MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

(A Govt. Aided UGC Autonomous & NAAC Accredited Institute Affiliated to RGPV, Bhopal)

Department of Mechanical Engineering

Summary of Board of studies (ME) meeting held on 07/04/2018

Detail of program/ courses where syllabus revision was carried out

Course/ Subject Name	Code	Year/date of introduction	Year/date of revision	Percentage of content added or replaced	Item no.	Page. No.
Mechanics of Materials	120302	2015	07/04/2018	10%	-	3-4
Theory of Machines-I	120303	2015	07/04/2018	20%	-	5-6
Fluid Mechanics	120304	2015	07/04/2018	30%	-	8-9

Dr. M. K. Gaur

HMED

MADHAV INSTITUTE OF TECHNOLOGY AND SCIENCE, GWALIOR-05

MECHANICAL ENGINEERING DEPARTMENT

Date: 07/04/2018

MINUTES OF MEETING OF BOARD OF STUDIES (BOS)

Following members were present:

Dr. Manish Kumar Sagar	Chairman
Dr. A. Mani	External Expert
Er. C. G. Porwal	External Expert
Dr. Pratesh Jayaswal	Member
Dr. Chandra Shekhar Malvi	Member
Dr. Manoj K Gaur	Member
Prof. R. P. Kori	Member
Prof. Vedansh Chaturvedi	Member
Dr. Jyoti Vimal	Member
Prof. Dinesh K Kasdekar	Member
Prof. Sharad Agrawal	Member
Prof. Vaibhav Shivhare	Member
Dr. Amit Aherwar	Member
Prof. Bhupendra K Pandey	Member

At the beginning, the Chairman welcomed the experts and members for attending the Board of Studies dated 07/04/2018 in the department of mechanical engineering. The Chairman further expressed special thanks to Dr. A. Mani, Professor, IIT Madras, Dr. C.G. Porwal, Chairman & Managing Director, NIMDC Pvt. Ltd and Dr. Manjaree Pandit, Dean Academic, MITS Gwalior for sparing the time from their busy schedule to attend the BoS meeting.

AGENDA OF BOARD OF STUDIES MEETING:

To finalize the Scheme and Syllabus for B.E. (Mechanical Engineering & Automobile Engineering) and M.Tech. (Production Engineering) Students.

Following suggestions has been listed below:

1. The Subject- 'Bio-Science' as a course in Basic Science category in First or Second year may be added in the BE Scheme.
2. As per Supreme Court 'Constitution of India' is mandatory so it may kept as a qualifier for all students.
3. In Engineering graphics subject, in lab session: one session for hands-on practice on sheet and one session for on machine practice on Auto CAD for all students in each week
   The 2 hour lecture and 6 hours Lab practice on drawing sheet and on machine-AutoCAD for each students may be introduce w.e.f. 2018-19.
   Justifications for Engg. Graphics: No students from any stream can directly move to work on machines. A conventional/basic techniques and fundamentals is required.
4. 'Theory of Machines' should come before 'Design of Machine Elements'.
   Therefore 'Theory of Machine' is kept in third sem and 'Design of Machine Elements' may be in fourth sem along with Simulation and Modelling Lab (previously was in third sem).
5. 'Engineering Thermodynamics' and 'Fluid Mechanics' course can be run in parallel.
6. 'Design of Machine Elements' is shifted to fourth sem from third sem and 'Machine Design' shifted to fifth sem from fourth sem.
7. In IV Sem 'Theory of Machines-2', Vibration may be introduced as 'Unit-II: Kinematic Analysis and Vibration'.
8. In the V Unit of 'Reliability and vibration control' flow induced vibration may be added, and this subject (Reliability and vibration control) will be DC.
9. The subject 'Theory of Machines (Dynamics of Machines)' shifted to fourth sem as DC.
10. 'Dynamics lab' may be added in fourth semester.
11. Subjects suggested by expert for departmental core, following are essential :

Thermal:	Design:	Production:
1. Fluid mechanics,	1. Mechanics of Materials,	1. Metallurgy and Materials,
2. Engg. Thermodynamics,	2. TOM-I,	2. Manufacturing process,
3. HMT,	3. TOM-II,	3. machine tools,
4. Thermal engineering-I,	4. Design of Machine Elements,	4. metrology and measurement,
5. Thermal engineering-II	5. Machine Design,	5. CAD/CAM/CIM
	6. Reliability and Vibration Control.	

12. As per the BOS, following credits are proposed:
    DC 16(current) from 13 (Previous)
    DE 5 (current) from 6 (Previous)
    OC 3 (current) from 5 (Previous)

13. 'Fluid lab' may be added separately in third sem, however, theory and lab credits should be balanced.
14. In Open Category, subject/courses from other departments may also be added. Subjects may be increased in OC category as per the specialization and facility available in the Department
15. The subject 'Renewable Energy' may be offered as OC in place of DE.
16. In VIII sem, major project will be based on the learning and experience received from Industry Visits or from Industrial Internship.
17. Discussion with students/OBE students for B.E. scheme and syllabus also their suggestion is incorporated.
18. In M.Tech (Production Engineering) Research Methodology is incorporated and Mathematics subject has been removed.

Prof. Bhupendra K Pandey
Member

Dr. Amit Aherwar
Member

Prof. Vaibhav Shivhare
Member

Prof. Sharad Agrawal
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Dr. Pratesh Jayaswal
Member

Er. C. G. Porwal
External Expert

Dr. A. Mani
External Expert

Dr. Manish Kumar Sagar
Chairman

Syllabus Revision on 07/04/2018

For batch admitted in Academic Session 2018

Mechanics of Materials/ Mechanics of Materials-I

Category	Title	Code	Credit-4			Theory Paper
			L	T	P	
Departmental Core-DC	Mechanics of Materials	120302/ 190302/ BMEL-302/ MEL-305/ 3225	3	-	2	Max.Marks-70 Min.Marks-22 Duration-3hrs.

Course Pre-Requisites:

Basic Civil Engineering and Mechanics (Subject Code – 100205)

Course Objectives: To make the students:

Learn the basic concepts and principles of strength of materials.

Calculate stresses and deformations of objects under external loadings.

Apply the knowledge of strength of materials on engineering applications and design problems.

Syllabus

Unit- I Stress and strain: Stress-strain relationship and elastic constants, Poisson's ratio; Mohr's circle for plane stress and plane strain, compound and combined stresses, thermal stresses.

Unit-II Stresses in beams: Shear Force & Bending Moment diagram, theory of simple bending, Section Modulus, bending Stresses and Shear stresses in beam.

Slope and deflection: Equation of Elastic Curve, Macaulay's Method, Area Moment Method, Strain Energy Methods etc.

Unit- III Shear stress distribution: Horizontal, Vertical, Transverse, Longitudinal Shear Stress, Graphical Methods for Different Sections.

Shafts: Torsion of circular shaft, stress concentration in shafts; series and parallel combination.

Unit -IV Column and Struts: Euler's theory of column, Rankine's formula, slenderness ratio; strut with eccentric load.

Thin cylinder: Stress and Strain in thin cylinder, wire wound thin cylinder; thin spherical shells.

Unit- V Materials testing: Tensile, compressive, hardness, impact and torsion testing. Strain Gauges - types of strain gauges, electrical strain gauges, Gauge factor, strain rosette.

Strain Energy: Strain energy due to direct stress, simple shear, torsion, bending, shear force in beams. (Added)

Course Outcomes: After successful completion of this course students will be able to:

Identify various structural elements and its application.

Illustrate different types of stress and strain on various types of structural elements like beam, shaft column etc.

Calculate principal stresses, maximum shearing stress, and the different stresses acting on a structural member.

Analyze stresses and deflection for beam, shaft, long columns, thin cylinder etc.

Select appropriate materials in design considering engineering properties, sustainability, cost and weight.

Design simple bars, beams, and circular shafts to meet desired needs in terms of strength and deformation.

Text & Reference Books

Strength of Materials (MoM) **by** R S Lehri and A S Lehri; S K Katariya and Sons Pub.
Strength of Materials **by** S S Rattan; McGraw Hill Pub.
Mechanics of Materials **by** F P Beer, E R Johnston, J T DeWolf; TATA McGraw Hill Pub.
Strength of Materials **by** S. Timoshenko; D Van NostrandCompnay,
Mechanics of Solids **by** Mubeen; Pearson Education Pub
Strength of Materials **by** S Ramamrurtham, R Narayan; DhanpatRai sons Pub.
Strength of Materials **by** Sadhu Singh; Khanna Publisher Pub.
Mechanics of Materials **by**AdarashSwaroop, New Age international Pub.

NPTEL Link for Mechanics of Material

https://onlinecourses.nptel.ac.in/noc18_ce04/preview

LIST OF EXPERIMENTS

Tension test
Compression Test
Bending Test.
Single / Double Shear Test
Fatigue Test
Hardness test on metals - Brinell and Rockwell Hardness Number. Rockwell hardness Test
Impact test on metal specimen.
Spring Testing
To draw Bending moment diagram for simply supported Beam under point Loads.

Lab Course Outcomes: After successful completion of this course lab students will be able to:

Evaluate the values of yield stress, breaking stress and ultimate stress of the given specimen under tension test.

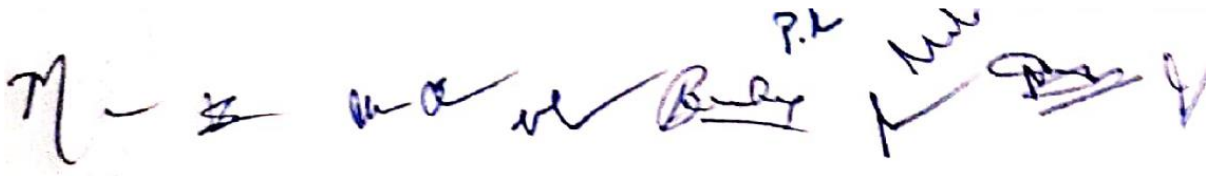
Conduct the torsion test to determine the modulus of rigidity of given specimen.

Perform compression tests on spring and wood.

Justify the Rockwell hardness test over with Brinell hardness and measure the hardness of the given specimen.

Determine elastic constants using flexural and torsion tests.

Examine the stiffness of the open coil and closed coil spring and grade them.



120303: Theory of Machines-I

Category	Title	Code	Credit-4			Theory Paper
			L	T	P	
Departmental Core-DC	Theory of Machines-I	120303	3	-	2	Max.Marks-70 Min.Marks-22 Duration-3hrs.

Course Pre-Requisite:
Engineering Graphics (Subject Code – 100105)
Mechanics of Materials (Subject Code – 120302)

Course objectives: To make the students:
Familiarize with different types of mechanisms.
Understand the basics of synthesis of simple mechanisms.
Apply fundamental of mechanics to machines which include engines, linkages etc.

Syllabus

Unit-I **Mechanism:** Machine, Mechanism, Kinematics Links, Pairs, Chains, Degree of freedom. Mechanisms and its Inversions; Slider, Double Slider and 4 bar mechanism. Lower pair mechanisms: pantograph, Straight line motions. Davis and Ackerman Steering Mechanisms.

Unit-II Kinematic Analysis: Displacement, velocity and acceleration analysis of plane mechanisms; relative velocity, instantaneous centre, Kennedy's Theorem, Klein's construction methods. Coriolis component. (Added)

Unit-III Dynamic Analysis: D'Alembert's principle. Equivalent dynamic system, Graphical and analytical methods of dynamic forces, analysis of mechanisms and machines including reciprocating engines.

Flywheel: Introduction, Turning-moment diagrams and Flywheel analysis.

Unit-IV Brakes: Analysis of simple brake assuming uniform pressures and uniform wear, band brake, block brakes, internal and external shoe brakes, braking of vehicles.

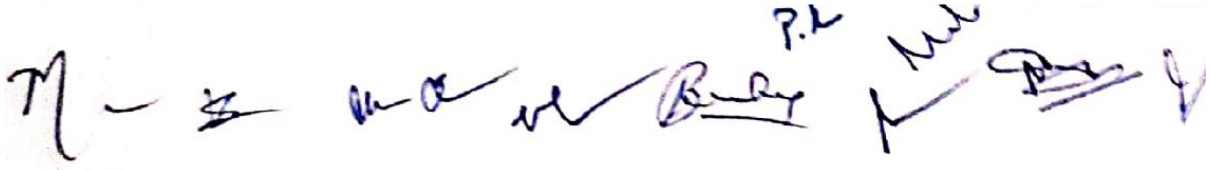
Clutches: Single plate and multi plate clutches, cone clutches, centrifugal clutches.

Dynamometers: Different types and their applications.

Unit-V Governors: Introduction, Types of governors, Various gravity and spring controlled governors, governor characteristics, Effort and power of a governor, Controlling force diagrams, Coefficient of insensitiveness.

Gyroscopes: Gyroscopic couple, Effect of Gyroscopic couple on the stability of four wheel and two wheel vehicles, Aeroplanes and Naval ships, Gyrostabilisers.(Added)

Course Outcomes: After successful completion of this course students will be able to:



Identify basic mechanisms in real life applications.
Discuss about mechanics of various machines.
Apply fundamental principles of statics and dynamics to machinery.
Analyze various types of motions and mechanisms of machinery.
Compare various components suitable for different applications.e.g. different types of governor, clutch, brakes, flywheel etc.
Create the mechanism or components to justify the demands of work.

Text &Reference Books:

Theory of Machines by Rattan, SS; TMH full detail of publicaiton
Theory of Machine by Norton, RL; TMH
Theory of Machine byBallaney, PL;Kanna Pub.
Mechanism and Machine Theory by Ambekar, AG; PHI.
Theory of Mechanism and Machines by Sharma, CS and Purohit K; PHI.
Theory of Machines by Bevan, Thomos; Pearson/ CBS PUB Delhi.
Mechanism and Machine Theory byRao, JS and Dukkipati; NewAge Delhi.
Theory of Machines byLal,Jagdish; Metropolitan Book Co; Delhi –
Theory of Mechanisms & Machines byGhosh,A.,Mallik,AK; Affiliated East West Press,Delhi.

NPTEL Link for Theory of Machines-I

http://nptel.ac.in/courses/112104121/1 and http://nptel.ac.in/courses/112104114/

List of experiments (expandable)

Study of Kinematics links pairs and chains.
To find degree of freedom of a given mechanism.
To study all inversions of four-bar mechanisms using models.
Draw velocity and acceleration polygons of all moving link joints in slider crank mechanism.
Study of inertia forces in reciprocating parts and analysis of flywheel.
Study of various types of governors.
Study of various types of clutch.
Study of various types of brakes.
Study of various types of dynamometer.
Use virtual lab for any two experiments.

Lab Course Outcomes: After successful completion of this course lab students will be able to:
Design and **analyze** mechanism required for the specified type of motion.
Draw inversions and determine velocity and acceleration of different mechanisms.
Construct different types of cam profile for a given data.
Analyze various motion transmission elements like gears, gear trains, cams, belt drive and rope drive.
Compare the various components related to machines and mechanism.
Determine the degrees-of-freedom (mobility) of a mechanism.

120304: Fluid Mechanics

Category	Title	Code	Credit-4			Theory Paper
			L	T	P	
Departmental Core-DC	Fluid Mechanics	120304	2	1	2	Max.Marks-70 Min.Marks-22 Duration-3hrs.

Course Objectives: To make the students to understand:

1. To introduce and explain fundamentals of Fluid Mechanics, which is used in the applications of Aerodynamics, Hydraulics, Marine Engineering, Gas dynamics etc.
2. To give fundamental knowledge of fluid, its properties and behaviour under various conditions of internal and external flows.
3. To develop understanding about hydrostatic law, principle of buoyancy and stability of a floating body and application of mass, momentum and energy equation in fluid flow.
4. To imbibe basic laws and equations used for analysis of static and dynamic fluids.
5. To inculcate the importance of fluid flow measurement and its applications in Industries.

Syllabus

Unit-I Properties of fluid: Pressure, density, specific weight, viscosity, dynamic and kinematic viscosity Newton's law of viscosity and its applications. **Fluid Static:** Pressure variation with depth, pressure measurement, pressure on immersed surface centre pressure, Buoyance, flotation, stability of floating bodies.

Unit-II Fluid Kinetics: One dimensional flow approximation, control, volumes concept, Reynolds transport theorem, continuity equation in 3-D, its differential and integral form, velocity and acceleration of fluid particle stream line, stream line path, stream line path line. Rotation, vorticity and circulation. Stream velocity potential function. Flow net, Free, forced, vortex flow.

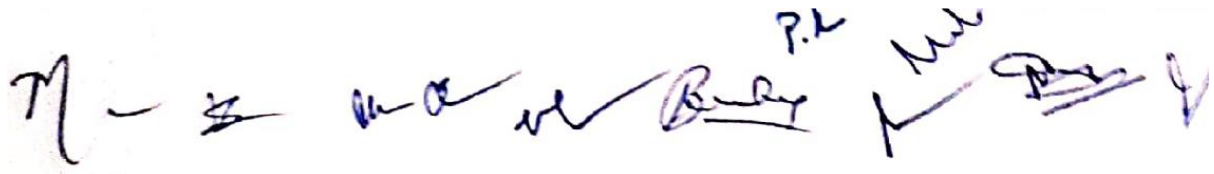
Unit-III Fluid Dynamics: Momentum theorem, Impulse momentum equation and its application Euler's equation in 3-D, Bernoulli's equation for incompressible fluid flow, engineering applications of energy equation, Pilot- static probe, Current meters. Venturi meter, Orifice meter, Rotameter, Nozzle meter, Notches & weirs.

Unit-IV Dimensional Analysis: Rayleigh's method, Buckingham's Pie theorem, physical significance of various dimensionless numbers, Similarity concept, Geometric, kinematic and dynamic similarity, Model testing and its applications.(Removed)

Unit-IV Flow through Pipes: Critical Reynolds's number, velocity distribution in pipes, friction factor. Moody's chart, Laminar flow through pipe, Hagen-Poiseulli's equation, Turbulent flow through pipe, Hydraulic gradient line and total energy line. Minor head losses in pipes, Pipe Networking and Transmission of power through pipes.(Added)

Unit-V Flow through Pipes: Critical Reynolds's number, velocity distribution in pipes, friction factor. Moody's chart, Laminar flow through pipe, Hagen-Poiseulli's equation, Turbulent flow through pipe, Hydraulic gradient line and total energy line. Minor head losses in pipes, Pipe Networking Transmission of power through pipes.

Boundary Layer Theory: Development of boundary layer over flat plate and pipe, boundary layer thickness displacement energy, and momentum thickness, integral equation. (Removed)



Water Turbine: Impulse and Reaction principles, Pelton, Francis and Kaplan turbines, velocity diagrams, Work done by turbines, Draft Tube theory.(Added)

Course Outcomes: After successful completion of this course students will be able to:

1. **State** the Newton's law of viscosity and **Explain** the mechanics of fluids.
2. **Compute** force of buoyancy on a partially or fully submerged body and **Analyse** the stability of a floating body.
3. **Derive** Euler's Equation of motion and **Deduce** Bernoulli's equation.
4. **Examine** energy losses in pipe transitions and **sketch** energy gradient lines.
5. **Evaluate** pressure drop in pipe flow using Hagen-Poiseuille's equation for laminar flow in a pipe.
6. **Distinguish** the types of flows and **Determine** sonic velocity in a fluid.

Text &Reference Books:

1. Fluid Mechanics **by** Streeter & Wylis; McGraw-Hills Pub.
2. Fluid Mechanics **by** Modi & Seth; Standard publishing house.
3. Fluid Mechanics **by** D.S. Kumar ; Katson publisher.
4. Fluid Mechanics **by** R.K. Bansal; Laxmi Publishing House.
5. Fluid Mechanics **by** Yunus A Cengel & John M. Cimbala; Tata McGraw Hill Edition.

List of Experiments

1. Calculate the coefficient of discharge of Venturimeter.
2. Calculate the Cd, Cv and Cc through Orifice meter.
3. Calculate the Cd through Notch.
4. Calculate the Coefficient of Friction through Pipe Set Apparatus.
5. Study of Pressure Distribution curve around a cylinder and Aerofoil.
6. Study of boundary layer over a flat plate, Boundary layer Thickness, Displacement thickness along with Integral Moment.
7. Study of Viscosity of given oil through Redwood Viscometer.
8. Study of Coefficient of friction between flowing Apparatus.
9. Calculate the Critical Reynolds's Number through Pipe Set Apparatus.