

ATTENDANCE SHEET -CUM- MINUTES OF BOARD OF STUDIES

Minutes of the meeting of the Board of Studies of Mechanical Engg. (Subject)
 held on 3/3/2017 (date) at 8.00 PM. (time).

PRESENT

| (Name) | | (Signature) |
|---|---------------------|--------------------------------|
| 1. <u>Prof. S.K. Gaur</u> | (Chairperson) | <u>[Signature]</u> |
| 2. <u>Prof. H. H. Raj</u> <u>Prof. Subair Ahmed</u> | (External Expert 1) | <u>Disputed electronically</u> |
| 3. <u>Prof. Rahul Caprihan</u> <u>Prof. Navneet Arora</u> | (External Expert 2) | <u>Disputed electronically</u> |
| 4. <u>Prof. V. Soan Das</u> | (Internal Member) | <u>[Signature]</u> |
| 5. <u>Prof. D. G. Rao</u> | (Internal Member) | <u>[Signature]</u> |
| 6. <u>Prof. Saijai Sureshwar</u> | (Internal Member) | <u>[Signature]</u> |
| 7. <u>Prof. Man Mohan Agarwal</u> | (Internal Member) | <u>Mr. Moh</u> |
| 8. <u>Prof. Rahul Caprihan</u> | (Internal Member) | <u>[Signature]</u> |
| 9. <u>Prof. Sunil Kumar</u> | (Internal Member) | <u>S. Kumar</u> |
| 10. <u>Prof. Ravindra Kumar</u> | (Internal Member) | <u>Ran</u> |
| 11. <u>P.R. Rahul Swarnup Sharma</u> | | <u>[Signature]</u> |

Proposed changes in the existing system

Enclosed as Annexure II

[Signature]
(Signature of Chairperson)

ANNEXURE-II

Proposal for Board of Studies: Department of Mechanical Engineering

Proposal M1: Introduction of a new course on value engineering for industrial engineering stream in fifth semester. It has been felt that probability & Statistics is an important course and should be made available to students of all engineering streams. Hence a common course titled Probability & Statistics (MAM58X) has been proposed in the proposal No. 5 of Electrical engineering department with common consensus. A new course on Value Engineering (MEM516) for students of Industrial Engineering stream is introduced. The detailed syllabus is given below:

Course Title: Value Engineering(LTPS 4-0-0-0)

COURSE TEMPLATES

| | | |
|-----|---|---|
| 1 | Department/Centre proposing the course | Mechanical Engineering |
| 2 | Course Title (< 45 characters) | VALUE ENGINEERING |
| 3 | L-T-P Structure | (L:4+T:0+P:0+S:0) |
| 4 | Credits | 4 |
| 5 | Course Number | MEM516 |
| 6 | Status (category for program) | (Elective/ Core) Core for Industrial Engineering Stream |
| 7 | Status vis-à-vis other courses (give course number/title) | |
| 7.1 | Overlap with any UG/ PG course of Department/ Centre | No |
| 7.2 | Overlap with any UG/ PG course of other Department/ Centre | No |
| 8 | Frequency of offering | Every semester/ Every alternative semester/ Once in four semesters/ |
| 9 | Faculty who will teach the course | Prof. Sanjay Kumar Srivastava |
| 10 | Will the course require visiting faculty? | No |
| 11 | Course objectives (about 50 words) indicating motivation and aims | To introduce the concept of value engineering as one of the core concept in planning and production to give inputs of reliability engineering and its application to students. To develop on certification from the concept of value. |

PROPOSED SYLLABUS
MEM 516 Value Engineering

UNIT 1: INTRODUCTION

Value Engineering (VE). Value Analysis. VE History. VE Terminology. VE Benefits. VE Applications. Professional Societies of VE. Certification Programme.

UNIT 2: FUNCTION ANALYSIS

VE Concept. Quantitative definition of value. Esteem Value. Exchange Value. Use Value. Cost Value. Function. Cost. Life Cycle Cost. Function-cost-worth analysis. Function analysis system technique.

UNIT 3: DECISION MAKING

Decision making for optimum alternative. Decision under risk. Decision under uncertainty. Expected value. Decision Tree. Marginal contribution for decision making. BEP. Payback period. Return on investment.

UNIT 4: JOB PLAN TO VALUE IMPROVEMENT

Job plan to value improvement. Methodology of VE. Phases of the job plan. Brainstorming. ABC analysis. Gordon Technique. Attribute listing. Morphological analysis. Laddering

UNIT 5: SYSTEM RELIABILITY

System reliability. Reliability elements in series and parallel. Distribution of failure and repair times. Determination of MTBF and MTTR. Results reporting. Follow up through review meeting.

SUGGESTED READING

1. Value Engineering: Analysis And Methodology, Del Younger, CRC Press, value consulting winter springs, Florida, USA Marcel Dekker, Inc, 270 Madison Avenue, New York.
2. Value Engineering Concepts, Techniques and Applications, Anil Kumar Mukhopadhyaya, SAGE Publication Inc 2455 Teller Road Thousand oaks California 91320, USA; 2009.
3. Reliability Engineering: L S Srinath, East- west press New Delhi; IV Edition, ISBN13 9788176710480

Proposal M2: Minnor changes in fifth unit of the course in mechanics of solids II(MEM505) is proposed the justification for the changes are given below:

| EXISTING SYLLABUS | PROPOSED CHANGED SYLLABUS | JUSTIFICATION |
|--|---------------------------|---------------|
| Unit I to Unit IV | – no change – | |
| UNIT - I <u>Analysis of Stress and Strain</u> The 3-dimensional state of stress and strain. Stress tensor. Stress invariants. Principal stresses. Differential equations of equilibrium. Plane stress in Cartesian and cylindrical coordinates. Strain tensor. Principal strains. Plane strain state in Cartesian and cylindrical coordinates. Generalized Hooke's law, application to isotropic materials. | – no change – | |
| UNIT - II <u>Theories of Failure</u> Theories of failure (Maximum normal stress, maximum normal strain, maximum shear stress, octahedral shear stress, maximum strain energy, maximum distortion energy) and their significance. <u>Axisymmetric Problems</u> Thick-walled cylinders. Compound cylinders. Rotating discs of uniform thickness. Discs of variable thickness. Rotating shafts and cylinders. | – no change – | |

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| <p>UNIT - III Inelastic Behavior in Bending and Torsion Deformation, stresses and residual stresses in the Inelastic range in bending of beams and in torsion of circular bars. Energy Methods Strain energy in uniaxial and biaxial loading. Principle of superposition. Maxwell's reciprocal theorem. Castigliano's theorems.</p> | <p>– no change –</p> | |
| <p>UNIT - IV Bending of Beams Asymmetrical bending of straight bars. Bending of curved beams. Winkler-Bach formula for circumferential stresses. Torsion Torsion of bars of non-circular cross-sections. Membrane analogy. Thin rectangular sections. Thin-walled tubes.</p> | <p>– no change –</p> | |

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|--|---|---|
| <p>UNIT - V Experimental Stress Analysis - Strain Gages Principle of electrical resistance strain gages. Gage factor. Wheatstone bridge circuit. Temperature compensation. Experimental Stress Analysis - Photoelasticity Principle of photoelastic analysis. Stress optic law. Plane and circular polariscopes. Isoclinics and Isochromatics. Calibration.</p> | <p>UNIT - V Introduction to Fiber Reinforced Composites Introduction, Classification, Difference in behavior from conventional materials, Manufacturing processes, materials used, Advantages, disadvantages. Lamina and Laminate Behavior Stress-strain relations, Engineering constants, Restrictions on constants, Micro-mechanical behavior, Rule of mixtures. Constitutive relations, [A], [B] and [D] matrices,</p> | <p>Strain Gages – are studied in the course MEM401- Instrumentation Photoelasticity – is not a widely used method of stress analysis Composites – Use of composites is increasing drastically. Some basic information of these is essential for mechanical engineers.</p> |
|--|---|---|

Proposal M3: Structure and syllabus of Modular course of 3D printing for 10+2 pass out students for skill development of the students has been considered and approved in BOS of the department. The details are given below:

Annexure II
Dayalbagh Educational Institute, Dayalbagh, Agra-282005
Modular Programme: 3D Printing
Session 2016-17
Module Structure: Duration 9-weeks

Module 1 Title: 3D Printing - I

| S. No. | Course Number | Course Title | Course Type | Credits | Periods/ week |
|--------|---------------|--------------------------|-------------|---------|---------------|
| 1 | MTD 111 | Introduction to Computer | Theory | 3 | 6 |
| 2 | MTD 112 | Technical Drawing | Practical | 3 | 9 |
| 3 | MTD 113 | Computer Lab | Practical | 3 | 9 |
| 4 | MCC 111 | Abridged Core Course 1 | T + P | 1 | 3 |

Module 2 Title: 3D Printing – II

| S. No. | Course Number | Course Title | Course Type | Credits | Periods/ week |
|--------|---------------|----------------------------|-------------|---------|---------------|
| 1 | MTD 121 | Getting to Know 3D Printer | Theory | 3 | 6 |
| 2 | MTD 122 | Operating a 3D printer | Practical | 3 | 9 |

| | | | | | |
|---|---------|------------------------|-----------|---|---|
| 3 | MTD 123 | Computer Aided Drawing | Practical | 3 | 9 |
| 4 | MCC 121 | Abridged Core Course 2 | T + P | 1 | 3 |

Module 3

Title: Advanced 3D Printing - I

| S. No. | Course Number | Course Title | Course Type | Credits | Periods/ week |
|--------|---------------|--|-------------|---------|---------------|
| 1 | MTD 131 | Electronic & Electrical components of 3D printer | Theory | 3 | 6 |
| 2 | MTD 132 | Operating a 3D Printer – Advanced | Practical | 3 | 9 |
| 3 | MTD 133 | Designing and Creating Objects with 3D Printer | Practical | 3 | 9 |
| 4 | MCC 131 | Abridged Core Course 3 | Theory | 1 | 2 |

Module 4

Title: Advanced 3D Printing – II

| S. No. | Course Number | Course Title | Course Type | Credits | Periods/ week |
|--------|---------------|------------------------------------|-------------|---------|---------------|
| 1 | MTD 141 | Manufacturing and Entrepreneurship | Theory | 3 | 6 |
| 2 | MTD 142 | Project | Practical | 6 | 18 |
| 3 | MCC 141 | Abridged Core Course 4 | Theory | 1 | 2 |

Module 1 and Module 3 are pre-requisites for Module 2 and Module 4, respectively.

Abridged Core Courses

| | |
|---------|--|
| MCC 111 | 1. Cultural Education; 2. Agriculture; 3. Social Service |
| MCC 121 | 1. Comparative Study of Religion; 2. Games & Sports; 3. Cultural & Literary Activities |
| MCC 131 | 1. Environmental Science and Pollution; 2. General Knowledge |
| MCC 141 | 1. Employability & Entrepreneurship Skills |

Dayalbagh Educational Institute
Dayalbagh, Agra -5

Modular Programme: 3D Printing
Normal Duration of each Module: 9- weeks

FIRST SEMESTER

| S. No. | Course Number | Course Title | Course Type | Credits | Periods/ week |
|--------|---------------|--------------------------|-------------|---------|---------------|
| 1 | MTD 111 | Introduction to Computer | Theory | 3 | 6 |
| 2 | MTD 112 | Technical Drawing | Practical | 3 | 9 |
| 3 | MTD 113 | Computer Lab | Practical | 3 | 9 |
| 4 | MCC 111 | Abridged Core Course 1 | T + P | 1 | 3 |

Detailed Syllabus:

| | |
|----------------------------------|--|
| Course Code: | MTD 111 |
| Course Title: | Introduction to Computer |
| Total Credits: | 3 |
| Unit I: Knowing Computer | |
| 1 | What is Computer?, Components of Computer System, Central Processing Unit (CPU), VDU, Keyboard and Mouse, Other input/output Devices |
| 2 | Basic Applications of Computer |
| 3 | Concepts of Hardware and Software |
| 4 | Computer Memory |
| UNIT – II Operating System | |
| | What is an Operating System?, Basics of Popular Operating Systems |
| | User Interface, Using Mouse and Moving Icons on the screen |
| | Use of Common Icons, Status Bar, Using Menu and Menu-selection |
| | Running an Application |
| | Viewing of File |
| UNIT – III | |
| | Folders and Directories, Creating and Renaming of files and folders |
| | Opening and closing of different Windows, Creating Short cuts |
| UNIT – IV Word Processing Basics | |
| 19 | Word Processing Basics, Opening and Closing of documents |
| 20 | Text creation and Manipulation |
| 21 | Formatting of text; Table handling, Spell check, language setting and thesaurus |
| 22 | Printing of word document |
| UNIT –V Introduction to Internet | |
| 25 | Basic of Computer networks |
| 26 | Concept of Internet, Knowing the Internet; |
| 27 | Applications of Internet; connecting to internet |
| 28 | World Wide Web; Web Browsing softwares, Search Engines; |
| 29 | Basics of electronic mail; Getting an email account; Sending and receiving emails; |
| 30 | Accessing sent emails; Using Emails; |

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|----------------|--|
| Course Code: | MTD 112 |
| Course Title: | Technical Drawing - Practical |
| Total Credits: | 3 |
| | Projections to be practiced by first angle projection. Elements of projection. Orthographic views from the supplied blocks (sketching only). Drawing of different machine parts (single pieces). Basic plane geometry. Construction and drawing of curves such as Parabola, Ellipse. Projection of points, lines, plane figures and solids such as cylinder, cone, sphere. |

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|---------------|--------------------------|
| Course Code: | MTD 113 |
| Course Title: | Computer Lab – Practical |

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| Total Credits: | 3 |
| | Exercises based on the lessons of Unit I to Unit V of Course Number MTD 111. Connecting keyboard, mouse, monitor and printer to CPU and checking power supply. |

Module 2

Title: 3D Printing – II

| S. No. | Course Number | Course Title | Course Type | Credits | Periods/ week |
|--------|---------------|----------------------------|-------------|---------|---------------|
| 1 | MTD 121 | Getting to Know 3D Printer | Theory | 3 | 6 |
| 2 | MTD 122 | Operating a 3D printer | Practical | 3 | 9 |
| 3 | MTD 123 | Computer Aided Drawing | Practical | 3 | 9 |
| 4 | MCC 121 | Abridged Core Course 2 | T + P | 1 | 3 |

| | |
|----------------|--|
| Course Code: | MTD 121 |
| Course Title: | Getting to Know 3D Printer |
| Total Credits: | 3 |
| | |
| 1 | Naming and understanding the function of the different parts of a printer |
| 2 | Understanding X, Y and Z axis coordinates |
| 3 | Steps in a common print (design, convert, import into print software, print) |
| 4 | Machine Control Panel Interface |
| 5 | Understand the need for and implement printing safety procedures |
| 6 | Input material PLA and ABS |
| 7 | Limitations of 3D printer |

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| Course Code: | MTD 122 |
| Course Title: | Operating a 3D printer – Practical |
| Total Credits: | 3 |
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| 1 | Setting up, powering on and heating the machine to ready it for printing |
| 2 | Loading and unloading filament |
| 3 | Importing 3D Models, Positioning, Scaling, And Rotation |
| 4 | Experimenting with different software settings |
| 5 | Printing Exercise |

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| Course Code: | MTD 123 |
| Course Title: | Computer Aided Drawing - Practical |
| Total Credits: | 3 |
| | |
| 1 | CAD: Practice Exercises based on Solid Works Software. |
| 2 | Drawing and Manipulating Lines, Shapes, and Other Objects. |

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|---|--|
| 3 | Creating 3D models using Solidworks. |
| 4 | Atleast two sheets be prepared using Solid Works Software. |

SECOND SEMESTER

Module 3

Title: Advanced 3D Printing - I

| S. No. | Course Number | Course Title | Course Type | Credits | Periods/ week |
|--------|---------------|--|-------------|---------|---------------|
| 1 | MTD 131 | Electronic & Electrical components of 3D printer | Theory | 3 | 6 |
| 2 | MTD 132 | Operating a 3D Printer – Advanced | Practical | 3 | 9 |
| 3 | MTD 133 | Designing and Creating Objects with 3D Printer | Practical | 3 | 9 |
| 4 | MCC 131 | Abridged Core Course 3 | Theory | 1 | 2 |

Detailed Syllabus:

| | |
|----------------|--|
| Course Code: | MTD 131 |
| Course Title: | Electronic & Electrical components of 3D printer |
| Total Credits: | 3 |
| 1 | Stepper Motors |
| 2 | End Stops |
| 3 | Printer Board |
| 4 | Extruder |
| 5 | Power supply |
| 6 | Print heat bed |
| 7 | Printing temperatures |

| | |
|----------------|---|
| Course Code: | MTD 132 |
| Course Title: | Operating a 3D Printer – Advanced - Practical |
| Total Credits: | 3 |
| 1 | Slicer options: loops, Z resolution, infill % |
| 2 | Software options (slic3r, cura) |
| 3 | Generating G-code |
| 4 | Rotating Parts For Strength, Mirroring, And Infill Levels |
| 5 | Advanced designing with printer limitations in mind (overhangs, thin features, etc) |
| 6 | Layer Heights, Perimeters, And First Layer |
| 7 | Troubleshooting common machine problems |
| 8 | Calibrating the printer to improve print quality |
| 9 | G-code And Machine Configuration Settings |

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|----------------|--|
| Course Code: | MTD 133 |
| Course Title: | Designing and Creating Objects with 3D Printer - Practical |
| Total Credits: | 3 |
| | |
| 1 | Rotating Parts For Strength, Mirroring, And Infill Levels |
| 2 | Printing with support |
| 3 | Troubleshooting and working to fix print quality issues |
| 4 | Finishing printed objects - Sanding printed objects |
| 5 | Assemble different pieces to build a bigger object |
| 6 | Removing rafting, skirting or support material from a printed object |
| 7 | Painting finished objects |

Module 4

Title: Advanced 3D Printing – II

| S. No. | Course Number | Course Title | Course Type | Credits | Periods/ week |
|--------|---------------|------------------------------------|-------------|---------|---------------|
| | MTD 141 | Manufacturing and Entrepreneurship | Theory | 3 | 6 |
| | MTD 142 | Project | Practical | 6 | 18 |
| | MCC 141 | Abridged Core Course 4 | Theory | 1 | 2 |

| | |
|----------------|---|
| Course Code: | MTD 141 |
| Course Title: | Manufacturing and Entrepreneurship |
| Total Credits: | 3 |
| | |
| 1 | What types of objects are being 3D printed? |
| 2 | How are things traditionally manufactured? How can 3D printing change that? |
| 3 | What items in your home could be 3D printed? |
| 4 | How is 3D printing used in manufacturing? |
| 5 | Open source/open hardware vs closed source/closed hardware solutions |
| 6 | 3D printing and implications for copyright and intellectual property |
| 7 | Advantages and Disadvantages using 3D printing as a manufacturing technique |
| 8 | Economics of 3D printing |
| 9 | When is 3D printing the right choice vs. traditional manufacturing? |

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|----------------|--|
| Course Code: | MTD 142 |
| Course Title: | Project - Practical |
| Total Credits: | 6 |
| | |
| | Undertake project work involving product selection, cad drawing, 3d printing, finishing, and costing |

