PRODUCTION DRAWING **Course Code : 313311**

Programme Name/s : **Mechanical Engineering/ Mechatronics/ Production Engineering**
Programme Code : **ME/ MK/ PG**
Semester : **Third**
Course Title : **PRODUCTION DRAWING**
Course Code : **313311**

I. RATIONALE

Production drawing is essential for communicating ideas in manufacturing industry as well as other engineering applications. Production drawings illustrate set of instructions to manufacture a product, providing information about dimensions, materials, finishes, tools required, methods of assembly and so on. Therefore, this course has been developed for interpretation and preparation of the production drawing.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

Prepare Production drawing of a given part / component as per requirement.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

Students will be able to achieve & demonstrate the following COs on completion of course based learning

- CO1 - Construct an auxiliary view of given object.
- CO2 - Use convention for representation of material and mechanical components.
- CO3 - Interpret and draw production drawing.
- CO4 - Prepare assembly drawing using given details.
- CO5 - Prepare detail drawing based on the given assembly drawing/data.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Assessment Scheme											
				Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TL				Based on SL		Total Marks
															Practical						
				CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
											Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
313311	PRODUCTION DRAWING	PDR	SEC	2	-	4	2	8	4	4	30	70	100	40	25	10	25@	10	25	10	175

Total IKS Hrs for Sem. : Hrs
Abbreviations: CL- ClassRoom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment
Legends: @ Internal Assessment, # External Assessment, *# On Line Examination , @$ Internal Online Examination
Note :

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.* 15 Weeks
5. 1 credit is equivalent to 30 Notional hrs.
6. * Self learning hours shall not be reflected in the Time Table.
7. * Self learning includes micro project / assignment / other activities.

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

PRODUCTION DRAWING **Course Code : 313311**

Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
1	TLO 1.1 Construct an auxiliary view of a given object. TLO 1.2 Construct an incomplete principal view from the given auxiliary view.	**Unit - I Auxiliary View** 1.1 Auxiliary planes and views. 1.2 Draw Auxiliary view from the given orthographic views. 1.3 Complete the partial view from the given auxiliary and other principal view.	Lecture Using Chalk-Board Model Demonstration Video Demonstrations
2	TLO 2.1 Use IS SP-46 codes for preparing production drawing. TLO 2.2 Prepare production drawing using standard conventions.	**Unit - II Conventional representation** 2.1 Engineering Material Conventions 2.2 Conventional breaks in pipes, rod and shaft 2.3 Conventional representation of common features like slotted head, radial rib, knurling, serrated shaft, splined shaft, ratchet and pinion, repeated parts, square on shaft, holes on circular pitch, internal and external threads 2.4 Conventional representation of standard parts like ball and roller bearing, gears, springs 2.5 Pipe joints and valves 2.6 Counter sunk and counter bored holes 2.7 Tapers	Lecture Using Chalk-Board Model Demonstration Video Demonstrations
3	TLO 3.1 Calculate tolerances on the given machine components. TLO 3.2 Identify type of fit between mating parts of machine components based on given tolerance values. TLO 3.3 Prepare production drawing using suitable convention and codes.	**Unit - III Production Drawing** 3.1 Limits, Fits and Tolerances: Definitions, introductions to ISO system of Tolerance. Dimensional tolerances: Terminology, selection and representation of dimensional tolerance- number and grade method. Definitions concerning Tolerancing and Limits system, unilateral and bilateral tolerance, Hole and shaft basis systems, Types of fits- Clearance, transition and Interference, Selection of fit for engineering applications. Calculation of limit sizes and identification of type of fit from the given sizes like 50 H7/s6, 30 H7/d9 etc. 3.2 Geometrical Tolerances: Types of geometrical tolerances, terminology for deviation, representation of geometrical tolerance on drawing. 3.3 General welding symbols, length and size of weld, surface contour and finish of weld, all round and site weld, symbolic representation in Engineering practices and its interpretation. 3.4 Machining symbol and surface texture: Indication of machining symbol showing direction of lay, sampling length, roughness grades, machining allowances, manufacturing methods. Representation of surface roughness on drawing.	Lecture Using Chalk-Board Model Demonstration Video Demonstrations
4	TLO 4.1 Identify various components in given detail drawings. TLO 4.2 Identify sequence of assembling it. TLO 4.3 Prepare assembly drawing from given detailed drawing. TLO 4.4 Prepare bill of material.	**Unit - IV Details to assembly** 4.1 Introduction to assembly drawing, accepted norms to be observed for assembly drawings, sequence for preparing assembly drawing, Bill of Material (BOM). 4.2 Couplings: Oldham & Universal couplings. 4.3 Bearing: Foot Step & Pedestal Bearing. 4.4 Lathe: Single (pillar type) and square tool Post. 4.5 Bench vice & Pipe Vice. 4.6 Screw-jack 4.7 Drill Jig	Lecture Using Chalk-Board Model Demonstration Video Demonstrations

Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
5	TLO 5.1 Interpret various components in given assembly drawings. TLO 5.2 Identify sequence of dismantling in given assembly drawing. TLO 5.3 Prepare the detailed drawing from given assembly drawing.	**Unit - V Assembly to Details** 5.1 Basic principles of process of dismantling the assembly into components. 5.2 Couplings: Oldham & Universal couplings. 5.3 Bearing: Foot Step & Pedestal Bearing. 5.4 Lathe: Single (pillar type) and square tool Post. 5.5 Bench vice & Pipe Vice. 5.6 Screw-jack 5.7 Drill Jig	Lecture Using Chalk-Board Model Demonstration Video Demonstrations

VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL / TUTORIAL EXPERIENCES.

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 1.1 Draw an auxiliary view from given drawing.	1	*Draw an auxiliary view or complete given partial drawing. (any two)	4	CO1
LLO 2.1 Draw an auxiliary view from given drawing.	2	*Draw an auxiliary view or complete given partial drawing. (Continue Sr No 1)	4	CO1
LLO 3.1 Prepare drawing using convention and code as per IS-SP46.	3	*Draw various conventional representations as per IS SP-46	4	CO2
LLO 4.1 Use various tolerances and symbols in drawing.	4	*Draw Dimensional and Geometrical Tolerances, Welding Symbols, Surface Roughness and Machining Symbols on the given figures.	4	CO2 CO3
LLO 5.1 Use various tolerances and symbols in production drawing.	5	Develop Production drawing of machine components showing dimensional and geometrical Tolerance, surface finish etc. (any two)	4	CO2 CO3
LLO 6.1 Draw assembly drawing using standard procedure for assembly of components.	6	Draw an Assembly drawing from the given detailed drawing showing fits, part numbers, bill of material, assembly dimensions (Any one)	4	CO2 CO3 CO4 CO5
LLO 7.1 Draw assembly drawing using standard procedure for assembly of components.	7	Draw an Assembly drawing from the given detailed drawing showing fits, part numbers, bill of material, assembly dimensions. (Sr No 6 continue)	4	CO2 CO3 CO4 CO5
LLO 8.1 Draw assembly drawing using standard procedure for assembly of components.	8	Draw an Assembly drawing from the given detailed drawing showing fits, part numbers, bill of material, assembly dimensions. (Sr No 6 continue)	4	CO2 CO3 CO4 CO5
LLO 9.1 Draw assembly drawing using standard procedure for assembly of components.	9	*Draw an Assembly drawing from the given detailed drawing showing fits, part numbers, bill of material, assembly dimensions. (any one)	4	CO2 CO3 CO4 CO5
LLO 10.1 Draw assembly drawing using standard procedure for assembly of components.	10	*Draw an Assembly drawing from the given detailed drawing showing fits, part numbers, bill of material, assembly dimensions. (Sr No 9 continue)	4	CO2 CO3 CO4 CO5

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 11.1 Draw detail drawing using standard procedure for dismantling of given assembly drawing.	11	Draw detailed drawing from the given assembly drawing showing Conventional Representation, Dimensional and Geometrical Tolerances and Surface Finish symbols. (any one)	4	CO2 CO3 CO4 CO5
LLO 12.1 Draw detail drawing using standard procedure for dismantling of given assembly drawing.	12	Draw detailed drawing from the given assembly drawing showing Conventional Representation, Dimensional and Geometrical Tolerances and Surface Finish symbols. (Sr No 11 continue)	4	CO2 CO3 CO4 CO5
LLO 13.1 Draw detail drawing using standard procedure for dismantling of given assembly drawing.	13	Draw detailed drawing from the given assembly drawing showing Conventional Representation, Dimensional and Geometrical Tolerances and Surface Finish symbols. (Sr No 11 continue)	4	CO2 CO3 CO4 CO5
LLO 14.1 Draw detail drawing using standard procedure for dismantling of given assembly drawing.	14	*Draw detailed drawing from the given assembly drawing showing Conventional Representation, Dimensional and Geometrical Tolerances and Surface Finish symbols. (any one)	4	CO2 CO3 CO4 CO5
LLO 15.1 Draw detail drawing using standard procedure for dismantling of given assembly drawing.	15	*Draw detailed drawing from the given assembly drawing showing Conventional Representation, Dimensional and Geometrical Tolerances and Surface Finish symbols. (Sr No 14 continue)	4	CO2 CO3 CO4 CO5

Note : Out of above suggestive LLOs -

- '*' Marked Practicals (LLOs) Are mandatory.
- Minimum 80% of above list of lab experiment are to be performed.
- Judicial mix of LLOs are to be performed to achieve desired outcomes.

VII. SUGGESTED MICRO PROJECT / ASSIGNMENT/ ACTIVITIES FOR SPECIFIC LEARNING / SKILLS DEVELOPMENT (SELF LEARNING)

Micro project

- Prepare assembly drawing/detailed drawing of machine vice/ lathe tailstock/ tool post etc. by visiting Institute's workshop.
- Prepare report on various types of welding symbols used for fabrication work by Visiting nearby fabrication workshop.
- Any other micro-projects suggested by subject faculty on similar line.
- Prepare detailed drawings of Various IC Engine components using proper measuring instruments by visiting Institute's Power engineering Lab or any other.
- Students should collect Production drawings from nearby workshops/industries and establish item reference numbers on that drawing for convention or tolerance value. Prepare report showing item reference numbers and their meaning.
- Prepare report representing conventional representation of various piping joints by visiting nearby process industries like sugar factory, chemical industries, water treatment plant, etc.

Note :

- Above is just a suggestive list of microprojects and assignments; faculty must prepare their own bank of microprojects, assignments, and activities in a similar way.
- The faculty must allocate judicial mix of tasks, considering the weaknesses and / strengths of the student in acquiring the desired skills.
- If a microproject is assigned, it is expected to be completed as a group activity.
- SLA marks shall be awarded as per the continuous assessment record.
- For courses with no SLA component the list of suggestive microprojects / assignments/ activities are optional, faculty may encourage students to perform these tasks for enhanced learning experiences.
- If the course does not have associated SLA component, above suggestive listings is applicable to Tutorials and maybe considered for FA-PR evaluations.

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Models, charts of objects for Auxiliary view.	1
2	Models/ Charts of Conventional representation and Production drawing.	3,4,5
3	Models, charts of assembly and details drawings.	6,7,8,9,10,11,12,13,14,15
4	Drawing equipment and instruments for classroom teaching-large size: a. T-square or drafter (Drafting Machine). b. Set square (45-45-90 and 30-60-90) c. Protector. d. Drawing instrument box (containing set of compasses and dividers). Drawing sheets, drawing pencils H,2H, Eraser, Drawing pins / clips	All
5	Drawing Table with Drawing Board of Full Imperial/ A1 size.	All
6	Set of various industrial drawings being used by industries.	All

IX. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

Sr.No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Auxiliary View	CO1	4	0	0	8	8
2	II	Conventional representation	CO2	4	6	8	0	14
3	III	Production Drawing	CO3	6	4	8	4	16
4	IV	Details to assembly	CO4	8	0	0	16	16
5	V	Assembly to Details	CO5	8	0	0	16	16
Grand Total				**30**	**10**	**16**	**44**	**70**

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

- continuous assessment based on laboratory performance.

Summative Assessment (Assessment of Learning)

- End term exam- Theory
- End term exam- Practical (Lab performance)

XI. SUGGESTED COS - POS MATRIX FORM

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Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	2	2	1	-	-	-	-			
CO2	3	3	1	-	-	-	-			
CO3	3	3	1	-	-	-	-			
CO4	3	2	1	-	-	-	-			
CO5	3	2	1	-	-	-	-			

Legends :- High:03, Medium:02,Low:01, No Mapping: -
*PSOs are to be formulated at institute level

XII. SUGGESTED LEARNING MATERIALS / BOOKS

Sr.No	Author	Title	Publisher with ISBN Number
1	Bureau of Indian Standards.	Engineering Drawing Practice for Schools and Colleges IS: SP-46	October 2003, ISBN: 81-7061-091-2
2	Bhatt, N.D.	Engineering Drawing	Charotar Publishing House, 2011, ISBN: 978-93-80358-17-8
3	Bhatt, N.D.; Panchal, V. M	Machine Drawing	Charotar Publishing House, 2011, ISBN: 978-93-80358-11-6
4	Narayan, K. L. Kannaiah, P. Venkata Reddy, K.	Production Drawing	New Age International Publications, 2011, ISBN: 978-81-224-2288-7
5	Sidheswar, N. Kannaiah, P. Sastry, V.V.S.	Machine Drawing	Tata McGraw Hill Education Private Ltd, New Delhi, 2011, ISBN-13: 978-0-07-460337-6

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://youtu.be/599ThWCvMVA	Auxiliary View
2	https://youtu.be/k7-POcJfjAU	Auxiliary View
3	https://youtu.be/5Pj7vkcolXk	Introduction to working drawing.
4	https://youtu.be/VRi2LMm6jHU	Assembly
5	https://youtu.be/FqzplEaE4Z0	Details to Assembly

Note :

- Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students