills in automotive vehicle technology

3. Prequisites:

Basic knowledge on motor vehicles.

4. Course Outcomes:

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

- Learn the fundamentals of vehicle maintenance
- Learn Brake, steering, wheel balancing and suspension systems according to vehicle performance Characteristics
- Gain knowledge about various shop floor equipments

5. Teaching Strategies:

The teaching mode will contain both theory as well as practical classes. Additionally the seminars to be delivered by experts from industry will give more details about emerging trends in the field. Also the students should undergo a training program in various service centres .

6. Syllabus:

Chapter -1 –Introduction Requirements and importance of maintenance, types of maintenance, Preparation of check lists, Inspection schedule, maintenance of records,Safety precautions in maintenance,Motor vehicle acts, insurance etc and traffic rules,Vehicle body maintenance, minor and major repairs.Door locks and window glass actuating system maintenance

Chapter -2-Engine maintenance Dismantling of engine components and cleaning, cleaning methods, Visual and dimensional inspections,Minor and major reconditioning of various components,Reconditioning methods, Engine assembly, Special tools used for maintenanceOverhauling, Engine tune up

Chapter -3 - Chassis Components Maintenance Mechanical and automobile clutch, fluid flywheel, torque converter, Automatic transmission and gear box, servicing and maintenance. Maintenance, servicing of propeller shaft and differential system. Maintenance and servicing of suspension systems. Maintenance and servicing of Brake systems, Maintenance and servicing of Steering systems, Wheel alignment, computerized alignment and wheel balancing.

Chapter -4-Electrical And Electronic System Maintenance – Servicing Testing methods for checking electrical and electronic components, Servicing of battery, starter motor, charging systems, Maintenance and servicing of alternator, ignitions system, lighting systems. Fault diagnosis and maintenance of modern electronic controls, Checking and servicing of dash board instruments.

Chapter-5-Maintenance Of Fuel / Cooling / Lubrication System-Servicing and maintenance of fuel system of different types of vehicles, Calibration and tuning of engine for optimum fuel supply. Cooling systems, water pump, radiator, thermostat, Anticorrosion and antifreeze additives. Lubrication maintenance, lubricating oil changing, greasing of parts.

7. Course plan:

| No of Hrs | Topic |
|-----------|--|
| 1 | Basic Engine Principles |
| 1 | Engine Removal |
| 1 | Engine Disassembly |
| 1 | Valve Train And Cylinder Head Reconditioning |
| 1 | Engine Crankshaft, Bearings And Oil Pump |
| 1 | Cylinder And Piston Reconditioning |
| 1 | Engine Reassembly |
| 1 | Engine Installation |
| 1 | Cooling System |
| 1 | Engine Lubrication System |
| 1 | Exhaust System |
| 2 | Fuel System |
| 1 | Clutch Assembly |
| 2 | Standard Transmission |
| 1 | Rear Axle |
| 1 | Transfer Case Diagnosis And Removal |
| 2 | Transfer Case Disassembly, Cleaning, Adjustment And Reassembly |
| 1 | Basic Electrical Theory |
| 1 | Battery Service |
| 1 | Charging System |

| | |
|---|-----------------|
| 1 | Starting System |
| 1 | Ignition System |
| 1 | Wheel Bearings |
| 2 | Brake Systems |
| 2 | Disc Brakes |

8.Course Assessment:

| S. No | Description | Max. Marks |
|-------------|--|------------|
| 1. | Continuous Assessment I (Quiz/Practicals/Test) | 30 |
| 2. | Continuous Assessment II (Quiz/Practicals/Test) | 30 |
| 3. | Final Assessment (Test / viva voce) | 40 |
| Total Marks | | 100 |

9. References:

- Automotive Mechanics by Crouse and Angelin , McGraw Hill publication
- Service Manuals from Different Vehicle Manufacturers
- Automotive Technology, James Helderma, Pearson Education
- Automotive Technology by Jack Erjavec, Yesdee Publication

10. Resource Requirements:

ABT MARUTI Service centers.

140CR5122 SITE SUPERVISION (BUILDING CONSTRUCTION)

1. Title of the Course

Site Supervision (Building Construction)

2. Aim:

This course aims to give a basic knowledge of various construction methods and teach the process of construction activities.

3. Prerequisites:

A theoretical Knowledge on the following subjects

- Construction Materials and Methods I
- Construction Materials and Methods II

4. Course Outcomes:

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

- Understand the field works in different construction practice.
- Experience the various kinds of resources involved in the construction practice.
- Acquire knowledge of the execution practices
- Verify the quality and standards of materials and construction work.

5. Teaching Strategies:

The teaching Methodology includes

- Site Visit/Field Work
- PowerPoint Presentations/seminar on construction activities and structures by the internal Faculty
- Assignments on different tasks which is to be followed, learned by the students from construction site.
- Collection of data/reports at the end of every activity and discussing the same

6. Syllabus:

Unit 1 – Foundation

6

Foundation – Types of foundation - Setting out of foundation trenches – Excavation – Equipments for excavation - Setting out for brickwork – Plinth beam – Filling in foundation trenches.

Unit 2 – Construction Practices

6

Masonry – Stone and brick masonry- classification- dressing- Joints – safe permissible load on masonry – walls –load bearing & Non load bearing walls- cavity & partition walls

Unit 3 Form Work & Scaffolding

6

Types of scaffoldings – components – formwork for columns, lintels, roof slabs, beams – detailing in formworks – precautions

Unit 4 – Mortar works

6

Mortar –Types of mortar – selection of mortar – preparation of mortar–proportion for various works- Plastering: Ceiling, Wall – quality control.

Unit 5 – Concrete

6

Concrete –Components – Mixing, transporting, placing – Quality control.

Total (L+P) = 4+26 = 30 hours

7. Course Plan:

| No. of Hrs | Topic |
|-------------------|---|
| 3 | Introduction about the Course |
| 3 | Lectures on Field Visit and Model Reports |
| 3 | Field Work – on learning about building components with dimensions and material specifications including cost in detail |
| 3 | Field Work – on learning about the masonry works. |
| 3 | Field Work – on learning the form work and scaffolding activities |
| 3 | Field Work – on learning sequence of construction activities as followed in construction site, study of building plan and construction practices in mortar works. |
| 3 | Field Work – on learning about concreting |
| 3 | Field Work –on learning different types of scaffoldings, formwork, Plastering |
| 3 | Final Attendance Report from Site |
| 3 | Final Report Submission and seminar |

8. Course Assessment:

| S.No | Particulars | Marks |
|-------------|--|--------------|
| 1 | Assignment No.1 / Tasks / Case Studies | 20 |

| | | |
|--------------|---------------------------------------|------------|
| 2 | Assignment No.2/ Tasks / Case Studies | 20 |
| 3 | Report submission and Seminar | 20 |
| 4 | Test | 40 |
| Total | | 100 |

9. References:

- Building Construction, S.P Arora and Bindra
- <http://www.bmtpc.org/> - Building materials and technology promotion council
- <https://law.resource.org/pub/in/bis/S03/is.sp.62.1997.pdf> - SP 62 -hand book on Building construction practice.

10. Resource Requirements:

Access a Construction Site to learn the practical Knowledge

140CR5123 SURVEYING USING TOTAL STATION

1. Title of the Course: Surveying using Total Station

2. Aim:

To teach advanced surveying technology with total station. Theory lectures explain the concepts of total station working mechanism followed by practical exercises, which helps to gain practical understanding and essential skill sets required now in the surveying industry.

3. Prerequisites:

Students must have knowledge of surveying basic, Dumpy level, Theodolite.

4. Course Outcomes:

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

- Define the advantages and disadvantages of Total Station surveying
- Define the vertical and horizontal angle measurement mechanism of Total Station instrument
- Understand Electronic Distance Measurement (EDM) principles
- Define Rectangular Vs Polar coordinate system measurements
- Define How Total Station works, need of TS orientation

- Define open and close traversing terminology using TS
- Define application of survey using TS
- Calculate 2D, 3D area on the field / Site
- Calculate surface volume on the field / Site
- Understand the survey work estimation factors
- Define the procedure for downloading and uploading data to TS
- Define the TS data formats
- Produce simple survey map using AutoCAD.

5. Teaching Strategies:

The teaching methodology includes

- Demonstration of Total Station
- Power point presentations/Seminar on total station usage with manual of the instrument by the internal faculty.
- Assignments on different tasks which is to be followed, learned by the students from the field work.
- Submission of reports at the end of every activity and discussing the same.
-

6. Syllabus:

Unit 1 – Introduction

2

Types of instruments – advantage of total station – basic keys operations

Unit 2 – Characteristics and setting of instrument **6**

Pole prism – Height of Instrument – axis of Instrument – Mandatory settings – Leveling and centering – Job creation – Setting coordinates – Rectangular and polar coordinates – Zero setting.

Unit 3 – Field work **8**

Distance and angle measurement – elevation determination – Longitudinal and cross sectioning – Area Calculation

Unit 4 – Contour Mapping **6**

Determination of elevations using contour interval for hills, ponds etc.,

Unit 5 – Setting out works and data editing **8**

Curve Setting – Building layout setting – stake out points – RDM – Data transferring and editing.

Total (L+P) = 8+22 = 30 hours

7. Course Plan:

| No. of Hrs. | Topic |
|--------------------|--|
| 3 | Introduction about the course |
| 3 | Lectures on Total Station |
| 3 | Demonstration about the instrument and accessories – Usage of functional keys in Instrument & Submission of Assignment No. 1 |
| 3 | Job creation and Mandatory settings – rectangular and polar coordinates (NEZ and XYZ) settings - Zero Settings. |
| 3 | Field Work – Distance measurement for the given set of points – determine the instrument position with two or three given points using angular measurements. |
| 3 | Field Work – Longitudinal and Cross Sectioning & Submission of Assignment 2 |
| 3 | Area calculation – Contour Mapping for given feature |
| 3 | Curve settings – with respect to long chord, deflection angle – Building Layout |
| 3 | Data transferring and editing |
| 3 | Final Attendance Report from site ,Final Report Submission, Seminar/PPT Presentation |

8. Course Assessment:

| S.No | Particulars | Marks |
|--------------|--|--------------|
| 1 | Assignment No.1 / Tasks / Case Studies | 20 |
| 2 | Assignment No.2/ Tasks / Case Studies | 20 |
| 3 | Report submission and Seminar | 20 |
| 4 | Test | 40 |
| Total | | 100 |

9. References:

- Punmia B C, Higher Surveying - Volume 3, Laxmi Publications (P) Ltd., New Delhi, 2005.
- Gopi. S., Sathikumar. R., Madhu. N. Advanced Surveying, Dorling Kindersley (India) Pvt. Ltd., 2008.

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10. Resource Requirements:

Total Station with Software

140CR5124 CONSTRUCTION SEQUENCE OF RESIDENTIAL BUILDINGS

1. Title of the Course:

Construction Sequence of Residential Buildings

2. Aim:

This course concentrates on the construction methods and sequences of residential buildings. At the end of this course, the students shall have a clear knowledge of the construction methods and sequence of construction of residential buildings.

3. Prerequisites:

Theoretical Knowledge on

- Building Materials
- Construction Technology

4. Course Outcomes:

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

- List out the structural components of a residential building
- Specify their standard sizes, material to be used for construction and method of construction

5. Teaching Strategies:

The teaching Methodology includes

- Explaining the various structural elements, their standard sizes, material used for construction, method of construction.
- Reinforcement detailing for structural elements.

6. Syllabus:

Unit 1 – Introduction

4

Components of a residential building, Substructure – PCC, Masonry, Footings, Types, Superstructure, Land survey, trial pit, soil exploration, earth work excavation

Unit 2 – Construction of Substructure

6

Selection of foundation, PCC – Size, Concrete mix, Random Rubble Masonry, Coursed Rubble Masonry – width and depth of foundation, layers, cement mortar, methods of construction, footing – Isolated, Combined - size, reinforcement specifications, Concrete Grade, DPC, Plinth beam, sand filling for basement

Unit 3 – Construction of Superstructure

6

Masonry wall – Stone Masonry, Brick Masonry – Size, arrangement, cement mortar, Lintel and Sunshade – Size, reinforcement, Concrete Grade, RCC Roof – Beams, Slab – Dimensions, reinforcement details, concrete grade, parapet, weathering course

Unit 4 – Flooring, Door, Windows, Fittings, Painting, Interior Works

7

Flooring – tiles, marble, granite – specifications, methods of construction, Timber – Commercially available types, identification, cost, Doors and Windows – Size, dimension of rafter, Electrical Fittings – Types, purpose, Plumbing, Plastering, white washing, Painting – Interior, Exterior, water based, enamel, specifications, commercially available brands

Unit 5 – Miscellaneous Works**7**

Hall – wardrobe, showcase, Kitchen – shelves, cabinet, elements and fittings, Bath and WC – Size, Plumbing, fittings

Total = 30 hours**7. Course Plan:**

| No. of Hrs. | Topic |
|--------------------|---|
| 3 | Basic components of a residential, building Site visit, soil exploration |
| 3 | Availability of construction materials ,Foundation types |
| 3 | Masonry – types, construction details, curing, Footings – types, construction |
| 3 | Reinforcement details, Plinth beam – size, specifications, |
| 3 | DPC – purpose, method of construction, Curing, sand filling |
| 3 | Stones, bricks – selection of good materialsStone Masonry, Brick Masonry – types of bond, size, height, cement mortar, curing |
| 3 | Lintel and sunshade – size, reinforcement details, concrete grade, Reinforcement detailing of Two way slabs, beams and columns in a residential building, Reinforcement detailing of types of stair cases |
| 3 | Fixing doors, windows, electrical fittings, PCC, Flooring – Types, method of construction, Size, standard methods of fabrication for wooden doors, windows, ventilators |
| 3 | Plastering walls, curing, white washing, primer, painting – interior, exterior, types of paints – water based, enamel paints,Bath, toilet – fittings, finishing, flooring and walls |
| 3 | Site Visit to a residential building construction to have on hand experience |

8. Course Assessment:

| S.No | Particulars | Marks |
|--------------|--|--------------|
| 1 | Assignment No.1 / Tasks / Case Studies | 20 |
| 2 | Assignment No.2/ Tasks / Case Studies | 20 |
| 3 | Report submission and Seminar | 20 |
| 4 | Test | 40 |
| Total | | 100 |

9. References:

- YouTube – construction sequence of residential buildings – different videos downloaded
-

10. Resource Requirements:

Class room, a laptop, LCD projector, White screen

VI -SEMESTER

11CR016 PERFORMANCE AND EMISSION ANALYSIS IN A MULTI-FUEL VCR CI ENGINE

1. Title of the Course:

Performance and Emission analysis in a multi-fuel VCR CI engine.

2. Aim:

- To analyze the engine performance and exhaust emissions under varying load conditions for fixed compression ratio.
- To study the effect of varying the compression ratio on the performance and exhaust emissions of the engine.

3.Prerequisites:

- Basic knowledge in IC engines and air standard cycles.

3. Course Outcomes:

At the end of the course students will be able to

- Acquire good knowledge on the performance and emission analysis of IC engines.
- Develop skills for critically analyzing the effect of various design and operating parameters on the engine performance and emissions.

5.Teaching Strategies:

| S.No | Description | Teaching Methods |
|------|-------------|---|
| 1. | Unit I | Black board, PPTs and Videos. |
| 2. | Unit II | Experiments |
| 3. | Unit III | Experiments |
| 4. | Unit IV | Experiments, PPTs, Videos and Practices |

6.Syllabus:

Unit I

6

Combustion phenomenon-Normal and abnormal combustion, factors affecting combustion in CI engines, air motions, Concept of Variable Compression Ratio (VCR) in CI engines.

Unit II

9

Performance and Emission analysis in CI engine with fixed compression ratio.

Unit III**9**

Compression ratio variation and its effects on Diesel engine parameters.

Unit IV**6**Analysis of Heat release rate from p- θ curve, Trouble shooting and maintenance.**Theory : 06 Hrs****Practical : 24 Hrs****Total : 30 Hrs****7.Course Content:**

| No. of Hrs | Topic |
|-------------------|--|
| 3 | Combustion phenomenon-Normal and abnormal combustion |
| 3 | Factors affecting combustion in CI engines |
| 3 | Airmotions , Concept of Variable Compression Ratio (VCR) in CI engines. |
| 3 | Performance and Emission analysis in CI engine with fixed compression ratio |
| 3 | Performance and Emission analysis in CI engine with fixed compression ratio |
| 3 | Performance and Emission analysis in CI engine with fixed compression ratio |
| 3 | Compression ratio variation and its effects on Diesel engine parameters. |
| 3 | Compression ratio variation and its effects on Diesel engine parameters. |
| 3 | Analysis of Heat release rate from p- θ curve, Trouble shooting and maintenance |
| 3 | Analysis of Heat release rate from p- θ curve, Trouble shooting and maintenance |

8.Course Assessment :

| S. No | Description | Max. Marks |
|--------------|--|-------------------|
| 1. | Continuous Assessment-I (Test / Quiz / Assignment) | 30 |

| | | |
|-------------|--|-----|
| 2. | Continuous Assessment-II (Assignment /Test-Analysis using VCR) | 30 |
| 3. | Final Assessment (Test& Viva voce) | 40 |
| Total Marks | | 100 |

9. References:

- Internal Combustion Engine Fundamentals by John Heywood, McGraw Hill Publishers. Computer Simulation of Compression-Ignition Engine Processes by V. Ganesan
- An Introduction to Combustion, Concepts and Applications, S.R. Turns, McGraw-Hill, New York, 1996; Second Edition, 2000
- IC Engines: Combustion and Emissions, B. P. Pundir, Alpha Science International Limited, 2010.

10. Resource Requirements:

Computerized VCR Engine

11CR022 MICRO STRUCTURAL CHARACTERIZATION OF MATERIAL

1. Title of the Course:

Micro Structural Characterization of Material

2. Aim:

To impart knowledge on Microstructure of Materials and its influence on material behavior.

3. Prerequisites:

- Basic knowledge in Fe-C Equilibrium diagram.
- Basic knowledge about metals and nonmetals.
- Properties of material.
- Characterization of Materials.

4. Course Outcomes:

At the end of the course students will be able to

- Study material characterization.
- Choose the appropriate material for suitable applications
- Analyze any microstructure and interpret the results.
- Develop new materials through the systems engineering approach.

5. Teaching Strategies:

| S.No | Description | Teaching Methods |
|------|-------------|---|
| 1. | Unit 1 | PPTs, Videos , Metallographic charts. |
| 2. | Unit 2 | Practices using Mould Preparation Machine |
| 4. | Unit 3 | Practices using Disc polishing Machine and Metallurgical Microscope |
| 5. | Unit 4 | Practices using Furnace |
| 6. | Unit 5 | PPTs, Videos |

6. Syllabus:

Unit I

Introduction to materials and properties of materials.

Iron Carbenequilibrium diagram. Microstructure of materials and its influence on mechanical behaviour of materials.

Unit II

Study of Metallurgical Microscope and specimen preparation. Purpose of Etching and study of etchant used for characterization of different metals and non metals. Preparation of mounted specimen for metallographic examination using molding machine.

Unit III

Study and drawing of microstructure of steels and cast iron

Unit IV

Heat treatment of steel and cast iron and its metallurgical behavior

Unit V

Case Studies, Mini project.

Theory : 9 Hrs

Practical : 21Hrs

Total : 30 Hrs

7. Course Assessment :

| S. No | Description | Max. Marks |
|-------------|--|------------|
| 1. | Continuous Assessment(Quiz/Assignment) | 30 |
| 2. | Continuous Assessment(Case Study) | 30 |
| 3. | Final Assessment (Test) | 40 |
| Total Marks | | 100 |

8. Course Plan:

| No. of Hrs | Topic |
|------------|---|
| 2 | Introduction to materials and its properties. |
| 2 | Fe-C Equilibrium diagram |
| 2 | Microstructure of different metals and Non Metals |
| 2 | Different types of etchant used and etchant preparation |
| 2 | Specimen preparation |
| 2 | Micro structural Analysis of Materials |
| 2 | Microstructure of Steels |

| | |
|---|---------------------------------------|
| 2 | Microstructure of Cast iron |
| 2 | Microstructure of Non Metals |
| 2 | Heat treatment of Steel and cast iron |
| 2 | Heat treatment of Non Metals |
| 2 | Practice on Heat Treatment |
| 2 | Image analysis (Metals) |
| 2 | Image Analysis (Fibers) |
| 2 | Case Studies |

9. References:

Study Material – User Manuals

10. Resource Requirements :

Physical Metallurgy ,Avner .

ASM Handbook for Micro structural Characterization of Materials

11CR014 GEAR ENGINEERING

1. Title of the Course:

Gear Engineering

2. Aim:

To impart knowledge on basics of Gear engineering.

3. Prerequisites:

- Basic knowledge in Kinematics of Machinery
- Engineering drawing
- Engineering Mechanics
- Knowledge in Trigonometry

4. Course Outcomes:

At the end of the course students will be able to

- Understand the gear nomenclature and involuetry
- Understand the gear tooth action
- Develop the spur gear tooth profile.
- Distinguish the various failure modes in gear
- Design the spur and helical gears using AGMA and ISO standards.
- Know the industrial practices in gear manufacturing processes

5. Teaching Strategies:

| S.No | Description | Teaching Methods |
|------|-------------|---|
| 1. | Unit 1 | PPTs, Videos |
| 2. | Unit 2 | PPTs |
| 4. | Unit 3 | PPTs and problem solving |
| 5. | Unit 4 | PPTs and journal reading and interpretation |
| 6. | Unit 5 | Industrial visit |

6. Syllabus:

Unit I**6 Hours**

Review on gear tooth nomenclature, law of gearing interference and undercutting, contact ratio. Gear tooth action, Gear tooth profiles –cycloidal and involute profile, Involuometry, involute profile generation. Addendum modification factor, tipping and topping, backlash

Unit II**6 Hours**

Gear tooth failure modes, Derivation of tooth bending stress and contact stress equations. Influence of various gear parameters on bending and contact stresses

Unit III**6 Hours**

Introduction to AGMA and ISO standards for spur and helical gear design, Design of spur and helical gear using AGMA and ISO standards for power transmission applications

Unit IV**12 Hours**

NCR , HCR and asymmetric gears and related Journal paper reading and interpretation

Unit V**6 Hours**

Industrial visit and report submission on manufacturing methods and heat treatment process

Theory: 09 Hrs Practical :21Hrs Total: 30 Hrs

7. Course Plan:

| No of Hrs | Topic |
|-----------|--|
| 3 | Review on gear tooth nomenclature |
| 3 | Design of spur gear using AGMA and ISO |
| 3 | Design of helical gear using AGMA |
| 3 | Development of spur gear profile |
| 3 | Derivation of tooth bending stress and contact stress equations. |
| 3 | Gear tooth failure modes |
| 3 | Introduction to AGMA and ISO standards |
| 3 | NCR , HCR and asymmetric gears |
| 3 | Journal reading , interpretation and Industrial visit report |
| 3 | Heat treatment process |

| | | |
|-------------|--|-----|
| 1. | Continuous Assessment I (Quiz/Practicals/Test) | 30 |
| 2. | Continuous Assessment II (Quiz/Practicals/Test) | 30 |
| 3. | Final Assessment (Practicals/Test) | 40 |
| Total Marks | | 100 |

8. Course Assessment :

9. References:

- Hand book of gear design by GitinM .Maitra, 2nd edition,
- AGMA-2001-D04, fundamental rating factor and calculation methods for involute spur and helical gear teeth, AGMA,2001.
- AGMA-908-B89, Geometric factor for determining the pitting resistance and bending strength of spur gear, helical and herringbone gear teeth, AGMA,1989.
- ISO-6336, calculation of load capacity of spur and helical gears
- ISO-6336-2 Calculation of load capacity of spur and helical gears-Part2: Calculation of surface durability(pitting), ISO, 2004
-

10. Resource Requirements:

MCET - Machine shop

11CR023 AUTOMOTIVE AIR CONDITIONING SYSTEM

1. Title of the Course:

Automotive Air Conditioning system

2. Aim:

The main aim of this course is to familiarize the students with the fundamentals of air conditioning, heating systems, refrigerants, trouble shooting and service.

3. Course Outcomes:

At the end of the course the student will be able to

- Understand the concepts of Air conditioning and heating.
- Differentiate the conventional and modern refrigerants for automotive applications.
- Perform air control, handling, trouble shooting and servicing in automobiles.
- Recognize the function and necessity of automotive air conditioning.
- Explain the functions of automotive air conditioning system components.
- Diagnose and repair the air conditioning system components.
- Demonstrate service procedures.

4. Prerequisites:

- Basic knowledge in Thermodynamics
- Basic knowledge about Refrigeration components

5. Teaching Strategies:

- Lecture
- Power point presentation
- Demonstrations
- Videos

6. Syllabus:

UNIT I FUNDAMENTALS OF AIR-CONDITIONING SYSTEM 7

Basic terminology, design factors and concepts related to air conditioning system - study of HVAC components like compressor, evaporator, condenser, etc. Location of air conditioning components in a vehicle - Demonstrations.

UNIT II REFRIGERANTS 6

Refrigerant Classification, Designation, Alternate Refrigerants, Global Warming Potential & Ozone Depleting Potential aspects. Handling refrigerants.

UNIT III AIR CONDITIONER - HEATING SYSTEM 6

Automotive heaters - Manually controlled air conditioner - Heater system - Automatic temperature control - Air conditioning protection- Demonstrations.

UNIT IV AIR ROUTING 6

Objectives - Evaporator care airflow through the Dash recirculation unit - Duct system - Controlling flow - Vacuum reserve

UNIT V TROUBLE SHOOTING AND SERVICE 5

Causes of air conditioner failure - Trouble shooting of air controlling system - Air conditioner maintenance and service - Servicing heater system – leak testing - Compressor service- Demonstrations.

7. Course Plan:

| No. of Hrs | Topics |
|-------------------|--|
| 3 | Basic terminology, design factors and concepts related to air conditioning system |
| 3 | study of HVAC components like compressor, evaporator, condenser, etc |
| 2 | Location of air conditioning components in a vehicle - Demonstrations. |
| 3 | Refrigerant Classification, Designation, Alternate Refrigerants |
| 3 | Global Warming Potential & Ozone Depleting Potential aspects. Handling refrigerants. |
| 2 | Automotive heaters - Manually controlled air conditioner - Heater system |
| 3 | Automatic temperature control - Air conditioning protection- Demonstrations. |
| 3 | Objectives - Evaporator care airflow through the Dash recirculation unit |
| 2 | Duct system - Controlling flow - Vacuum reserve |

| | |
|---|---|
| 3 | Causes of air conditioner failure - Trouble shooting of air controlling system |
| 3 | Air conditioner maintenance and service –Servicing heater system – leak testing – Compressor service- Demonstrations. |

8. Course Assessment :

9. R

| S. No | Description | Max. Marks |
|-------------|--|------------|
| 1. | Continuous Assessment(Quiz/Assignment) | 30 |
| 2. | Continuous Assessment(Case Study) | 30 |
| 3. | Final Assessment (Test) | 40 |
| Total Marks | | 100 |

9. References:

- <https://www.youtube.com/watch?v=t0sjFKPdvIc>
- <https://www.youtube.com/watch?v=zalg5VyPvjk>
- Automotive Heating and Air Conditioning” , John H Haynes
- “Automotive Heating and Air Conditioning” , Tom Birch

10. Resource Requirements:

- Projector

1. Title of the Course :

Vehicle Body Engineering

2. Aim:

To impart sound knowledge in the construction details of different types of vehicles body and their designing technology to provide maximum comfort for the passengers.

3. Prerequisites:

- Basic knowledge in types of vehicles body
- Basic knowledge in aerodynamics.

4. Course Outcomes:

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

- Differentiate the constructions of car body, bus body and commercial vehicle body
- Use the designing techniques of vehicle bodies
- Create an optimized design of vehicle bodies based on aerodynamics.
- Understand the different types of body materials and painting process involved.

5. Teaching Strategies:

- Lecture
- Power point presentation
- Videos

6. Syllabus:**UNIT- 1 CAR BODY DETAILS**

Types: saloon, convertibles, limousine, estate car, racing and sports car. Visibility: regulations, driver's visibility, tests for visibility, methods of improving visibility and space incars, safety design, Car body construction: design criteria, prototypes, crash tests on full scale model, Dummies and Instrumentation

UNIT- 2 BUS BODY DETAILS

Types: mini bus, single decker, double-decker, two level and articulated bus. Bus body layout; floor height, engine location, entrance and exit location, seating dimensions, construction, types of metal sections used, Regulations, Conventional and integral type construction.

UNIT-3 COMMERCIAL VEHICLE DETAILS

Types of body; flat platform, drop side, fixed side, tipper body, tanker body, Light commercial vehicle body types, Drivers cab design.

UNIT-4 VEHICLE AERODYNAMICS

Objectives. Vehicle drag and types, various types of forces and moments, effects of forces and moments, side wind effects , Various body optimization techniques for minimum drag, wind tunnel testing, flow visualization techniques.

UNIT –5 BODY MATERIALS, TRIM

Steel sheet, timber, plastic, GRP, properties of materials; Corrosion, anticorrosion methods. Selection of paint and painting process. Body trim items.

7. Course Plan:

| No. of Hrs | Topic |
|------------|---|
| 3 | Types: saloon, convertibles, limousine, estate car, racing and sports car. |
| 3 | Visibility: regulations, driver's visibility, tests for visibility, methods of improving visibility and space in cars, |
| 3 | safety design, Car body construction: design criteria, prototypes, crash tests on full scale model |
| 3 | Dummies and Instrumentation, Types: mini bus, single decker, double-decker, two level and articulated bus |
| 3 | Bus body layout; floor height, engine location, entrance and exit location, seating dimensions |
| 3 | types of metal sections used, Regulations, Conventional and integral type construction |
| 2 | Types of body; flat platform, drop side, fixed side, tipper body, tanker body |
| 2 | Light commercial vehicle body types, Drivers cab design. |
| 2 | Objectives. Vehicle drag and types, various types of forces and moments, effects of forces and moments, side wind effects |
| 2 | Various body optimization techniques for minimum drag, wind tunnel testing: flow visualization techniques. |
| 2 | Steel sheet, timber, plastic |
| 2 | GRP, properties of materials, Corrosion, anticorrosion methods. |
| 2 | Selection of paint and painting process. Body trim items |

Total hours: 30

8. Course Assessment :

| S. No | Description | Max. Marks |
|-------------|--|------------|
| 1. | Continuous Assessment(Quiz/Assignment) | 30 |
| 2. | Continuous Assessment(Case Study) | 30 |
| 3. | Final Assessment (Test) | 40 |
| Total Marks | | 100 |

9. References:

- www.en.wikipedia.org
- www.books.google.co.in
- J.Powloski - "Vehicle Body Engineering" - Business Books Ltd, London -1989

10. Resource Requirements:

Bus Body building

11CR015 DESIGN AND ASSEMBLY OF OFF ROAD VEHICLE

1. Title of the Course:

Design of OFF Road Vehicle

2. Aim:

To design the OFF road vehicle based on the load condition and application.

3.Prerequisites:

- Basic knowledge in construction of OFF road vehicles
- Basic knowledge in Engineering Mechanics
- Basic knowledge in Design of machine elements
- Basic knowledge in machine mechanism

4. Course Outcomes:

At the end of the course students will be able to

- Select appropriate subsystem based on dynamic condition
- Calculate various stress behavior on subsystem components

5.Teaching Strategies:

Each session will be interactive with hands-on practice.

- Lecture
- Dismantling and assemblage of subsystems

6.Syllabus:

Construction layout, capacity and applications. Power Plant, Chassis and Transmission – Design of chassis frame and subsystems – suspension and transmission – selection of braking system and Tyres.

7.Course Plan:

| No of Hrs | Topic |
|-----------|---|
| 6 | Construction layout, capacity and applications. Power Plant, Chassis and Transmission |
| 5 | Design of chassis frame |
| 5 | Suspension and transmission system calculation |
| 5 | Braking system calculation and selection of subsystem components |
| 4 | Presentation |

| | |
|---|------------------------------------|
| 5 | Assemblage of subsystem components |
|---|------------------------------------|

Theory: 9Hrs Practical: 21 Hrs Total: 30 Hrs

8.Course Assessment:

| S. No | Description | Max. Marks |
|--------------|--|-------------------|
| 1. | Continuous Assessment I (Quiz/Practicals/Test) | 30 |
| 2. | Continuous Assessment II (Quiz/Practicals/Test) | 30 |
| 3. | Final Assessment (Practicals/Test) | 40 |
| Total Marks | | 100 |

9.References :

- <https://www.youtube.com/watch?v=ViYzgxi3M3g>
- “Automotive chassis” – Rein Paul

10.Resource Requirements:

OFF road vehicle system

11CR025 ENGINEERING ANALYSIS USING ANSYS-Workbench

1. Title of the Course:

Engineering Analysis Using Ansys Workbench

2. Aim:

To impart the students to create virtual prototypes of their designs under real-world operating conditions

3. Prerequisites:

- The students must have the basic knowledge about Engineering mechanics and Strength of materials.
- The students should have Analytical capabilities to solve the problems in Finite Element method.

4. Course Outcomes:

At the end of the course students will be able to

- Understand Finite Element methodology and procedures.
- Apply the concepts and calculation methods for solving engineering problems,
- Validate their computational results with their complementary experimental laboratories exercise.
- Create and modify geometry in Ansys environment.

5. Teaching Strategies:

- Lecture, Power point presentation ,Videos &Tutorials

6. Syllabus:

Introduction to FEA and Ansys-Static structural Analysis of cantilever beam-Static structural analysis of bike crank-Modal Analysis of air foil wing-Harmonic analysis of cantilever beam-Thermal analysis on a pipe-Transient Thermal analysis on a wall-Coupled field analysis on a bar-Crack generation on a rigid body-Contact analysis -Laminar and turbulent flow analysis on a pipe

Theory : 9Hrs

Practical : 21 Hrs
Total : 30 Hrs

7. Course Content:

| No of Hrs | Topics |
|-----------|---|
| 3 | Introduction to FEA and Ansys |
| 3 | Static structural Analysis of cantilever beam |
| 3 | Modal Analysis of air foil wing |
| 3 | Modal Analysis of air foil wing |
| 3 | Harmonic analysis of cantilever beam |
| 3 | Thermal analysis on a pipe. |
| 3 | Transient Thermal analysis on a wall |
| 3 | Coupled field analysis on a bar |
| 3 | Contact analysis |
| 3 | Laminar and turbulent flow analysis on a pipe |
| 3 | Crack generation on a rigid body |

8. Course Assessment:

| S. No | Description | Marks |
|-------------|--|-------|
| 1. | Continuous Assessment I (Quiz/Practicals/Test) | 30 |
| 2. | Continuous Assessment II (Quiz/Practicals/Test) | 30 |
| 3. | Final Assessment (Practicals/Test) | 40 |
| Total Marks | | 100 |

9. Reference :

- <http://www.mece.ualberta.ca/tutorials/ansys/>
- <http://www.engr.uky.edu/~jbaker/ansystutor.html>
- <http://www.csa.ru/CSA/CADS/docs/ansys/tut2/>
- http://www.andrew.cmu.edu/course/24-ansys/htm/s1_tower.htm

10. Resource Requirements:

The resources are available at the Ansys 15- ALTAIR Centre of Excellence

11CR013 FACTORY AUTOMATION

1. Title of the Course: Factory Automation

2. Aim:

To impart knowledge in automation technologies used in Automobile Industries, Packaging Industries, CNC, Home, Factory, Agriculture etc.

3. Prerequisites:

- Basic knowledge in hydraulics and pneumatics
- Basic knowledge in Analog/Digital circuits and electrical drives
- Principles and operations of sensors and transducers
- Basic knowledge in microprocessor based systems

4. Course Outcomes:

At the end of the course students will be able to

- Understand the basics of hydraulics, electro hydraulics and its circuits
- Understand the basics of pneumatics, electro pneumatics and its circuits
- Develop an automation system with suitable sensors
- Interface the electrical drives and sensors with PLC

5. Teaching Strategies:

| S.No | Description | Teaching Methods |
|-------------|-----------------------------------|---|
| 1. | Hydraulics and Electro Hydraulics | PPTs, Videos and Practices using Hydraulic Instruments |
| 2. | Pneumatics and Electro Pneumatics | PPTs, Videos and Practices using Pneumatic Instruments |
| 4. | Sensorics | PPTs and Practices on different Sensors |
| 5. | Mechatronics | PPTs, Videos and Practices on Bosch Mechatronics System |
| 6. | PLC Programming | PPTs, Videos and Practices on Rexroth PLC |

6. Syllabus:

Unit I Hydraulics

9

Basics of Hydraulics - Components of hydraulics - Types of valves – DCVs - operations - hydraulic Circuits – Electro hydraulics - Solenoids - Relays - Electrical logic circuits - Applications of electro hydraulics - Practices on different types of electro hydraulic circuits.

Unit II Pneumatics

9

Basics of Pneumatics - Components of Pneumatics - Types of valves - DCVs - operations - Pneumatic circuits – Electro pneumatics - Electrical Logic circuit – Relay ladder logic - Applications of electro pneumatics - Practices on different types of electro pneumatic circuits.

Unit III Sensorics

6

Introduction to sensorics - Closed loop system - Types of Proximity sensors - construction - principle of operation - Applications proximity sensors - electrical connections - Practices on all types of proximity sensors

Unit IV Automation System

6

Introduction to Mechatronics system – over view of Automation System – Types of Automation – role of sensors in automation system. Introduction to PLC H/W - Architectural evolution - Role of PLC in Automation - Ladder Logic - Basics of digital logic - Latching - Timers – counters - Selections of PLC - Practices on Ladder logic using PLC.

| | |
|------------------|-----------------|
| Theory | : 09Hrs |
| Practical | : 21 Hrs |
| Total | : 30 Hrs |

7. Course Plan:

| No. of Hrs | Topic |
|------------|--|
| 2 | Basics of Hydraulics, Components and types of valves, Solenoids and relays |
| 4 | Practices on Hydraulic circuits |
| 2 | Practices on Electro Hydraulic circuits |
| 2 | Practical Test – Hydraulic/Electro Hydraulic circuits |
| 1 | Basics of Pneumatics, Components and types of Directional control valves |
| 4 | Practices on Pneumatic circuits |
| 2 | Practices on Electro Pneumatic circuits |
| 2 | Practical Test – Pneumatic/Electro Pneumatic circuits |
| 1 | Types and operations of Proximity sensors |
| 2 | Practices on different types of proximity sensors |
| 2 | Overview of Automation systems, role of sensors and electrical drives |
| 1 | Demo – Mechatronics System |
| 2 | Overview of PLC, H/W structure |
| 1 | Basic digital logic and relay ladder logic |
| 2 | PLC Programming – LD and ST |

8. Course Assessment:

| S. No | Description | Max. Marks |
|-------------|--|------------|
| 1. | Continuous Assessment I (Quiz/Practicals/Test) | 30 |
| 2. | Continuous Assessment II (Quiz/Practicals/Test) | 30 |
| 3. | Final Assessment (Practicals/Test) | 40 |
| Total Marks | | 100 |

9. References:

- Bosch Rexroth User Manuals
- Esposito Anthony, “Fluid Power with Applications”, Pearson Education Inc., New York, 2003.
- W. Bolton “Mechatronics” Pearson education, second edition, fifth Indian Reprint, 2010
- DevadasShetty and Richard A.Kolk, “Mechatronics systems design”, PWS Publishing company 2007.

10. Resource Requirements:

The resources are available at the MCET-BOSCH Rexroth Centre of Excellence.

1. Title of the Course:

Embedded C programming

2. Aim:

The purpose of this course is to impart knowledge in the design of embedded control software for the ECU

3. Prerequisites:

- Basic knowledge about C language
- Basic knowledge in Electronics

4. Course Outcomes:

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

- Write embedded C programs
- Design embedded control software for the ECU

5. Teaching Strategies:

- Lecture
- Power point presentation
- Tutorials

6. Syllabus:

Introduction to Embedded systems-C programming-Data types, Conditional statements and branching-Control structures, Arrays and pointers ,I/O port interfacing-Interrupt programming-ADC interfacing-PWM

7. Course Plan:

| No of Hrs | Topics |
|-----------|---|
| 3 | Introduction to Embedded systems |
| 4 | C programming -Data types and branching |
| 3 | Conditional statements |
| 3 | Control structures |
| 3 | Arrays and pointers |
| 4 | I/O port interfacing |
| 3 | Interrupt programming |
| 3 | ADC interfacing |
| 4 | PWM |

8. Course Assessment :

| S. No | Description | Max. Marks |
|-------------|--|------------|
| 1. | Continuous Assessment I (Quiz/Practicals/Test) | 30 |
| 2. | Continuous Assessment II (Quiz/Practicals/Test) | 30 |
| 3. | Final Assessment (Practicals/Test) | 40 |
| Total Marks | | 100 |

9. References:

- www.microchip.com
- www.frescale.com
- Embedded systems Architecture, Programming and design by Raj kamal
- Design of Embedded systems by using 8051 microcontroller by Mazid Ali

10. Resource Requirements:

Keil IDE evaluated version

1. Title of the Course:

Automotive Electrical and Electronics

2. Aim:

To impart knowledge of Automotive Electronics and control systems.

3. Prerequisites:

The students must have basic knowledge in Electrical and Electronic devices and circuits.

4. Course Outcomes:

At the end of the course students will be able to

- Explain the Automobile Electrical and Electronics systems
- Diagnose fault in a given automotive electrical system

5. Teaching Strategies:

- Lecture
- Power point presentation
- Tutorials

6. Syllabus:

Chassis electronics, Body electronics, Sensors, communication protocol and Ignition systems

7. Course Content

- **Chassis electronics**
 - ABS
 - ESP
 - ASR/TCS
- **Body electronics,**
 - Door control module
 - Lighting system
- **Sensors,**
 - Hall sensor
 - Inductive sensor
 - Knock sensor
 - Temperature sensor
- **communication protocol**
 - CAN
 - LIN
- **Ignition systems**

- Electronic ignition system
- Transistor ignition system
-

8. Course Assessment :

| S. No | Description | Max. Marks |
|-------------|---|------------|
| 1. | Continuous Assessment (Quiz/Assignment) | 30 |
| 2. | Continuous Assessment (Case Study) | 30 |
| 3. | Final Assessment (Test) | 40 |
| Total Marks | | 100 |

9. References:

- www.microchip.com
- www.frescale.com
- Automotive electrical and electronics by TOM DENTON 4th edition, B&H Publishing Company.

10. Resource Requirements:

Automotive electronics kits LUCAS NULLE and LABSOFT software are available at MCET TUV Automotive Training Centre.

11CR027 SITE SUPERVISION (PROJECT QUANTITY SURVEYING)

1. Title of the Course:

Site Supervision (Project Quantity Surveying)

2. Aim:

To give a basic knowledge of project quantity surveying works like planning, costing and the basic skills of measurement.

3. Prerequisites:

A theoretical Knowledge on the following subjects

- Construction Materials and Methods
- Building Planning
- Basic Mathematics

4. Course Outcomes:

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

- Know the process of planning for each activity
- Understand and apply the standard rules for measurement
- Prepare a budget cost report for building projects
- Determine accurate rates for items of common building work
- Understand the pre and post contract cost management processes
- Interpret construction drawings.

5. Teaching Strategies:

The teaching Methodology includes

- Site Visit/Field Work
- PowerPoint Presentations/seminar on planning, costing and measurements of construction activities and structures by the internal Faculty
- Assignments on different tasks which is to be followed, learned by the students from construction site.
- Collection of data/reports at the end of every activity and discussing the same

6. Syllabus:

Unit 1

Basic Measurement Techniques - Substructure – super structure - Centre Line Method.

Unit 2

Standard Forms of Contracts and its selection - Interpretation of the Standard Conditions- budget estimating.

Unit 3

Definition of Scope of works, Drawings, Specification –Interpretation – Material Procurement – Process.

Unit 4

Building up unit rates for building works- Quotation - Cost Data - Cost Indices - Materials and labor rates for estimation -Records - actual costs

Total (L+P) = 4+26 = 30 hours

7. Course Plan:

| No. of Hrs | Topic |
|------------|---|
| 3 | Introduction about the Course |
| 3 | Lectures on Field Visit and Model Reports |
| 4 | Field Work – on learning about building contracts. |
| 4 | Field Work – on learning the measurement of all the construction activities |
| 4 | Field Work – on learning sequence of construction activities as followed in construction site, study of building plan |
| 4 | Field Work – on learning costing of construction activities |
| 4 | Field Work –on learning process of material procurement |
| 4 | Final Report Submission and seminar |

8. Course Assessment:

| S.No | Particulars | Marks |
|--------------|--|------------|
| 1 | Assignment No.1 / Tasks / Case Studies | 20 |
| 2 | Assignment No.2/ Tasks / Case Studies | 20 |
| 3 | Report submission and Seminar | 20 |
| 4 | Test | 40 |
| Total | | 100 |

9. References:

- Building Construction, S.P Arora and Bindra
- <http://www.bmtpc.org/> - Building materials and technology promotion council
- <https://law.resource.org/pub/in/bis/S03/is.sp.62.1997.pdf> - SP 62 -hand book on Building construction practice
- Schedule of Rates

10. Resource Requirements:

Access Construction Site to learn the practical Knowledge.

1. Title of the Course:

Industrial Safety and Environmental Audit

2. Aim:

This course is designed to train and provide expert human resource for safety management and to reflect various types of evaluations intended to identify environmental compliance and management system bringing direct benefits to the industry and society.

3. Prerequisites:

Environmental Studies

4. Course Outcomes:

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

- Gain knowledge to handle the complex industrial environment.
- Explain about Industrial safety and its management systems.
- Understand risk assessment and management.
- Acquire knowledge on environmental audit trails and audit scheduling.
- Understand the Environmental legislation.
-

5. Teaching Strategies:

Lecture – Concepts will be taught with examples

Case Study – To provide a more thorough analysis of a situation or a case

Field Visit – To give practical exposure

Debate/Group Discussion – To develop the reflective thinking among the students.

6. Syllabus:**UNIT – I**

Introduction – Safety, Health and Environment – Principles & Practices – Role of Management

UNIT – II

Accident Prevention – Incident – accident injury – unsafe acts – Theories/Models of accident – Principles of Prevention – Financial Implication – Reports

UNIT – III

Personal Protective Equipment – Needs – Respiratory protective devices – Non respiratory protective devices – Fire Extinguishers & its operations

UNIT – IV

Environmental Policy and Laws –Administrative procedures for Environmental Clearances – HAZAN & HAZOP studies

UNIT – V

Environmental Audit – ISO regulations – Qualities of Environmental Auditor – Contents of EA reports

7. Course Plan:

| No of Hrs. | Topic |
|-------------------|---|
| 3 | Introduction – Safety, Health and Environment - Principles & Practices – Role of Management |
| 3 | Accident Prevention – Incident – accident injury |
| 3 | Unsafe acts – Theories/Models of accident – Principles of Prevention |
| 3 | Financial Implication – Reports - |
| 3 | Personal Protective Equipment – Needs - Respiratory protective devices – |
| 3 | Non respiratory protective devices - Fire Extinguishers & its operations |
| 3 | Environmental Policy and Laws –Administrative procedures for Environmental Clearances |
| 3 | HAZAN & HAZOP studies - Environmental Audit – ISO regulations |
| 3 | Site Visit/ Case Study Report |
| 3 | Qualities of Environmental Auditor – Contents of EA reports |

8. Course Assessment:

| S.No | Particulars | Marks |
|--------------|--|--------------|
| 1 | Assignment No.1 / Tasks / Case Studies | 20 |
| 2 | Assignment No.2/ Tasks / Case Studies | 20 |
| 3 | Report submission and Seminar | 20 |
| 4 | Test | 40 |
| Total | | 100 |

9. References:

- The Factories Act 1948, Madras Bok Agency, Chennai, 2000
- National seminar on hazardous waste management organized by National Safety council, Ministry of environment and forests, Government of India, United States – Asia environmental partnership, Tamilnadu pollution control board and Indian chemical manufacturers association, April 2001.
- W. Kurge: ISO 14001 Certification – Environmental Management System, Prentice Hall, 1995.

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10. Resource Requirements:

Manpower – One faculty is required to teach the course. Also the experts from the Industry/ Labour Institutes can be invited to give guest lecture

Infrastructure – One Classroom is required

11CR029

STAAD Pro

1. Title of the Course

STAAD Pro

2. Aim:

To give training for civil engineering students for creating a structural model. This consists of generating the structural geometry, specifying member properties, material constants, load, analysis and design specifications and also visualization and verification of the model geometry.

3. Prerequisites:

Theoretical Knowledge on

- Mechanics of solids
- Basic structural Design
- Design of Reinforced Concrete Elements.
- Design of steel structures
- Structural analysis
-

4. Course Outcomes:

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

- Work within the StaadPro graphical environment.
- To create a structural model and meshing
- To generate the structural geometry.
- To specify member properties and material constants
- To assign different types of loads and their combination along with boundary conditions
- To visualize and do verification of the model geometry.
- Running the STAAD analysis engine to perform analysis
- To design and do Verification of results - graphically and numerically
-

5. Teaching Strategies:

| S.No | Description | Teaching Methods |
|------|--------------------------------------|------------------------|
| 1. | Introduction | PPT / Demonstration |
| 2. | Design of elements and structures | Demonstration |

| | | |
|----|-------------------|---------------|
| 3. | Verifying Results | Demonstration |
|----|-------------------|---------------|

6. Syllabus:

Unit 1-Introduction to Staad Pro

Creating a new project in Staad Pro -Units –Model Generation using various methods – Creating Nodes and beam members- model editing tools –Translational repeat- Circular Repeat- Move-Mirror-Rotate-Insert mode-Add beam-Support condition- Material Specification.

Unit 2 –Analysis and design of R.C Elements

Model the structure-assign the properties of members- assign support conditions-loading-design properties –analyze the structure- get results in STAAD output- run the programme. Individual visual data- column design –beam design- post processing /report setup/output.

Unit 3 – Analysis and design of special structure

Model the structure-assign member property - assign support conditions- loading-types of loading-Wind load-seismic load –loading combination-design properties –analyze the structure-perform analysis- get results in STAAD output- run the programme.- Individual visual data- post processing /report setup/output.

Unit 4 – Steel roof truss

Using structure wizard model the structure- connect the members-select sections-thickness- plate load-pressure on full plate-Assign loading conditions- analyze the structure- get results in STAAD output- run the programme. Individual visual data-column design –beam design- post processing /report setup/output.

Unit 5 – Water tank

Water tank –types- design and analyze the water tank

Total = 30 hours

7. Course Plan:

| No. of Hrs | Topic |
|------------|---|
| 2 | Understanding the StaadProGraphical Environment Introduction to the user interface - Exploring the Tool space and menus in the modeling mode - Creating a new project in Staad Pro - Units –Model Generation using various methods –Creating Nodes and beam members- model editing tools –Translational repeat-Circular Repeat- Move-Mirror-Rotate-Insert mode-Add beam-Support condition- Material Specification. |
| 3 | Practice |
| 2 | Model the structure-assign the properties of members- assign support conditions- loading-design properties –analyze the structure- get results in STAAD output- run the programme. Individual visual data- column design –beam design- post processing /report setup/output |
| 3 | Practice |

| | |
|---|---|
| 2 | Model the structure-assign member property - assign support conditions- loading- types of loading-Wind load-seismicload-loading combination-design properties –analyze the structure-perform analysis- get results in STAAD output- run the programme.-Individual visual data- post processing /report setup/output |
| 3 | Practice |
| 2 | Steel roof truss Using structure wizard model the structure- connect the members-select sections-thickness- plate load-pressure on full plate-Assign loading conditions- analyze the structure- get results in STAAD output- run the programme. Individual visual data- column design –beam design- post processing /report setup/output. |
| 3 | Practice |
| 2 | water tank :Types- design and analyze the water tank |
| 4 | Practice |
| 4 | Mini Project |

8. Course Assessment:

| S.No | Particulars | Marks |
|--------------|--|------------|
| 1 | Assignment No.1 / Tasks / Case Studies | 20 |
| 2 | Assignment No.2/ Tasks / Case Studies | 20 |
| 3 | Report submission and Seminar | 20 |
| 4 | Test | 40 |
| Total | | 100 |

9. References:

- <http://www.multiconstructions.net/2014/02/bentley-staad-pro-v8i-step-by-step.html>
- <http://allaboutfreebooks.com/staad-pro-2007-tutorial-pdf-download/>

10. Resource Requirements:

- License activation for the software Staad. Pro is already available.
- Resource person for teaching the course is already available.