S Y M Tech Mech Engg (MED) Semester – I									
Course Code	**Course Title**	**Teaching Scheme Hours /Week**			**Examination Scheme**			**Marks**	**Credit**
		Lecture	**Tutorial**	**Practical**	**In Semester**	**End Semester**	**Oral**		
HSEL 2101	Elective III	Online			50	50	0	100	4
OE 2101	Elective IV	Online			50	50	0	100	3
MED 2101	Project Stage I	0	0	18	125	0	100	225	9
Total		**6**	**1**	**18**	**225**	**100**	**100**	**425**	**16**
Grand Total		**25**			**425**			**425**	**16**

**** Elective III: Online Course (HS)**

****Elective IV: Online Course (Programme)**

****It is mandatory for the student to appear for ISE and ESE for both the Electives offered in SY M Tech Sem-I (Sem-III)**

DEAN ACADEMICS
MKSSS's Cummins College of Engineering for Women Karvenagar, Pune-411052

Principal
MKSSS's Cummins College of Engg. For Women, Karvenagar, Pune-52

APPROVED BY
Governing Body Members
MKSSS's Cummins College of Engineering for Women Karvenagar, Pune-411052

OEHS 2101A: Elective III Entrepreneurship and IP Strategy (NPTEL)

Teaching Scheme
Lectures: 3 Hours / Week

Examination Scheme
ISE: 50 Marks
ESE: 50 Marks
Credits: 3

Course Objectives:

1. To discuss intellectual property strategy to protect inventions and innovations of new ventures.
2. To develop skills of commercial appreciation by allocating knowledge about substantive aspects of management, strategy and legal literature.
3. The course will make participants appreciate the nature, scope and differences of IP, its different utilities and approaches
4. The course will make participants to manage and strategize IP lifecycle effectively throughout the journey of start-up, in a time when it is aspired highly by the economy and society.
5. Participants will learn the fundamentals and advanced strategies of IP. They will be given opportunity for understanding the same in MSME sector. They will be finally be provided brief exposure about the valuation techniques and audits of IP.

Course Outcomes:

After completion of the course, students will be able to

1 Illustrate the importance of securing intellectual property to protect inventions and innovations of new ventures

2 Appreciate the scope, nature, protection process and infringement of Trademarks and Patents as an entrepreneur

3 Appreciate the scope, nature, protection process and infringement of Copyrights and Industrial Design as an entrepreneur

4 Apply various concepts of IP and Entrepreneurship in strategic valuation and audit of IP management at MSMEs

Unit I: Introduction to entrepreneurship and intellectual property: Definition, concepts **(05)**

1. Introduction, 2. What is an entrepreneurship? 3. What do you understand by IP?, 4. Whether entrepreneurship and IP related? What is role of IP strategy in entrepreneurship? 5. Case study I – IT industry

Unit II: Innovation and entrepreneurship: (05)

1.Innovation, invention and creativity, 2. Types of innovation, 3. Innovation, market and IP, 4. Open innovation and IP, 5. Case Study II - Biotechnology

Unit III: IPR: Trademark and entrepreneurship: (05)

1. Trademark-Definition, 2. Trademark-Types, 3. Trademark-Registration, 4. Trademark infringement, 5. Case study III - Textile industry

Unit IV: IPR: Patent and entrepreneurship: (05)

1. Patent-introduction, 2. Patent infringement, 3. Patent strategies- I, 4. Patent strategies- II
5. Capsule version

Unit V: IPR: Copyright and entrepreneurship: (05)

1. Copyright – Definition and subject matter, 2. Copyright and related rights, 3. Copyright registration and entrepreneurship, 4. Copyright infringement, 5. Case study IV – Film industry

Unit VI: IPR: Industrial design and entrepreneurship: (05)

1. Industrial Design- Definition, concept, 2. Industrial Designs Act - Key features, 3. Industrial Design-Business, 4. Industrial Design infringement, 5. Case study V - Automobile industry

Unit VII: IP strategy & entrepreneurship (05)

1. IP strategy for start-up and MSME, 2. IP transaction – introduction, 3. IP valuation, bank loan, insurance, 4. Success story and business model of a few start-ups, 5. Case Study VI – Pharma industry and Agriculture.

Unit VIII: Entrepreneurship & IP - Government initiates: (05)

1.Incubators, research parks, 2.Various Government policies, 3.Integrative approach – Entrepreneurship & IP strategy, 4.Capsule revision, 5.Am I ready to venture my start up? (Course applicability)

Books and References:

1. Ove Granstrand, "**The Economic and management of Intellectual Property**", (1999)
2. Narayanan, V. K., "**Managing technology and innovation for competitive advantage**", first edition, Pearson education, New Delhi, (2006)
3. Idris, K. (2003), "**Intellectual property: a power tool for economic growth**", 2nd edition, WIPO publication no. 888, Switzerland

4. Bosworth D. & Webster E, "**The Management of Intellectual Property**", Edward Elgar.
5. Berman, "**Ideas to Assets**", Wiley publications
6. Richard Dorf & Thomas Byers, "**Technology ventures from idea to enterprise**", 2nd edition.
7. Neeraj Padey, Khushdeep Dharni "Intellectual Property Rights", 1st Edition, August 2014

Online Resources:

1. NPTEL Course: **"Entrepreneurship and IP Strategy"**
   https://onlinecourses.nptel.ac.in/noc22_hs110/preview
2. **WIPO: Global Forum for Intellectual Property**
3. http://www.wipo.int/portal/en/index.html
4. **Intellectual Property India**
   http://www.ipindia.nic.in/

OEHS2101B Elective III Industrial Safety Engineering
(Online NPTEL Swayam)

Teaching Scheme
Lecture : 3 Hrs/week

Examination Scheme
In semester : 50 marks
End semester : 50 marks
Credits : 3

Course Objectives:
Students are expected to –
1. Understand criticality of safety in industrial environment
2. Understand concept and application risk, safety and reliability
3. Understand accident root cause analysis
4. Understand of the key elements of various safety standards

Course Outcome:
1. Students will be capable to do critical examination of factory premises from safety point of view.
2. Students will be capable to do carry out risk and safety analysis
3. Students will be able to analyse root cause analysis of accidents.
4. Students will be design safety provisions confirming to various standards.

Unit 1: Introduction to Industrial Safety
Introduction, key concepts, terminologies, and safety quantification, safety by design, Fault tree and event tree analysis (qualitative & quantitative)

Unit 2: Risk Assessment and Analysis
Bow-tie and quantitative risk assessment (QRA), safety function deployment, Safety vs reliability– quantification of basic events (repair to failure, repair-failure-repair, and combined processes), Safety vs reliability – quantification of basic events

Unit 3: Systems Safety Analysis
Systems safety quantification (e.g., truth tables, structure functions, minimal cut sets) Human error analysis and safety

Unit 4: Investigation of Accidents
Accident investigation and analysis, Application of virtual reality

Unit 5: Safety Standards
OSHAS 18001 and OSHMS

Books:

1. Probabilistic Risk Assessment for Engineering and Scientists, Komamoto and Henley, IEEE Press, 1995.
2. Industrial Accident Prevention, Heinrich et al., McGraw Hill, 1980.
3. Techniques for safety management - A systems approach, Petersen D, ASSE 1998.

OE2101 EL-IV Modal Analysis

Teaching Scheme

Lecture: 3 Hrs/week
Tutorials: Nil

Examination Scheme

In semester: 25 marks
End semester: 50 marks
Credits: 3

Prerequisites:

Advanced Mathematics and Numerical Techniques, Vibration and Acoustic

Course Objectives:

1. To teach the basics of the theory and practice of modal analysis
2. To introduce experimental methods in modal analysis
3. To teach basics of digital signal processing of measurements
4. To teach estimation and extraction of modal parameters (natural frequencies, damping and mode shapes) from measured data
5. To teach construction of mathematical models from extracted modal parameters
6. To introduce advanced topics on dynamic sub-structuring, modal reduction, modal expansion, model updating, and vibration testing of weakly nonlinear structures

Course Outcomes:

Students will, on completion of the course:

1. Get familiar with theoretical and practical aspects of structural dynamics
2. Develop the ability to plan for experimental testing of structural vibrations
3. Gain understanding of sensor and actuator selection and placement
4. Gain understanding of the basics of digital signal processing of measurements, and its impact on quality of measured data
5. Gain the ability to reconstruct mathematical models describing the structure based on experimental modal analysis
6. Appreciate role of modal analysis in system identification, model updating, and condition monitoring

Unit 1: Background and Theory of Modal Testing

Experimental Modal Analysis (EMA), Theoretical Modes, Time Domain Structural Response, The Frequency Domain Response, Experimental Modal Analysis (EMA) Procedure

Unit 2: Single-Degree-of-Freedom (SDoF) and 2DoF Systems

The Single Degree of Freedom System: Spring k, Mass m, Damper c, Motion of an SDoF System, The Impulse Response Function, h(t), The Frequency Response Function (FRF), Displaying the FRF Nyquist Plot, Structural Dynamic Relationships, Two Degrees of Freedom (2DoF), 2DoF Frequency Response

Unit 3: Multiple-Degrees of Freedom (MDoF) Systems
Natural Frequencies and Mode Shapes, Modal and Frequency Matrices, Orthogonality and Normalization, Decoupling the Equations, Single Point Excitation and Response, Mode Shapes for: Cantilever Beam, Mode Shape Animation

Unit 4: Some Essentials of Signal Processing
Analog to Digital (A-D) Conversion, Aliasing, FFT, DFT, Windowing for Continuous, Random and Transient Signals, System Identification Using the FFT, Signal Averaging Coherence, Rules of Signal Processing, Time and Frequency Domain Terminology

Unit 5: Setting up the Modal Test:
Support the Structure, Free Boundary, Mounting Transducers, Contact Resonance, Mounting Methods: Stud, Superglue, Beeswax, Magnet, Mounting Base, Double-Mount, setting up the Analyzer, Random Excitation, Impact Excitation, Windowing the Response Coherence Function, Coherence Examples

Unit 6: Modal Parameter Extraction
Natural Frequencies, Modal Damping and Modal Constant, Modal Inferposition Using Single Mode Methods: "Quadrature" method, "Circle Fit" Method, Modal Residues, Multiple Mode Methods

Books:

1. Jimin He and Zhi-Fang Fu, Modal Analysis, Butterworth-Heinemann, Oxford, 2001, ISBN 9780750650793
2. D. J. Ewins, Modal Testing: Theory, Practice and Application, 2nd Edition, Wiley Publications, ISBN: 978-0-86380-218-8

OE2101 Elective IV Introduction to Composites
(NPTEL Swayam Online)

Teaching Scheme
Swayam Online

Examination Scheme
In semester: 50 marks
End semester: 50 marks
Credits: 3

Course Objectives:

1. To understand a perspective utilization and processing of composite materials
2. To analyze short fiber reinforced composites
3. To analyze lamina of long fiber reinforced composite material at micro and macro level
4. To analyze the laminated composite material at macro level

Course Outcomes:

Upon completion of this course, the student will be able to:

1. Define need, utilization of class of composite material, its constitution, list its application fields along with fabrication process
2. Analyze short fiber reinforced composites
3. Analyze long fiber reinforced composite lamina at micro and macro level
4. Analyze the laminated composite material at a macro level using classical lamination theory

Course Content:

Week 1 : Intro and terminology
Week 2 : Concept Review
Week 3 : Fibers
Week 4 : Matrix materials
Week 5 : Short fiber composites
Week 6 : Short fiber composites
Week 7 : Orthotropic lamina
Week 8 : Orthotropic lamina
Week 9 : Orthotropic lamina
Week 10 : Composite laminates
Week 11 : Composite laminates
Week 12 : Composite laminates

References:

1. Analysis and Performance of Fiber Composites, Agarwal, B. D. and Broutman, L. J., John Wiley & Sons.
2. Mechanics of Composite Materials, Jones, R. M., Mc-Graw Hill.
3. Engineering Mechanics of Composite Materials, Daniel, I. M. and Ishai, O., Oxford University Press.

MED 2101 Project Stage I

Teaching Scheme **Examination Scheme**
Practical: 18 Hrs/week InSem: 125 Marks
Oral: 100 Marks

Credits: 9

Course Objectives:

1. To identify societal and engineering needs; formulate a problem statement, articulate aims and objectives to create solutions for complex problems.
2. To carry out literature Survey relevant to the problem and decide appropriate solution methodology to arrive at a solution of real-life engineering problems.
3. To apply principles of mechanical engineering and interdisciplinary knowledge to carry out design analysis of complex engineering problems using research-based methods.
4. To Form teams, work effectively and be able to plan the project activities for timely completion of the project.

Course Outcome:

After learning the course, the students should be able to –

1. Identify societal and engineering needs; formulate a problem statement, articulate aims and objectives to create solutions for complex problems.
2. Survey literature relevant to the problem and decide appropriate solution methodology to arrive at a solution of real-life engineering problems.
3. Apply principles of mechanical engineering and interdisciplinary knowledge to carry out design analysis of complex engineering problems using research-based methods.
4. Form teams, work effectively and be able to plan the project activities for timely completion of the project.

Content:

The project work shall be based on the knowledge acquired by the student during the work and preferably it should meet and contribute towards the needs of the society. The project aims to provide an opportunity of designing and building complete system or subsystems based on area where the student likes to acquire specialized skills.

Project Stage – I is an integral part of the project work. In this, the student shall complete the partial work of the project which will consist of problem statement, literature review, project overview, scheme of implementation of mathematical model and design of the Set-up etc.

As a part of the progress report of Project work Stage-I, the candidate shall deliver a presentation on the advancement in Technology pertaining to the selected dissertation topic. The student shall submit the duly certified progress report of Project work Stage-I in Standard format for satisfactory completion of the work by the concerned guide and Head of the Department.