

Introduction to Modelling and Design for Manufacturing		Semester	3
Course Code	BMEL305	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	0:0:2*:0	SEE Marks	50
Total Hours of Pedagogy	14 Sessions	Total Marks	100
Credits	01	Exam Hours	3
Examination nature (SEE)	Practical		
*One hour per week can be taken additionally			
Course objectives: 1. To improve the visualisation skills and understand the conventions used in engineering drawing. 2. To inculcate understanding of the theory of projection and make drawings using orthographic projections and sectional views. 3. To impart fundamental knowledge of drawing of different machine parts. 4. To enable the students with concepts of dimensioning and standards related to drawings. 5. To enable the students to draw the assembly of various machine components. 6. To enable the students on limits, tolerance and fits and indicate them on machine drawings.			
Teaching-Learning Process (General Instructions) These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes. <ul style="list-style-type: none">• Adopt different types of teaching methods to develop the outcomes through PowerPoint presentations and Video demonstrations or Simulations.• Chalk and Talk method for Problem Solving.• Adopt online sharable playlist for students• Adopt collaborative (Group Learning) learning in the class.• Adopt Problem Based Learning (PBL), which fosters students' analytical skills and develops thinking skills such as evaluating, generalizing, and analysing information.			
Module-1			
Introduction to Computer Aided Sketching Review of graphic interface of the software. Review of 2D Sketching, Parametric Solid Modeling, Assembly creation and product rendering. Limits, Fits and Tolerances: Introduction, Fundamental tolerances, Deviations, Methods of placing limit dimensions, Types of fits with symbols and applications, Geometrical tolerances on drawings, Standards followed in industry. (Above topics to be studied as a review) 01 Session Geometrical Dimensioning and Tolerances (GD&T): Introduction, Fundamental tolerances, Deviations, Methods of placing limit dimensions, machining symbols, types of fits with symbols and applications, geometrical tolerances on drawings. Standards followed in industry. The basics of sketching and modelling: Create a basic sketch - Profile Tools, Curve Tools, Editing Tools, Operation Tools, Constraints, construction geometries and adding dimensions. Part- Solid from sketches, Solid from surfaces, modify Tools, Operation Tools. 02 Sessions			
Module-2		02 Sessions	
Exploring design tools for production: Create draft during a feature - Create draft as a feature - Add ribs and plastic supports - Analyze draft on a design - Create holes and threads - Use a coil feature - Mirrors and patterns - Surface creation for complex geometry - Use surfaces to replace faces - Use surfaces to split bodies and faces - Practice exercise.			
Module-3		03 Sessions	

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The Basics of Assemblies

The different ways to create components - Use scripts to create gears - Component color swatch and color cycling - Use McMaster-Carr parts in a design - Copy, paste, and paste new.
- Distributed designs - Create as-built joints - Create joints - Joint origins and midplane joints - Drive joints and motion studies - Interference detection and contact sets - Isolation and opacity control - Create groups and organize a timeline - Practice exercise.

Module-4

06 Sessions

Assembly Drawings: (Part drawings shall be given)

Drawing Basics-Detailing Drawings. Explode a 3D model for a drawing, Create a drawing sheet and views, Add geometry and dimensions to a drawing, Add GD & T text, BOM, tables and symbols, Place an exploded view, Edit a title block, Export to different file formats.

1. **Reciprocating saw mechanical assembly,**
2. **Innovated bottle design for sustainability**
3. **Engine Piston**
4. **Cylinder Flange**
5. **Engine Case**
6. **Design for Injection Molding**

Course outcome (Course Skill Set)

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

1. Demonstrate their visualization skills.
2. Apply limits and tolerances to assemblies and choose appropriate fits for given assemblies. Make component drawings.
3. Produce the assembly drawings using part drawings.
4. Engage in lifelong learning using sketching and drawing as communication tool.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation (CIE):

- CIE marks for the practical course is 50 Marks.
- CIE shall be evaluated for max marks 100. Marks obtained shall be accounted for CIE final marks, reducing it by 50%.
- CIE component should comprise of
 - Continuous evaluation of Drawing work of students as and when the Modules are covered.
 - At least one closed book Test covering all the modules on the basis of below detailed weightage.
 - *Weightage for Test and Continuous evaluation shall be suitably decided by respective course coordinators.*

Module	Max. Marks weightage	Evaluation Weightage in marks	
		Computer display & printout	Preparatory sketching
Module-1	15	10	05
Module-2	15	10	05
Module-3	20	15	05
Module-4	50	40	10
Total	100	80	20

Semester End Evaluation (SEE):

SEE marks for the practical course is 50 Marks.

- The duration of SEE is 03 hours. Questions shall be set worth of 3 hours
- SEE shall be conducted jointly by the two examiners (one internal and one external) appointed by the University.
- SEE shall be conducted and evaluated for maximum of 100 marks. Marks obtained shall be accounted for SEE final marks, reducing it to 50 marks.
- Question paper shall be set jointly by both examiners and made available for each batch as per schedule.
- Questions are to be set preferably from Text Books.
- Evaluation shall be carried jointly by both the examiners.
- Scheme of Evaluation: To be defined by the examiners jointly and the same shall be submitted to the university along with question paper.
- One full question shall be set from each Modules as per the below tabled weightage details.
However, the student may be awarded full marks, if he/she completes solution on computer display without sketch.

Module	Max. Marks Weightage	Evaluation Weightage in marks	
		Computer display & printout	Preparatory sketching
Module-1 OR Module-2	20	15	05
Module-3	20	15	05
Module-4	60	50	10
Total	100	80	20

Suggested Learning Resources:

Books

Text Books:

1. 'A Primer on Computer Aided Machine Drawing-2007', Published by VTU, Belgaum.
2. 'Machine Drawing', N.D.Bhat & V.M.Panchal, Published by Charotar Publishing House, 1999.
3. 'Machine Drawing', K.R. Gopala Krishna, Subhash publication.

Reference Book:

1. "A Text Book of Computer Aided Machine Drawing", S. Trymbakaa Murthy, CBS Publishers, New Delhi, 2007.
2. 'Machine Drawing', N.Siddeshwar, P.Kannaiah, V.V.S. Sastri, published by Tata Mc.Grawhill, 2006.
3. K L Narayana, P Kannaiah, K Venkata Reddy, "Machine Drawing", New Age International, 3rd Edition. ISBN-13: 978-81-224-2518-5, 2006
4. Ajeet Singh, "MACHINE DRAWING", Tata McGraw-Hill Education,, ISBN: 9781259084607, 2012

Web links and Video Lectures (e-Resources):

- <https://www.autodesk.com/certification/learn/course/learn-fusion-360-in-90-minutes>
- Introduction to Modelling and Design for Manufacturing
- <https://www.autodesk.com/certification/learn/course/fusion360-intro-modeling-design-professional>

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

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