KSV UNIVERSITY

LDRP INSTITUTE OF TECHNOLOGY & RESEARCH

MECHANICAL ENGINEERING DEPARTMENT

SYLLABUS (2017-18)

M.E. MECHANICAL-PRODCUTION ENGINEERING

KADI SARVA VISHWAVIDYALAYA LDRP Institute of Technology & Research Gandhinagar 382015

30/04/2018

The meeting of the Program Committee (Board of Studies) under the Faculty of Engineering & Technology, for Mechanical/Automobile is scheduled on Monday, the 30th April, 2018 at 01:00 P.M. in the Board Room of the University, with the following Agenda:

- **TEACHING AND EXAMINATION SCHEME WITH DETAIL SYLLABUS OF B.E. II YEAR (3RD AND 4TH SEMESTER) AND M.E. II YEAR (3RD AND 4TH SEMESTER - PRODUCTION/THERMAL/AUTOMOBILE ENGINEEIRNG).**
- **TEACHING AND EXAMINATION SCHEME OF B.E. III AND IV YEAR (5TH TO 8TH SEMESTER) TO B.E. IV YEAR (MECHANICAL/AUTOMOBILE ENGINEEING).**

The following Committee members were present in Program Committee (Board of Studies) under the Faculty of Engineering & Technology,

1. Dr Gargi Rajpara, Principal LDRP-ITR
2. Prof. S. K. Mantra, Registrar, KSV
3. Prof. P. K. Shah, COE, KSV
4. Prof. Anand Dhruve, VGCE - Ahmedabad
5. Prof. R J Jani, LDCE - Ahmedabad
6. Dr N M Bhatt, Director, GIT, Moti Bhoyan, Gandhinagar.
7. Prof. U V Shah, Associate Professor, GEC, Modasa.
8. Dr D H Pandya, Prof. & HOD, Mechanical 1st Shift, LDRP-ITR, Gandhinagar.
9. Dr N S Mehta, Prof. & HOD, Mechanical 2nd Shift, LDRP-ITR, Gandhinagar.
10. Dr T M Patel, Professor, Mechanical Engineering, LDRP-ITR, Gandhinagar.
11. Prof. A M MAVANI, Asst. Prof., Mechanical Engineering, LDRP-ITR, Gandhinagar.
12. Prof. Vidya Nair, Asst. Prof., Mechanical Engineering, LDRP-ITR, Gandhinagar.
13. Prof. Mrunal Pandya, Asst. Prof., Mechanical Engineering, LDRP-ITR, Gandhinagar

14. Prof. Anirudh Kyada, Asst. Prof., Mechanical Engineering, LDRP-ITR, Gandhinagar

The discussion included

U.G. – AUTOMOBILE/MECHANICAL SECOND YEAR TEACHING AND EXAMINAITN SCHEME

1. It is suggested to replace Advanced Strength of Material with Material Science and Metallurgy is semester 3 with same teaching and examination scheme (3-0-2).
2. It is suggested to transfer the topic of friction from Kinematic of Machine (semester 3) to Theory of Machine (semester 5) and add Synthesis and analysis of Mechanics in subject Kinematic of Machine in semester 3.
3. It is suggested to replace the subject of Differential Equation and Integral Transforms with Engineering Mathematics III in 3rd semester Automobile Engineering. It is also recommended to discus the syllabus of the same in the BOS of Mathematics.
4. It is suggested to correct the name of the subject Complex Analysis and Numerical Analysis in semester 4 in consultation with BOS of Mathematics.
5. Teaching and Examination scheme of subject IDMD is suggested to change from 3 – 0 – 4 to 3 – 0 – 2. It is also recommended by BOS members to give 1 (one) hour as a practice in Industrial Drafting and Machine Design and credit of the same should not counted. It is recommended to redesign the syllabus of subject as per suggestion provided by BOS members.
6. It is suggested to interchange the subject of Thermodynamics (Semester 4) with Fluid Mechanics (Semester 3) in respective semesters.
7. It is suggested to utilize 2 hours of Audit course of Semester 3 and 4 to provide as an additional teaching hours for the other subject/ subjects of the same semester without considering the credit of the same.
8. It is also recommended by the BOS members to specify the outcome of each topic of all subjects.
9. It is recommended to add more numbers of standard book in all subject.
10. Typographical error was observed by the members and it recommended to rectify the same.

11. Some discrepancy was observed in the format of syllabus of M.P. I (semester 3), it is recommended to correct it.
12. It is suggested by BOS members to rename the name of Subjects namely, M.D. I, M.D. II, M.P. I and M.P. II etc. from the student transcript point of view.
13. Add more number of Elective Subject in Semester 5 to semester 8.

TEACHING AND EXAMINATION SCHEME OF M.E. II YEAR (Production/Thermal/Automobile).

- Teaching and Examination Scheme with detail syllabus of M.E. II year **(**Production/Thermal/Automobile) is approved without any modification.

Prof. (Dr.) D.H.Pandya
HOD-Mechanical Engineering

Dr. Gargi Rajpara
Principal

KadiSarvaVishwavidyalaya

Scheme for Teaching and Examination

First Year Master of Engineering (Semester I & II) (Mechanical Engineering-Production)

With Effect From: Academic Year 2017-18(CBCS)

SUB CODE	SUBJECT NAME	Teaching Scheme				Total Credit	Evaluation Scheme					
		L	T	P	Total		THEORY		IE	CIA	Pract/ VIVO	Total
		Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	Marks
SEMESTER – I												
MECC101-N	RESEARCH METHODOLOGY	2	0	-	2	2	3	70	30	20	-	120
MEPR102-N	MACHINING SCIENCE	4	0	2	6	5	3	70	30	20	30	150
MEPR103-N	ADVANCE CASTING TECHNIQUES	4	0	2	6	5	3	70	30	20	30	150
MEPR104-N	PRODUCT DESIGN FOR MANUFACTURE	3	0	2	5	4	3	70	30	20	30	150
MEPR105-N	SEMINAR-1	0	0	2	2	1	-	-	-	30	100	130
	ELECTIVE-I	4	0	2	6	5	3	70	30	20	30	150
	ELECTIVE-II	3	0	0	3	3	3	70	30	20	-	120
	TOTAL	**20**	**00**	**10**	**30**	**25**	**-**	**-**	**-**	**-**	**-**	**970**
SEMESTER – II												
MECC201-N	TECHNICAL COMMUNICATION	2	0	-	2	2	3	70	30	20	-	120
MEPR202-N	MECHANICS OF METAL FORMING	4	0	2	6	5	3	70	30	20	30	150
MEPR203-N	ADVANCE WELDING TECHNOLOGY	3	0	2	5	4	3	70	30	20	30	150
MEPR204-N	ADVANCED MATERIAL TECHNOLOGY & METALLURGY	4	0	2	6	5	3	70	30	20	30	150
MEPR205-N	SEMINAR-2	0	0	2	2	1	-	-	-	30	100	130
	ELECTIVE-III	4	0	2	6	5	3	70	30	20	30	150
	ELECTIVE-IV	3	0	0	3	3	3	70	30	20	-	120
	TOTAL	**20**	**00**	**10**	**30**	**25**	**-**	**-**	**-**	**-**	**-**	**970**

KadiSarvaVishwavidyalaya

Scheme for Teaching and Examination

First Year Master of Engineering (Semester I & II) (Mechanical Engineering-Production)

With Effect From: Academic Year 2017-18(CBCS)

UNIVERSITY ELECTIVE SEM I												
SUB CODE	**SUBJECT NAME**	**Teaching Scheme**				**Total Credit**	**Evaluation Scheme**					
		L	**T**	**P**	**Total**		**THEORY**		**IE**	**CIA**	**Pract/ VIVO**	**Total Marks**
		Hrs	**Hrs**	**Hrs**	**Hrs**		**Hrs**	**Marks**	**Marks**	**Marks**	**Marks**	
MECC101-N	RESEARCH METHODOLOGY	2	0	0	2	2	3	70	30	20	-	120
MECC102-N	PERSONALITY DEVELOPMENT	2	0	0	2	2	3	70	30	20	-	120
MECC103-N	ENTREPRENEURSHIP & INCUBATION	2	0	0	2	2	3	70	30	20	-	120
UNIVERSITY ELECTIVE SEM II												
SUB CODE	**SUBJECT NAME**	**Teaching Scheme**				**Total Credit**	**Evaluation Scheme**					
		L	**T**	**P**	**Total**		**THEORY**		**IE**	**CIA**	**Pract/ VIVO**	**Total Marks**
		Hrs	**Hrs**	**Hrs**	**Hrs**		**Hrs**	**Marks**	**Marks**	**Marks**	**Marks**	
MECC201-N	TECHNICAL COMMUNICATION	2	0	0	2	2	3	70	30	20	-	120
MECC202-N	PATENT SEARCH	2	0	0	2	2	3	70	30	20	-	120
MECC203-N	ENGINEERING ETHICS	2	0	0	2	2	3	70	30	20	-	120

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Scheme for Teaching and Examination

First Year Master of Engineering (Semester I & II) (Mechanical Engineering-Production)

With Effect From: Academic Year 2017-18(CBCS)

ELECTIVE – I	**ELECTIVE – III**
MEPR106-N-A: PRODUCT AUTOMATION & CNC TECHNOLOGY	MEPR-206-N-A: DESIGN OF MACHINE TOOLS
MEPR106-N-B: FINITE ELEMENT TECHNIQUES	MEPR206-N-B: EXPERIMENTAL TECHNIQUES AND DATA ANALYSIS
MEPR106-N-C: METROLOGY & COMPUTER AIDED INSPECTION	MEPR206-N-C: ROBOTICS & ARTIFICIAL INTELLIGENCE

ELECTIVE – II	**ELECTIVE – IV**
MEPR107-N-A: NON TRADITIONAL MACHINING	MEPR-207-N-A: MECHATRONICS
MEPR107-N-B: PIPING SYSTEM DESIGN	MEPR207-N-B: QUALITY ENGINEERING & MANAGEMENT
MEPR107-N-C: INDUSTRIAL TRIBOLOGY	MEPR207-N-C: MACHINE TOOL DYNAMICS
MEPR107-N-D: MICRO AND NANO MANUFACTURING	MEPR207-N-D: PLASTIC PROCESSING
MEPR107-N-E: PRECISION ENGINEERING	MEPR207-N-E: SURFACE TREATMENT PROCESSES

KadiSarvaVishwavidyalaya

Scheme for Teaching and Examination

Second Year Master of Engineering (Semester III & IV) (Mechanical Engineering-Production)

With Effect From: Academic Year 2017-18(CBCS)

SUB CODE	SUBJECT NAME	Teaching Scheme				Total Credit	Evaluation Scheme					
		L	T	P	Tota l		THEORY		IE	CIA	Pract/ VIVO	Total
		Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	Marks
SEMESTER – III												
MEPR301-N	TOOL & DIE DESIGN	4	0	2	6	5	3	70	30	20	30	150
MEPR302-N	DISSERTATION PHASE -I	-	-	-	-	15	-	-	-	50	150	200
	ELECTIVE V	4	0	2	6	5	3	70	30	20	30	150
	TOTAL	**8**	**0**	**4**	**12**	**25**	**6**	**140**	**60**	**90**	**210**	**500**
SEMESTER – IV												
MEPR401-N	MID SEMESTER THESIS PROGRESS REVIEW	-	-	-	-	5	-	-	-	50	150	200
MEPR402-N	DISSERTATION PHASE-II	-	-	-	-	20	-	-	-	100	200	300
	TOTAL	**-**	**-**	**-**	**-**	**25**	**-**	**-**	**-**	**150**	**350**	**500**

KadiSarvaVishwavidyalaya

Scheme for Teaching and Examination

Second Year Master of Engineering (Semester III & IV) (Mechanical Engineering-Production)

With Effect From: Academic Year 2017-18(CBCS)

ELECTIVE – V
MEPR303-N-A: OPTIMIZATION TECHNIQUES
MEPR303-N-B: RAPID PROTOTYPING AND TOOLING SYSTEM
MEPR303-N-C: DESIGN AND METALLURGY OF WELDED JOINTS

ME MECHANICAL-PRODUCTION ENGINEERING

SEMESTER-I

Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

First Semester Master of Engineering (Mechanical-Production Engineering)

In Effect from Academic Year 2017-18

Subject Code: MECC101-N	**Subject Title: RESEARCH METHODOLOGY**

Teaching Scheme				**Total Credit**	**Evaluation Scheme**					
L	**T**	**P**	**Total**		**Theory**		**IE**	**CIA**	**Pract/ VIVO**	**Total**
Hrs	**Hrs**	**Hrs**	**Hrs**		**Hrs**	**Marks**	**Marks**	**Marks**	**Marks**	**Marks**
2	**0**	**0**	**2**	**2**	**3**	**70**	**30**	**20**	**-**	**120**

LEARNING OBJECTIVES:

The educational objectives of this course are

- To learn various concepts related to research methodology

INSTRUCTIONAL METHOD AND PEDAGOGY (Continuous Internal Assessment (CIA) Scheme)

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal
- Weightage should be given to all units while conducting teaching & examination.
- Attendance is compulsory in lectures and Tutorial which carry 05 Marks.
- One internal exam of 30 marks is conducted as a part of Mid semester evaluation.

OUTLINE OF THE COURSE:

SR.NO	**CHAPTER NO**	**DATE/WEEK**
1	1,2,3,4	1^{st} ,2^{nd} ,3^{rd}
2	5,6,7,8	4^{th} ,5^{th} ,6^{th}
3	9,10,11	7^{th} ,8^{th} ,9^{th}
4	12	19^{th} b ,11^{th} ,12^{th}
5	13,14	13^{th} ,14^{th} ,15^{th}

Total Hours (Theory): 30

Total Hours (Lab): 00

Total Hours: 30

DETAILED SYLLABUS

SR NO	TOPIC
1.	Introduction to the Research Methodology and research process at glance.
2.	Discussion on Illustrative Research Proposals
3.	Quantitative Research Design: Types of Research Designs and its applications
4.	Identifying the Research Problem
5.	Specifying Data and Acquisition Methods: Data types, Data source, Primary Data & Secondary Data, Comparison between various data actualization method
6.	Quantities Research design
7.	Measuring and Scaling: Fundamentals and Comparative Scaling.: Commonly Used Scales in Business Research, Reliability and Validity of Scale
8.	Research Paper Discussion: A Paper Contains Development and Validation of Scale
9.	Questionnaire Designing: Steps in Designing Questionnaire, Pitfalls in Questionnaire Designing
10.	Developing and Using Online Questionnaire
11.	Sampling Design and Procedure: Sampling Method Procedure and Sample Size Decision
12.	Define Research Question and Framing and Testing of Hypotheses: Developing the Hypothesis, Testing of Hypotheses: Type – I and II Errors, One Tailed and Two Tails Test of Significance. Parametric and Nonparametric Tests of Univariate and Bivariate Data(Nonparametric Tests: Kolmogorov Smirnov Test, Sign Test, Wilcoxon Matched Paris Test, Kolmogorov Smirnov Two Sample Test, Mann Whitey U Test)
13.	Test of Association and Research Report writing: Regression (Introduction only), Preparing a Research Report and Communication the Research Result (Includes APA style of reporting the result referencing), Evaluation of Research Result
14.	Statistical Package for Social Service(SPSS)

LESSON PLANNING

LECT NO	Topic	Hours	% Weightage
1	Introduction to the Research Methodology and	1	**25**
2	Introduction to research process at glance	1	
3	Discussion on Illustrative Research Proposals	1	
4	Quantitative Research Design	1	
5	Types of Research Design	1	
6	Research Designs and applications	1	
7	Identifying the Research Problem	1	
8	Specifying Data and Acquisition Methods:	1	**25**
9	Data types, Data source,	1	
10	Primary Data & Secondary Data,	1	
11	Comparison between various data actualization method	1	
12	Quantities Research design	1	
13	Measuring and Scaling: Fundamentals and Comparative Scaling:	1	
14	Commonly Used Scales in Business Research,	1	
15	Reliability and Validity of Scale	1	**25**
16	Research Paper Discussion: A Paper Contains Development and Validation of Scale	1	
17	Questionnaire Designing: Steps in Designing Questionnaire, Pitfalls in Questionnaire Designing	1	
18	Developing and Using Online Questionnaire	1	
19	Sampling Design and Procedure: Sampling Method Procedure and	1	
20	Sample Size Decision	1	
21	Define Research Question and Framing and Testing of Hypotheses:	1	
22	Developing the Hypothesis, Testing of Hypotheses: Type – I and II Errors, One Tailed	1	**25**
23	Two Tails Test of Significance. Parametric and Nonparametric Tests of Univariate and Bivariate Data(Nonparametric Tests:	1	
24	Kolmogorov Smirnov Test, Sign Test, Wilcoxon Matched Paris Test, Kolmogorov Smirnov Two Sample Test, Mann Whitey U Test)	1	
25	Test of Association	1	
26	Research Report writing: Regression (Introduction only), Preparing a Research Report	1	
27	Communication the Research Result (Includes APA style of reporting the result referencing), Evaluation of Research Result	1	
28	Statistical Package for Social Service(SPSS)	1	
29	CASE STUDIES	1	
30	CASE STUDIES	1	
	TOTAL	**30**	**100**

STUDENTS LEARNING OUTCOME:

At the end of the course

The students will gain an experience in defining research problem, thesis writing, applying quantitative methods

TEXT BOOKS:

- Research Methodology: Methods & Techniques by C R Kothari, 2e, Wishwa Publication, New Delhi
- Research Methodology by D K Bhattacharyya, 1e, Excel Books, New Delhi, 2003

REFERENCE BOOKS:

- How to Research by Loraine Blaxter, Christina Hughes and Molcolm Tight, Viva Books Pvt. Ltd., New Delhi
- Basic Communication Skills for Technology – Andrea J Rutherford (Person)
- Writing Your Thesis by Paul Oliver, Vistaar Publication, New Delhi, 2006
- The Research Student's Guide to Success by Pat Cryer, Viva Books Pvt Ltd., New Delhi
- Technical Writing Process and Product – Shron J. Gerson (Person)
- Business Communication, Lesiker and Petit: McGraw Hill Publications, 1995
- Business Correspondence and Report Writing – R.C. Sharma, Krishna Mohan (Tata McGraw)

Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

First Semester Master of Engineering (Mechanical-Production Engineering)

In Effect from Academic Year 2017-18

Subject Code MEPR102-N	**Subject Title: MACHINING SCIENCE**

Teaching Scheme				**Total Credit**	**Evaluation Scheme**					
L	**T**	**P**	**Total**		**Theory**		**IE**	**CIA**	**Pract/ VIVO**	**Total**
Hrs	**Hrs**	**Hrs**	**Hrs**		**Hrs**	**Marks**	**Marks**	**Marks**	**Marks**	**Marks**
4	**0**	**2**	**6**	**5**	**3**	**70**	**30**	**20**	**30**	**150**

LEARNING OBJECTIVES:

The objective of this course is

- To learn various concepts related to machining.
- To have practical purview of various production techniques.

INSTRUCTIONAL METHOD AND PEDAGOGY (Continuous Internal Assessment (CIA) Scheme)

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all units while conducting teaching & examination.
- Attendance is compulsory in lectures and Tutorial.
- Viva Voce will be conducted at the end of the semester of 30 Marks.
- One internal exam of 30 marks is conducted as a part of Mid semester evaluation.

OUTLINE OF THE COURSE

SR.NO	**CHAPTER NO**	**DATE/WEEK**
1	1,2,3	1^{st} ,2^{nd} ,3^{rd}
2	4,5	4^{th} ,5^{th} ,6^{th}
3	6,7	7^{th} ,8^{th} ,9^{th}
4	8,9	10^{th} ,11^{th} ,12^{th}
5	10,11	13^{th} ,14^{th} ,15^{th}

Total hours (Theory): 60

Total hours (Practical):30

Total hours: 90

DETAILED SYLLABUS

SR NO	TOPIC
1.	**Introduction to Machining:** Basic Mechanism involved, Tensile test; stress and strain; Mechanism of Plastic Deformation-slip, dislocation.
2.	**Chip Formation:** Typical lathe tools; Orthogonal cutting; oblique cutting; Types of chips; Mechanism of built-up-edge formation
3.	**Tool Geometry:** Reference planes; Tools specification in ASA, ORS and NRS; conversation from ASA to ORS; Selection of tools angles; Multi-point cutting tools-geometry of peripheral milling cutters and twist drills
4.	**Mechanics of Metal Cutting:** Merchant's circle diagram- determination of cutting and thrust forces; Coefficient of friction; Stress, strain and strain rate; Measurement of shear angle - direct and indirect methods
5.	Mohr's circle diagram; slip line field method; Thin zone model - Lee and Shaffer's relationship; Thick zone model - Okushima and Hitomi model(analysis) ; Friction in Metal cutting.
6.	**Mechanics of Oblique Cutting:** Concept of rake angle measured in different planes; Shear angle; Velocity and force relationship
7.	**Measurement of Cutting Forces:** Cantilever beams, rings; Dynamometer requirement; turning, drilling milling and grinding.
8.	**Tool Wear and Tool Life:** Mechanism of wear; Progressive tool wear; Flank wear; Crater wear; Model of diffusion wear; Tool life : Variables affecting tool life-Cutting conditions; tool geometry; Tool materials; work materials; Work materials; Cutting fluids; Determination of tool life equation; Machinability.
9.	**Abrasive Machining Processes:** Introduction; Grinding: Characteristics of a grinding wheel; Specification of grinding heels; Mechanics of grinding process; Chip length in horizontal surface grinding; External and internal cylindrical grinding; Specific energy in grinding; Wheel wear; Thermal analysis;

	Selection of grinding wheels; Honning and lapping operations.
10.	**Abrasive Machining Processes:** Introduction; Grinding: Characteristics of a grinding wheel; Specification of grinding heels; Mechanics of grinding process; Chip length in horizontal surface grinding; External and internal cylindrical grinding; Specific energy in grinding; Wheel wear; Thermal analysis; Selection of grinding wheels; Honning and lapping operations.
11.	**Thermal Aspects of Machining:** Regions of heat generation; Distribution of heat generated; Equations of flow due to conduction, transportation, heat absorbed and heat generated; Average shear plane temperature; Average chip-tool interface temperature Experimental determination of cutting temperature - tool-work thermocouple technique, infrared photographic technique

LESSON PLANNING

Lecture No	Topic	Hours	% Weightage
1.	Introduction To Machining	1	
2.	Basic Mechanism Involved	1	
3.	Tensile Test; Stress And Strain	1	
4.	Mechanism Of Plastic Deformation- Slip	1	
5.	Dislocation	1	
6.	Chip Formation	1	
7.	Typical Lathe Tools	1	
8.	Orthogonal Cutting	1	**25**
9.	Oblique Cutting	1	
10.	Types Of Chips	1	
11.	Mechanism Of Built-Up-Edge Formation	1	
12.	Reference Planes; Tools Specification In ASA, ORS And NRS	1	
13.	Conversation From ASA To ORS	1	
14.	Selection Of Tools Angles	1	
15.	Multi-Point Cutting Tools- Cutters And Twist Drills.	1	
16.	Geometry Of Peripheral Milling Cutters	1	
17.	Merchant's Circle Diagram- Determination Of Cutting And Thrust Forces	1	
18.	Merchant's Circle Diagram- Determination Of Cutting And Thrust Forces	1	
19.	Coefficient Of Friction; Stress, Strain And Strain Rate;	1	**25**
20.	Measurement Of Shear Angle - Direct And Indirect Methods	1	
21.	Mohr's Circle Diagram; Slip Line Field Method	1	
22.	Slip Line Field Method	1	
23.	Thin Zone Model - Lee And Shaffer's Relationship;	1	
24.	Thick Zone Model - Okushima And Hitomi Model(Analysis)	1	

25.	Friction In Metal Cutting.	1	
26.	Concept Of Rake Angle Measured In Different Planes	1	
27.	Concept Of Rake Angle Measured In Different Planes	1	
28.	Shear Angle; Velocity And Force Relationship.	1	
29.	Cantilever Beams	1	
30.	Dynamometer Requirement; Turning	1	
31.	Mechanism Of Wear; Progressive Tool Wear; Flank Wear	1	
32.	Crater Wear; Model Of Diffusion Wear	1	
33.	Tool Life : Variables Affecting Tool Life	1	
34.	Tool Life : Variables Affecting Tool Life	1	
35.	Work Materials; Cutting Fluids; Machinability	1	
36.	Determination Of Tool Life Equation	1	
37.	Factors affecting machinability	1	
38.	Minimum Production Cost Criterion; Maximum Production Rate Criterion	1	**25**
39.	Maximum Profit Rate Criterion; Restriction On Cutting Conditions.	1	
40.	Restriction On Cutting Conditions.	1	
41.	Introduction; Grinding: Characteristics Of A Grinding Wheel	1	
42.	Specification Of Grinding Wheels	1	
43.	Mechanics Of Grinding Process	1	
44.	Mechanics Of Grinding Process	1	
45.	Chip Length In Horizontal Surface Grinding	1	
46.	Chip Length In Horizontal Surface Grinding	1	
47.	External And Internal Cylindrical Grinding	1	
48.	Specific Energy In Grinding; Wheel Wear	1	
49.	Wheel wear	1	
50.	Thermal Analysis	1	
51.	Selection Of Grinding Wheels	1	
52.	Honning And Lapping Operations	1	
53.	Regions Of Heat Generation	1	
54.	Distribution Of Heat Generated	1	
55.	Average Shear Plane Temperature; Average Chip-Tool Interface Temperature	1	**25**
56.	Average Shear Plane Temperature; Average Chip-Tool Interface Temperature	1	
57.	Experimental Determination Of Cutting Temperature - Tool-Work Thermocouple Technique	1	
58.	Experimental Determination Of Cutting Temperature - Tool-Work Thermocouple Technique	1	
59.	Infrared Photographic Technique	1	
60.	Infrared Photographic Technique	1	
	TOTAL	**60**	**100**

LIST OF EXPERIMENTS

1	ANALYSIS OF TOOLS & CUTTERS BASED ON GEOMETRY & MATERIALS TO BE PROCESSED
2	TO UNDERSTAND THE EFFECT OF VARIOUS PARAMETERS ON THE TYPE OF CHIP PRODUCED
3	COMPUTATION OF TOOL WEAR UNDER VARIOUS CUTTING CONDITIONS
4	VALIDATION OF OBLIQUE CUTTING THEORIES BY EXPERIMENTATION
5	EFFECT OF THE APPLICATION OF A CUTTING LUBRICANT ON POWER CRITERION IN ORTHOGONAL CUTTING
6	MEASUREMENT OF CHIP TOOL INTERFACE TEMPERATURE IN ORTHOGONAL CUTTING
7	EFFECT OF RAKE ANGLE IN ORTHOGONAL MACHINING ON POWER CRITERION & SHEAR ANGLE
8	MEASUREMENT OF CUTTING FORCES IN TURNING & DRILLING
9	MEASUREMENT OF SHEAR ANGLE IN ORTHOGONAL CUTTING
10	MEASUREMENT OF CHIP LENGTH IN GRINDING

STUDENT LEARNING OUTCOME

- The student can identify different areas of Machining science
- The students will gain an experience in the implementation of machining concepts which are applied in the field of production
- Can find the industrial applications

RECOMMANDED STUDY MATERIAL

1. An introduction to the principles of Metal working - Rowe, Edward Arnold, 1968

2. Manufacturing properties of metals and Alloys - Alexander and Brewar, Van Nostrand.

3. Principle of metal cutting- Dr A. Bhattacharya

4. Fundamental of machining and machine tools-Geoffrey Boothroyd-CRC Taylor & Francis

5. Manufacturing Engineering and Technology-Serope Kalakjian-Addison Wesley Longman (Singapore)Pvt. Ltd.

6. Introduction to machining science – Lal , G. K., New Age International, 1996.

Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

First Semester Master of Engineering (Mechanical-Production Engineering)

In Effect from Academic Year 2017-18

Subject Code MEPR103-N	**Subject Title: ADVANCE CASTING TECHNIQUES**

Teaching Scheme				**Total Credit**	**Evaluation Scheme**					**Total Marks**
L	**T**	**P**	**Total**		**THEORY**		**IE**	**CIA**	**Pract/ VIVO**	
					Hrs	**Marks**	**Marks**	**Marks**	**Marks**	
Hrs	**Hrs**	**Hrs**	**Hrs**							
4	**0**	**2**	**6**	**5**	**3**	**70**	**30**	**20**	**30**	**150**

LEARNING OBJECTIVES:

The educational objectives of this course are

- To learn various concepts related to casting
- To have practical purview of various special casting techniques.

INSTRUCTIONAL METHOD AND PEDAGOGY (Continuous Internal Assessment (CIA) Scheme)

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed
- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and Practical which may carries 05 Marks.
- Viva voce will be conducted at the end of the semester of 30 Marks.
- One internal exam of 30 Marks is conducted as a part of mid semester evaluation.
- Experiments shall be performed in the laboratory related to course contents.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concept being taught in lectures.

OUTLINE OF THE COURSE

SR.NO	CHAPTER NO	DATE/WEEK
1	1,2	1^{st} 2^{nd} 3^{rd}
2	3	4^{th} 5^{th} 6^{th}
3	4	7^{th} 8^{th} 9^{th} 10^{th}
4	5,6	11^{th} 12^{th} 13^{th}
5	7,8	14^{th} 15^{th}

Total hours (Theory): 60

Total hours (Practical): 30

Total hours: 90

DETAILED SYLLABUS

SR NO	TOPIC
1	**Casting Processes:** Classification, characteristics of sand casting processes, metal mould casting processes and casting processes using other mould/core materials, Pattern materials, types of patterns, Mould and core making materials and their characteristics.
2	Technology of Selected Casting Processes, clay bonded, oil bonded, synthetic resin bonded, and inorganic material bonded mould and core making processes. Sand additives and mould coatings. Metal mould casting processes, centrifugal and continuous casting processes
3	**Solidification, Gating and Riser design & analysis:** Nucleation and grain growth, Solidification of pure metals, short and long freezing range alloys
4	Rate of solidification, macrostructure and microstructure. Solidification Contraction; Fluidity and its measurement. Mould-metal interface reactions
5	**Melting and quality control:** Melting and quality control of various steels and non-ferrous alloys casting defects - fettling, inspection and testing of castings
6	Design for castability-process friendly design, castability analysis and collaborative engineering
7	**Casting for heterogeneousmaterials:** FRP, quick casting , full mould casting
8	Evaporative pattern casting

LESSON PLANNING

Lecture No	Topic	Hours	% Weightage
1	Casting Processes Classification,	1	
2	characteristics of sand casting processes	1	
3	casting processes using other mould/core materials	1	
4	Pattern materials, types of patterns	1	
5	Mould and core making materials and their characteristics.	1	
6	Casting Processes Classification,	1	
7	characteristics of sand casting processes	1	
8	metal mould casting processes	1	**25**
9	Technology of Selected Casting Processes	1	
10	clay bonded, oil bonded	1	
11	synthetic resin bonded	1	
12	inorganic material bonded mould	1	
13	core making processes.	1	
14	Sand additives and mould coatings	1	
15	Metal mould casting processes	1	
16	Solidification	1	
17	Nucleation and grain growth	1	
18	Nucleation and grain growth	1	
19	Solidification of pure metals	1	
20	short freezing range alloys.	1	
21	long freezing range alloys.	1	
22	Gating design & analysis	1	
23	Gating design & analysis	1	**25**
24	Riser design & analysis	1	
25	Riser design & analysis	1	
26	Rate of solidification	1	
27	Rate of solidification	1	
28	macrostructure	1	
29	Microstructure	1	
30	Microstructure	1	
31	Solidification Contraction	1	
32	Solidification Contraction	1	
33	Fluidity and its measurement	1	
34	Fluidity and its measurement	1	
35	Mould-metal interface reactions.	1	**25**
36	Mould-metal interface reactions.	1	
37	Melting and quality control	1	
38	Melting and quality control of various steels	1	
39	Melting and quality control of various steels	1	

40	Melting and quality control of various steels	1	
41	Melting and quality control of non-ferrous alloys	1	
42	Melting and quality control of non-ferrous alloys	1	
43	casting defects – fettling	1	
44	Inspection of castings.	1	
45	testing of castings	1	
46	Design for castability-process friendly design	1	
47	Design for castability-process friendly design	1	
48	Design for castability-process friendly design	1	
49	castability analysis	1	
50	castability analysis	1	
51	Collaborative engineering.	1	
52	Collaborative engineering.	1	
53	Casting for heterogeneous materials	1	**25**
54	Casting for heterogeneous materials	1	
55	FRP	1	
56	quick casting	1	
57	full mould casting	1	
58	full mould casting	1	
59	Evaporative pattern casting	1	
60	Evaporative pattern casting	1	
	TOTAL	**60**	**100**

LIST OF EXPERIMENTS

1	ASSESSMENT OF SAND CASTING &ITS BINDERS FOR GIVEN APPLICATIONS
2	PERFORMANCE OF SAND TESTING VIZ. PERMEABILITY TEST, GREEN STRENGTH, DRY SHEAR STRENGTH, MOULD HARDNESS TEST
3	TO STUDY ABOUT VARIOUS SPECIAL CASTING TECHNIQUES (QUICK CASTING , FULL MOULD CASTING
4	DESIGN & ANALYSIS OF GATING SYSTEM FOR FERROUS METAL
5	DESIGN & ANALYSIS OF RISER DESIGN FOR FERROUS METAL
6	FLUIDITY MEASUREMENT IN METAL CASTING
7	DESIGN FOR CASTABILITY OF VARIOUS MATERIALS
8	ASSESSMENT OF SOLIDIFICATION OF PURE METALS (SPECIFICALLY NUCLEATION & GRAIN GROWTH)
9	ASSESSMENT OF CASTING DEFECTS IN FERROUS MATERIALS USING NDT
10	CASE STUDY ON CASTING OF FRP MATERIALS

STUDENT LEARNING OUTCOME

The students will gain an experience in the implementation of casting techniques concepts which are applied in the field of production.

RECOMMANDED STUDY MATERIAL

1. Scrope Kalpakjian, “Manufacturing processes for Engineering Materials”, Addision, Wesley, 1997.
2. Fundamentals of metal casting technology - P.C. Mukherjee, Oxford and IBH.
3. Mechanical Metallurgy, Dieter, Me Graw Hill, Kogakusha
4. Casting properties of metals and alloys - V. Korolkove.
5. Metal casting-B.Ravi-PHI

Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

First Semester Master of Engineering (Mechanical-Production Engineering)

In Effect from Academic Year 2017-18

Subject Code MEPR104-N	**Subject Title: PRODUCT DESIGN FOR MANUFACTURE**

Teaching Scheme				**Total Credit**	**Evaluation Scheme**					
L	**T**	**P**	**Total**		**Theory**		**IE**	**CIA**	**Pract/ VIVO**	**Total**
Hrs	**Hrs**	**Hrs**	**Hrs**		**Hrs**	**Marks**	**Marks**	**Marks**	**Marks**	**Marks**
3	**0**	**2**	**5**	**4**	**3**	**70**	**30**	**20**	**30**	**150**

LEARNING OBJECTIVES:

The objective of this course is

- To learn various concepts related to product design
- To have practical purview of various product development

INSTRUCTIONAL METHOD AND PEDAGOGY (Continuous Internal Assessment (CIA) Scheme)

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all units while conducting teaching & examination.
- Attendance is compulsory in lectures and Tutorial.
- Viva Voce will be conducted at the end of the semester of 30 Marks.
- One internal exam of 30 marks is conducted as a part of Mid semester evaluation.

OUTLINE OF THE COURSE

SR.NO	CHAPTER NO	DATE/WEEK
1	1,2	1^{st} 2^{nd} 3^{rd}
2	3	4^{th} 5^{th} 6^{th}
3	4	7^{th} 8^{th} 9^{th}
4	5	10^{th} 11^{th} 12^{th}
5	6	13^{th} 14^{th} 15^{th}

Total hours (Theory): 45

Total hours (Practical): 30

Total hours: 75

DETAILED SYLLABUS

SR NO	Topic
1	**Engineering materials**: metals and their properties, uses, processing methods, design data and applications, selection criteria
2	Manufacturing and processing limitations, comparative studies; plastics and composites, types, classifications, properties, processing techniques and limitation, selection of plastics for specific applications, finishing and surface coating of different materials. Processing of polymers and ceramics, surface modification of materials.
3	**stages of product design:** An overview of three stages of product design, generating and evaluating conceptual alternatives from manufacturing point of view, selection of material and processes, evaluating part configuration for manufacturability, evaluating parametric design for manufacturability
	Design for manufacture, influence of materials process and tooling on the design of components manufactured by metal casting, forming and joining, forging, sheet metal design of components
4	**Elements of cost of a product**: Costing methods, cost reduction and cost control activities. Economic analysis, Break even analysis Charts. Value engineering in product design, creativity aspects and techniques. Procedures of value analysis – cost reduction, material and process selection Various manufacturing processes, degree of accuracy and finish obtainable, process capability studies Methods of improving tolerances. plastics, rubber and ceramics for product design Recent developments in casting, machining, forming and finishing Product design for manual assembly, product design for high- speed automatic assembly and product design for robot assembly.
5	**Ergonomics:** Ergonomics and automated systems, expert systems for ergonomic design, anthropomorphic data and its application in ergonomic design, limitations of anthropomorphic data, use of computerized database
6	Aesthetic Concepts : Concepts of Unity, concept of order with variety, concept of purpose, style and environment, aesthetic expression, style – components of style, house style, Observing style in capital goods

LESSON PLANNING

Lecture No	Topic	Hours	% Weightage
1	**Engineering materials**: metals and their properties	1	**25**
2	Engineering material use	1	
3	Engineering material processing methods	1	
4	Selection criteria of engineering material	1	
5	Design data and applications of engineering material	1	
6	Manufacturing and processing limitations	1	
7	Comparative studies of engineering material	1	
8	Plastics and composites, types, classifications, properties, processing techniques and limitation	1	
9	Selection of plastics for specific applications	1	
10	Finishing and surface coating of different materials	1	
11	Processing of polymers and ceramics, Surface modification of materials.	1	
12	**Stages of Product design:** An overview of three stages of product design	1	**25**
13	Generating and evaluating conceptual alternatives from manufacturing point of view	1	
14	selection of material and processes,	1	
15	evaluating part configuration for manufacturability,	1	
16	evaluating parametric design for manufacturability,	1	
17	Design for manufacture	1	
18	influence of materials process and tooling on the design of components manufactured by metal casting	1	
19	influence of materials process and tooling on the design of components manufactured by forming and joining	1	
20	influence of materials process and tooling on the design of components manufactured by forging	1	
21	influence of materials process and tooling on the design of components manufactured by sheet metal design of components	1	
22	**Elements of cost of a product**: Costing methods	1	**25**
23	Cost reduction and cost control activities	1	
24	Economic analysis	1	
25	Break even analysis Charts	1	
26	Value engineering in product design	1	
27	Creativity aspects and techniques	1	
28	Procedures of value analysis – cost reduction, material and process selection	1	
29	Various manufacturing processes, degree of accuracy and finish obtainable	1	
30	Process capability studies Methods of improving tolerances.	1	

	plastics, rubber and ceramics for product design		
31	Recent developments in casting, machining, forming and finishing	1	
32	Product design for manual assembly	1	
33	Product design for high- speed automatic assembly and product design for robot assembly	1	
34	**Ergonomics:** Ergonomics and automated systems	1	
35	Expert systems for ergonomic design	1	
36	Anthropomorphic data and its application in ergonomic design	1	
37	Limitations of anthropomorphic data	11	
38	Use of computerized database	1	
39	Aesthetic Concepts : Concepts of Unity	1	
40	Concept of order with variety	1	
41	Concept of purpose	1	**25**
42	Style and environment	1	
43	Aesthetic expression, style – components of style	1	
44	House style	1	
45	Observing style in capital goods	1	
	TOTAL	**45**	**100**

LIST OF EXPERIMENTS

1	PARAMETRIC DESIGN FOR MANUFACTURABILITY FOR A GIVEN COMPONENT
2	MATERIAL SELECTION BASED ON DFM
3	FORMULATION OF DESIGN PROBLEM BASED ON EMBODIEMENT CONSIDERATION
4	FAILURE MODES & EFFECTS ANALYSIS FOR AN EXISTING PRODUCT
5	TOLERANCE ANALYSIS FOR ROBUST DESIGN
6	CONFIGURATION DESIGN FOR A NEW PRODUCT
7	CONCEPT DESIGN FOR A NEW PRODUCT
8	PRODUCT DESIGN FOR MANUAL ASSEMBLY
9	PRODUCT DESIGN FOR HIGH- SPEED AUTOMATIC ASSEMBLY
10	PRODUCT DESIGN FOR ROBOT ASSEMBLY.

STUDENT LEARNING OUTCOME

At the end of the course

The students will gain an experience in product design for various processes like casting, forging etc

RECOMMANDED STUDY MATERIAL

1. Dieter G.E, Engineering Design: A materials and Processing Approach, McGraw Hill, 1991

2. Ashby M.F., Materials selection in mechanical design, Pergamon press, 1992

3. Oswaid P.F and Begeman, M., Manufacturing Process, John Willy, 1987

4. Levy S. and Dubois, L.H, Plastics production design Engineering Handbook, Methuen Inc, 1985

5. Product Design by Kevin Otto, Kristin Wood

Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

First Semester Master of Engineering (Mechanical-Production Engineering)

In Effect from Academic Year 2017-18

Subject Code :MEPR105-N	**Subject Title: SEMINAR 1**

Teaching Scheme				**Total Credit**	**Evaluation Scheme**					
L	**T**	**P**	**Total**		**Theory**		**IE**	**CIA**	**Pract/ VIVO**	**Total**
Hrs	**Hrs**	**Hrs**	**Hrs**		**Hrs**	**Marks**	**Marks**	**Marks**	**Marks**	**Marks**
0	**0**	**2**	**2**	**1**	**-**	**-**	**-**	**30**	**100**	**130**

LEARNING OBJECTIVES:

The educational objectives of this course are

- To present a problem oriented in depth knowledge of various literatures related to area of interest
- To address the advancement of selected area or mechanism or system and methods.
- To enhance skill of report writing and prepare report of seminar systematically.

INSTRUCTIONAL METHOD AND PEDAGOGY (Continuous Internal Assessment (CIA) Scheme)

At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.

Viva Voce will be conducted at the end of the semester.

Total Hours (Theory): 00

Total Hours (Lab): 30

Total Hours: 30

DETAILED SYLLABUS

The student will do literature review and prepare a seminar report as per the standard international practice on the identified technical topic under the guidance of the subject teacher. (AS PER INTERNATIONALLY ACCEPTED AMA, LMA, CHICAGO ETC. STYLE FORMATS)

STUDENTS LEARNING OUTCOME:

On successful completion of the course

- Be able to prepare reports of collected information
- Be able to present their work with various multimedia.
- Be able to enhance the knowledge in particular area of research.

ME MECHANICAL-PRODUCTION ENGINEERING DEPARTMENT ELECTIVE-I

Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

First Semester Master of Engineering (Mechanical-Production Engineering)

In Effect from Academic Year 2017-18

Subject Code: MEPR106-N-A	**Subject Title: PRODUCT AUTOMATION & CNC TECHNOLOGY**

Teaching Scheme				**Total Credit**	**Evaluation Scheme**					
L	**T**	**P**	**Total**		**Theory**		**IE**	**CIA**	**Pract/ VIVO**	**Total**
Hrs	**Hrs**	**Hrs**	**Hrs**		**Hrs**	**Marks**	**Marks**	**Marks**	**Marks**	**Marks**
4	**0**	**2**	**6**	**5**	**3**	**70**	**30**	**20**	**30**	**150**

LEARNING OBJECTIVES:

The objective of this course is

- To learn various concepts related CNC Technology
- To have practical purview of manual part programming

INSTRUCTIONAL METHOD AND PEDAGOGY (Continuous Internal Assessment (CIA) Scheme)

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed
- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all units while conducting teaching & examination.
- Attendance is compulsory in lectures and Tutorial.
- Viva Voce will be conducted at the end of the semester of 30 Marks.
- One internal exam of 30 marks is conducted as a part of Mid semester evaluation.

OUTLINE OF THE COURSE

SR.NO	CHAPTER NO	DATE/WEEK
1	1,2	1^{st} 2^{nd} 3^{rd}
2	3	4^{th} 5^{th} 6^{th}
3	4,5	7^{th} 8^{th} 9^{th}
4	6	10^{th} 11^{th} 12^{th}
5	7	13^{th} 14^{th} 15^{th}

Total hours (Theory): 60

Total hours (Practical):30

Total hours: 90

DETAILED SYLLABUS

Chap. No.	Topic
1	**Concept and scope of industrial automation:** Automation strategies, devices, drives and control circuits in automation – Semi-automats, Automats and transfer lines.
2	Mechanical, electrical, hydraulic, pneumatic, electronic & hybrid automation system. Comparative evaluation of automation system.
3	Concepts, features, fundamentals, advantages and classification of NC systems, Input media.
	Design consideration of NC machine tools - machining centre – MCU functions.
4	**Controls and System devices:** Control loops of NC system – CNC Concepts, reference pulse and sampled data techniques – Microprocessor and CNC adaptive control – ACO and ACC systems.
5	Graphical Numerical Control – part programming – design of post Processor
6	**Manual part programming:** Computer aided part programming – all canned cycles post processor, APT programming, Programming for CNC turning center, Machining center and CNC EDM and wire cut EDM
7	Computer Aided Process Planning: Introduction, Manual process planning vs. Computer aided process planning, Basics of variant and generative process planning methods, Examples of automated process planning systems. Computer Integrated Manufacturing: Introduction, features and applications of CIM, key elements, advantages and disadvantages of CIM

LESSON PLANNING

Lecture No	Topic	Hours	% Weightage
1.	Concept and scope of industrial automation:	1	
2.	Automation strategies,	1	
3.	devices,	1	
4.	Devices	1	
5.	drives and control circuits in automation	1	
6.	Drives and control circuits in automation	1	
7.	Semi-automats	1	
8.	Semi automats	1	**25**
9.	Automats and transfer lines.	1	
10.	Mechanical	1	
11.	electrical	1	
12.	hydraulic	1	
13.	pneumatic,	1	
14.	Electronic & hybrid automation system.	1	
15.	Comparative evaluation of automation system.	1	
16.	Concepts	1	
17.	Features	1	
18.	fundamentals	1	
19.	advantages and	1	
20.	classification of NC systems	1	
21.	Input media.	1	
22.	Input media	1	
23.	Design consideration of NC machine tools	1	**25**
24.	Design consideration of NC machine tools	1	
25.	- machining centre	1	
26.	– MCU functions.	1	
27.	Controls and System devices:	1	
28.	Control loops of NC system	1	
29.	– CNC Concepts,	1	
30.	reference pulse and sampled data techniques –	1	
31.	microprocessor and CNC adaptive control –	1	
32.	ACO and ACC systems.	1	
33.	Graphical Numerical Control –	1	
34.	part programming –	1	
35.	Part programming	1	**25**
36.	Canned cycles	1	
37.	Canned cycles	1	
38.	Canned cycles	1	
39.	Canned cycles	1	

40.	Canned cycles	1	
41.	Canned cycles	1	
42.	Canned cycles	1	
43.	design of post Processor	1	
44.	Manual part programming:	1	
45.	Computer aided part programming –	1	
46.	post processor,	1	
47.	APT programming,	1	
48.	Programming for CNC turning center,	1	
49.	Machining center and CNC EDM and wire cut EDM	1	
50.	Computer Aided Process Planning:	1	
51.	Introduction,	1	
52.	Manual process planning vs.	1	
53.	Computer aided process planning,	1	**25**
54.	Basics of variant and generative process planning methods,	1	
55.	Examples of automated process planning systems.	1	
56.	Computer Integrated Manufacturing:	1	
57.	Introduction,	1	
58.	features and applications of CIM,	1	
59.	key elements,	1	
60.	advantages and disadvantages of CIM	1	
	TOTAL	**60**	**100**

LIST OF PRACTICALS

Sr. No.	Practical Content
1	PROGRAMMING USING G CODE & M CODE IN CNC MACHINES.
2	ANALYSIS OF VARIOUS COMPONENTS OF CNC MACHINES
3	ELECTRICAL AND MECHATRONICS COMPONENTS OF CNC MACHINES.
4	MANUAL PART PROGRAMMING AND EXPERIMENTAL CASE STUDY.
5	PART PROGRAMMING USING AUTOMATICALLY PROGRAMMED TOOLS (APT).
6	ANALYSIS OF ADAPTIVE CONTROL SYSTEM.
7	ANALYSIS OF MANUFACTURING AUTOMATION SYSTEM FOR A GIVEN APPLICATION
8	ANALYSIS OF INTERPOLATORS & CONTROLLER FOR VARIOUS CNC MACHINES
9	PART CODING OF A GIVEN COMPONENT USING CAPP
10	CASE STUDY CIM APPLICATION FOR INDUSTRIAL AUTOMATION

STUDENTS LEARNING OUTCOMES:

At the end of the course

The students will gain an experience in the implementation of manual part programming as a part of industrial automation.

Reference Books:

1. Scrope Kalpakjian, “Manufacturing processes for Engineering Materials”, Addision Wesley, 1997.

2. Radhakrishnan, P. “Computer Numerical Control Machines”, New Central Book Agencies, 1997.

3. Yoram Korem, “Computer control of Manufacturing systems”, Mc Graw Hill,1986.

4. Engineering automation by Solomon

Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

First Semester Master of Engineering (Mechanical-Production Engineering)

In Effect from Academic Year 2017-18

Subject Code: MEPR106-N-B	**Subject Title: FINITE ELEMENT TECHNIQUES**

Teaching Scheme				**Total Credit**	**Evaluation Scheme**					
L	**T**	**P**	**Total**		**Theory**		**IE**	**CIA**	**Pract/ VIVO**	**Total**
Hrs	**Hrs**	**Hrs**	**Hrs**		**Hrs**	**Marks**	**Marks**	**Marks**	**Marks**	**Marks**
4	**0**	**2**	**6**	**5**	**3**	**70**	**30**	**20**	**30**	**150**

LEARNING OBJECTIVES:

The objective of this course is

To learn various concepts related to FEM Analysis

INSTRUCTIONAL METHOD AND PEDAGOGY (Continuous Internal Assessment (CIA) Scheme)

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed
- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all units while conducting teaching & examination.
- Attendance is compulsory in lectures and Tutorial.
- Viva Voce will be conducted at the end of the semester of 30 Marks.
- One internal exam of 30 marks is conducted as a part of Mid semester evaluation.

OUTLINE OF THE COURSE

SR.NO	CHAPTER NO	DATE/WEEK
1	1,2	1^{st} 2^{nd} 3^{rd}
2	3,4	4^{th} 5^{th} 6^{th}
3	5,6	7^{th} 8^{th} 9^{th}
4	7	10^{th} 11^{th} 12^{th}
5	8	13^{th} 14^{th} 15^{th}

Total hours (Theory): 60

Total hours (Practical): 30

Total hours: 90

DETAILED SYLLABUS

SR NO	Topic
1	**Introduction:** Introduction to Finite Element Method of solving field problems. Stress and Equilibrium. Boundary conditions. Strain-Displacement relations. Stress-strain relations. One Dimensional Problem: Finite element modeling. Local, natural and global coordinates and shape functions.
2	**Potential Energy approach** : Assembly of Global stiffness matrix and load vector. Finite element equations, treatment of boundary conditions. Quadratic shape functions
3	**Analysis of trusses and frames**: Analysis of plane truss with number of unknowns not exceeding two at each node. Analysis of frames with two translations and a rotational degree of freedom at each node.
4	**Analysis of Beams:** Element stiffness matrix for two noded, two degrees of freedom per node for beam element
5	**Finite element modeling of two dimensional** : Stress analysis problems with constant strain triangles and treatment of boundary conditions. Two dimensional four noded isoparametric elements and numerical integration.
6	**Finite element modeling of Axisymmentric**: Solids subjected of axisymmetric loading with triangular elements. Convergence requirements and geometric isotropy
7	**Steady state heat transfer analysis**: One dimensional analysis of a fin and two dimensional conduction analysis of thin plate. Time dependent field problems: Application to one dimensional heat flow in a rod. Dynamic analysis: Formulation of finite element modeling of Eigen value problem for a stepped bar and beam. Evaluation of Eigen values and Eigen vectors. Analysis of a uniform shaft subjected to torsion using Finite Element Analysis
8	**Finite element formulation of three dimensional** : Finite element formulation of three dimensional problems in stress analysis. Finite Element formulation of an incompressible fluid. Potential flow problems Bending of elastic plates. Introduction to non-linear problems and Finite Element analysis software

LESSON PLANNING

Lecture No	Topic	hours	% Weightage
1.	Introduction to Finite Element Method of solving field problems	1	
2.	Stress and Equilibrium	1	
3.	Boundary conditions.	1	
4.	Strain-Displacement relations	1	
5.	Stress-strain relations. Finite element modeling	1	
6.	Local, natural and global coordinates and shape functions	1	
7.	Assembly of Global stiffness matrix and load vector.	1	
8.	Finite element equations	1	**25**
9.	treatment of boundary conditions	1	
10.	treatment of boundary conditions	1	
11.	Quadratic shape functions	1	
12.	Quadratic shape functions	1	
13.	Quadratic shape functions	1	
14.	Quadratic shape functions	1	
15.	Quadratic shape functions	1	
16.	Analysis of plane truss with number of unknowns not exceeding two at each node.	1	
17.	Analysis of frames with two translations and a rotational degree of freedom at each node.	1	
18.	Analysis of frames with two translations and a rotational degree of freedom at each node.	1	
19.	Element stiffness matrix for two noded,	1	
20.	two degrees of freedom per node for beam element	1	
21.	Stress analysis problems with constant strain triangles	1	
22.	Stress analysis problems with constant strain triangles	1	**25**
23.	treatment of boundary conditions	1	
24.	Two dimensional four noded isoparametric elements	1	
25.	Two dimensional four noded isoparametric elements	1	
26.	Two dimensional four noded isoparametric elements	1	
27.	Two dimensional four noded isoparametric elements	1	
28.	Two dimensional four noded isoparametric elements	1	
29.	Two dimensional four noded isoparametric elements	1	
30.	Examples	1	
31.	numerical integration	1	
32.	numerical integration	1	
33.	Solids subjected of axisymmetric loading with triangular elements.	1	**25**
34.	Solids subjected of axisymmetric loading with triangular	1	

	elements		
35.	Convergence requirements and geometric isotropy	1	
36.	One dimensional analysis of a fin and two dimensional conduction analysis of thin plate	1	
37.	Time dependent field problems: Application to one dimensional heat flow in a rod.	1	
38.	Dynamic analysis: Formulation of finite element modeling of Eigen value problem for a stepped bar and beam.	1	
39.	Dynamic analysis: Formulation of finite element modeling of Eigen value problem for a stepped bar and beam.	1	
40.	Evaluation of Eigen values and Eigen vectors.	1	
41.	Analysis of a uniform shaft subjected to torsion using Finite Element Analysis	1	
42.	Analysis of a uniform shaft subjected to torsion using Finite Element Analysis	1	
43.	Analysis of a uniform shaft subjected to torsion using Finite Element Analysis	1	
44.	Analysis of a uniform shaft subjected to torsion using Finite Element Analysis	1	
45.	Analysis of a uniform shaft subjected to torsion using Finite Element Analysis	1	
46.	Finite element formulation of three dimensional problems in stress analysis.	1	**25**
47.	Finite Element formulation of an incompressible fluid.	1	
48.	Potential flow problems Bending of elastic plates.	1	
49.	Introduction to non-linear problems	1	
50.	Introduction to non linear problems	1	
51.	Introduction to non linear problems	1	
52.	Introduction to non linear problems	1	
53.	Introduction to non linear problems	1	
54.	Introduction to Finite Element analysis software	1	
55.	Introduction to Finite Element analysis software	1	
56.	Introduction to Finite Element analysis software	1	
57.	Introduction to Finite Element analysis software	1	
58.	Case studies	1	
59.	Case studies	1	
60.	Case studies	1	
	TOTAL	**60**	**100**

LIST OF PRACTICALS

Sr. No.	TITLE OF PRACTICAL
1	PROBLEM SOLVING METHODOLOGY BY FEM
2	FINITE ELEMENT MODELINGOF ONE DIMENSIONAL PROBLEM
3	PROBLEM SOLVING BY POTENTIAL ENERGY APPROACH
4	FINITE ELEMENT MODELINGOF TWO DIMENSIONAL PROBLEM
5	ANALYSIS OF FRAMES WITH TWO TRANSLATIONS
6	ANALYSIS OF PLANE TRUSS WITH NUMBER OF UNKNOWNS NOT EXCEEDING TWO AT EACH NODE
7	FINITE ELEMENT MODELINGOF TWO DIMENSIONAL FOUR NODED ISOPARAMETRIC ELEMENTS
8	FINITE ELEMENT MODELING OF AXISYMMENTRIC LOADING WITH TRIANGULAR ELEMENTS
9	ONE DIMENSIONAL ANALYSIS OF A FIN AND TWO DIMENSIONAL CONDUCTION ANALYSIS OF THIN PLATE
10	FORMULATION OF FINITE ELEMENT MODELING OF EIGEN VALUE PROBLEM FOR A STEPPED BAR AND BEAM
11	ANALYSIS OF A UNIFORM SHAFT SUBJECTED TO TORSION USING FINITE ELEMENT ANALYSIS
12	FINITE ELEMENT MODELINGOF THREE DIMENSIONAL PROBLEMS IN STRESSANALYSIS
13	FINITE ELEMENT FORMULATION OF AN INCOMPRESSIBLE FLUID
14	POTENTIAL FLOW PROBLEMS BENDING OF ELASTIC PLATES
15	FINITE ELEMENT ANALYSIS OF NON-LINEAR PROBLEMS AND FINITE ELEMENT ANALYSIS SOFTWARE

STUDENTS LEARNING OUTCOMES:

At the end of the course

- The students will gain an insight to FEM which can be used in various analysis of real life problems

Reference Books:

1. Tirupathi R Chandraputla and Ashok. D. Belegundu, Introduction of Finite Element in Engineering, Prentice Hall of India, 1997.

2. Rao S.S., The Finite Element Methods in Engineering, Pergamon Press, 1989.

3. Segerland. L.J., Applied Finite Element Analysis, Wiley Publication, 1984.

4. Reddy J.N. An Introduction to Finite Element Methods, Mc Graw Hill Company, 1984.

Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

First Semester Master of Engineering (Mechanical-Production Engineering)

In Effect from Academic Year 2017-18

Subject Code: MEPR106-N-C	**Subject Title: METROLOGY & COMPUTER AIDED INSPECTION**

Teaching Scheme				**Total Credit**	**Evaluation Scheme**					
L	**T**	**P**	**Total**		**Theory**		**IE**	**CIA**	**Pract/ VIVO**	**Total**
Hrs	**Hrs**	**Hrs**	**Hrs**		**Hrs**	**Marks**	**Marks**	**Marks**	**Marks**	**Marks**
4	**0**	**2**	**6**	**5**	**3**	**70**	**30**	**20**	**30**	**150**

LEARNING OBJECTIVES:

The objective of this course is

- To learn various concepts of instrumentation, metrology & computer assisted inspection.
- To have practical view of various measuring, gauging instruments.

INSTRUCTIONAL METHOD AND PEDAGOGY

- Continuous Internal Assessment (CIA) Scheme
- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed
- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all units while conducting teaching & examination.
- Attendance is compulsory in lectures and Tutorial.
- Viva Voce will be conducted at the end of the semester of 30 Marks.
- One internal exam of 30 marks is conducted as a part of Mid semester evaluation.

OUTLINE OF THE COURSE

SR.NO	CHAPTER NO	DATE/WEEK
1	1,2	1^{st} 2^{nd} 3^{rd}
2	3,4	4^{th} 5^{th} 6^{th}
3	5,6	7^{th} 8^{th} 9^{th}
4	7	10^{th} 11^{th} 12^{th}
5	8	13^{th} 14^{th} 15^{th}

Total hours (Theory): 60

Total hours (Practical): 30

Total hours: 90

DETAILED SYLLABUS

SR NO	Topic
1	**Significance of Measurement and Instrumentation:** Introduction; generalized configuration and functional stages of measuring systems. The transducer and its environment; an overview; sensing process and physical laws. Types of measurement problems, Transducer classification and their modeling; Information, Energy and Incremental Models; Characteristics of instruments, design and selection of components of a measuring system.
2	**Dynamic Response of Instruments:** Mathematical model of a measuring system, response of general form of instruments to various test inputs; time-domain and frequency domain analysis. Elementary transfer functions and Bode plots of general transfer functions.
3	**Errors in Measurement and its Analysis:** Causes and types of experimental errors; systematic and random errors. Uncertainty analysis; computation of overall uncertainty; estimation for design and selection for alternative test methods. **Transducers and Transduction Principles:** Developments in sensors, detectors and transducer technology; displacement transducers; force, torque and motion sensors; piezoelectric transducers; capacitive type transducers; Strain gage transducers; accelerometers, pressure transducers based on elastic effect of volume and connecting tubing.
4	**Data acquisition and Signal Processing:** Systems for data acquisition and processing; modules and computerized data system; digitization rate, time and frequency domain representation of signals, and Nyquist criterion
5	**Metrology and Techniques:** Standards in metrology-definition, Traceability, Characteristics Length & Angular measurements-Review of standard instruments, GD and tolerance procedure-Review of dimension & form tolerance and methods of measurement, Tolerance analysis
6	**Surface and form metrology** : flatness, roughness, waviness cylindricity, etc., Methods of improving accuracy & surface finish, Influence of forced vibration on accuracy, Dimensional wear of cutting tools and its influences on accuracy.

7	**Standards for length measurement standards and their calibration:** Light interference - Method of coincidence - Measurement errors. Various tolerances and their specifications, gauging assembly, comparators. Angular measurements - principles and measuring instruments. **Laser Applications in Metrology:** LASER light source, LASER interferometer, LASER alignment telescope, LASER micrometer, On-line and in-process measurements of diameter, Roundness and surface roughness using LASER, Micro holes and topography measurements, straightness and flatness measurement.
8	**Special Measuring Instruments and Techniques:** Optoelectronic devices, contact and non-contact types, Applications in on-line and in-process monitoring systems, Tool wear measurement, Surface measurement, Machine vision, shape identification, Edge detection techniques, Normalisation, gray scale correlation, Template Techniques, Surface roughness using vision system, Interfacing robot and image processing system.
9	**Sensors in Inspection:** Manufacturing applications of photo detectors, deflection methods-beam detection, Reflex detection, & Proximity detection, Applications of Inductive and Capacitive proximity sensors, Understanding microwave sensing applications laser sensors and limit switches. Advanced sensor technology-Bar code systems, Principles and applications of Colour sensors, electro-magnetic identifier, Tactile sensors, Ultrasonic sensors, Odour sensors.
10	**Computer Aided Metrology** : Principles and interfacing, soft metrology -Application of lasers in precision measurements-laser interface, laser scanners, Coordinate measurement machine (CMM), Type of CMM & applications
11	Non contact CMM, Electro optical sensors for dimension, contact sensors for surface finish measurements. Image processing and its Metrology, Acoustical measurements, Digital techniques in mechanical measurements, Assessing and presenting experimental DATA

OUTLINE OF THE COURSE

SR.NO	CHAPTER NO	DATE/WEEK
1	1,2	1^{st} 2^{nd} 3^{rd}
2	3,4	4^{th} 5^{th} 6^{th}

3	5,6	7^{th} 8^{th} 9^{th}
4	7,8	10^{th} 11^{th} 12^{th}
5	9,10,11	13^{th} 14^{th} 15^{th}

Total hours (Theory): 60

Total hours (Practical): 30

Total hours: 90

LESSON PLANNING

Lecture No	Topic	Hours	% Weightage
1.	**Significance of Measurement and Instrumentation:** Introduction; generalized configuration and functional stages of measuring systems.	1	**25**
2.	The transducer and its environment; an overview; sensing process and physical laws.	1	
3.	Types of measurement problems, Transducer classification and their modeling; Information.	1	
4.	Energy and Incremental Models; Characteristics of instruments, design and selection of components of a measuring system.	1	
5.	**Dynamic Response of Instruments:** Mathematical model of a measuring system.	1	
6.	Response of general form of instruments to various test inputs.	1	
7.	Time-domain and frequency domain analysis.	1	
8.	Elementary transfer functions and Bode plots of general transfer functions.	1	
9.	**Errors in Measurement and its Analysis:** Causes and types of experimental errors; systematic and random errors. Uncertainty analysis.	1	
10.	Computation of overall uncertainty; estimation for design and selection for alternative test methods.	1	
11.	**Transducers and Transduction Principles:** Developments in sensors, detectors and transducer technology; displacement transducers; force, torque and motion sensors; piezoelectric transducers.	1	
12.	detectors and transducer technology	1	
13.	displacement transducers	1	
14.	torque and motion sensors	1	
15.	torque and motion sensors	1	

16.	Capacitive type transducers; Strain gage transducers; accelerometers, pressure transducers based on elastic effect of volume and connecting tubing.	1	
17.	**Data acquisition and Signal Processing:** Systems for data acquisition and processing.	1	
18.	Modules and computerized data system	1	**25**
19.	Digitization rate, time and frequency domain representation of signals.	1	
20.	Nyquist criterion	1	
21.	**Metrology and Techniques:** Standards in metrology-definition, Traceability.	1	
22.	Characteristics Length & Angular measurements-Review of standard instruments.	1	
23.	GD and tolerance procedure-Review of dimension & form tolerance	1	
24.	GD and tolerance procedure	1	
25.	GD and tolerance procedure	1	
26.	Methods of measurement	1	
27.	Tolerance analysis.	1	
28.	Methods of measurement	1	
29.	**Surface and form metrology** : Flatness, roughness, waviness cylindricity, etc.,	1	
30.	Methods of improving accuracy & surface finish.	1	
31.	Influence of forced vibration on accuracy	1	
32.	Dimensional wear of cutting tools and its influences on accuracy.	1	
33.	**Standards for length measurement standards and their calibration:** Light interference - Method of coincidence - Measurement errors. Various tolerances and their specifications, gauging assembly.	1	
34.	Comparators. Angular measurements - principles and measuring instruments.	1	**25**
35.	**Laser Applications in Metrology:** LASER light source, LASER interferometer, LASER alignment telescope, LASER micrometer, On-line and in-process measurements of diameter.	1	
36.	Roundness and surface roughness using LASER, Micro holes and topography measurements, straightness and flatness measurement.	1	
37.	**Special Measuring Instruments and Techniques:** Optoelectronic devices, contact and non-contact types	1	
38.	Applications in on-line and in-process monitoring systems, Tool wear measurement, Surface measurement, Machine vision, shape identification.	1	
39.	Edge detection techniques, Normalisation, gray scale correlation,	1	

	Template Techniques.		
40.	Surface roughness using vision system, Interfacing robot and image processing system.	1	
41.	**Sensors in Inspection:** Manufacturing applications of photo detectors	1	
42.	deflection methods-beam detection	1	
43.	deflection methods-beam detection	1	
44.	Reflex detection	1	
45.	Proximity detection	1	
46.	Applications of Inductive and Capacitive proximity sensors, Understanding microwave sensing applications laser sensors and limit switches.	1	
47.	Advanced sensor technology-Bar code systems, Principles and applications of Colour sensors,	1	
48.	Electro-magnetic identifier, Tactile sensors, Ultrasonic sensors, Odour sensors.	1	
49.	**Computer Aided Metrology** : Principles and interfacing, soft metrology.	1	**25**
50.	Application of lasers in precision measurements- laser interface.	1	
51.	Laser scanners, Coordinate measurement machine (CMM).	1	
52.	Type of CMM & applications.	1	
53.	Non contact CMM, Electro optical sensors for dimension.	1	
54.	Contact sensors for surface finish measurements.	1	
55.	Image processing and its Metrology, Acoustical measurements.	1	
56.	Digital techniques in mechanical measurements.	1	
57.	Digital techniques in mechanical measurements.	1	
58.	Digital techniques in mechanical measurements.	1	
59.	Assessing and presenting experimental DATA.	1	
60.	Assessing and presenting experimental DATA.	1	
	TOTAL	**60**	**100**

LIST OF EXPERIMENTS

SR NO	TITLE OF EXPERIMENT
1	STUDY OF LENGTH STANDARDS & ITS CALIBRATION

2	TOLERANCE ANALYSIS FOR A GIVEN PART PRINT
3	MEASUREMENT OF STRAIGHTNESS, FLATNESS BY VARIOUS METHODS
4	MEASUREMENT OF SURFACE ROUGHNESS
5	ANALYSIS OF MACHINE VISION IN MANUFACTURING
6	GAUGE DESIGN FOR A GIVEN APPLICATION
7	MEASUREMENT OF ROUNDNESS USING CMM
8	ERROR ANALYSIS OF VARIOUS MEASURING INSTRUMENTS
9	MODELLING OF MEASURING SYSTEMS
10	MEASUREMENT OF SQUARENESS, ROUNDNESS

STUDENT LEARNING OUTCOME

At the end of the course

The students will gain an experience in the implementation of measuring & gauging techniques.

RECOMMANDED STUDY MATERIAL

1. Fundamentals of dimensional Metrology T. Busch and R. Harlow Delmar, 3e
2. Engineering Metrology G. Thomas and G. Butter Worth PUB
3. Sensors and Control systems in Manufacturing Sabne Soloman McGraw Hill Book
4. Measurement systems: Applications & Design Doebelin International Student Edition
5. Optoelectronics for Technology and Engineering Robert G. Seippel Prentice Hall India
6. Interface Technology for Computer Controlled Ulrich-Rembold, Armbruster Marcel

   Dekker Publications, Manufacturing processes and Ulzmann NY
7. Study manual on tolerance stacks, vol.1 Second edition ASME. 1994
8. Dimensioning and tolerancing of mass Spotts Prentice Hall, 1983

ME MECHANICAL-PRODUCTION ENGINEERING DEPARTMENT ELECTIVE-II

Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

Second Semester Master of Engineering (Mechanical-Production Engineering)

In Effect from Academic Year 2017-18

Subject Code: MEPR107-N-A	**Subject Title: NON TRADITIONAL MACHINING**

Teaching Scheme				**Total Credit**	**Evaluation Scheme**					**Total Marks**
L	**T**	**P**	**Total**		**THEORY**		**IE**	**CIA**	**Pract./ VIVO**	
					Hrs	**Marks**	**Marks**	**Marks**	**Marks**	
Hrs	**Hrs**	**Hrs**	**Hrs**							
3	**0**	**0**	**3**	**3**	**3**	**70**	**30**	**20**	**-**	**120**

LEARNING OBJECTIVES:

The objective of this course is

To learn various concepts related to modern machining processes & their applications

INSTRUCTIONAL METHOD AND PEDAGOGY (Continuous Internal Assessment (CIA) Scheme)

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed
- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all units while conducting teaching & examination.
- Attendance is compulsory in lectures and Tutorial
- One internal exam of 30 marks is conducted as a part of Mid semester evaluation.

OUTLINE OF THE COURSE

SR.NO	CHAPTER NO	DATE/WEEK
1	1,8	1^{st} 2^{nd} 3^{rd}
2	2,3	4^{th} 5^{th} 6^{th}
3	4	7^{th} 8^{th} 9^{th}
4	5,6	10^{th} 11^{th} 12^{th}
5	7	13^{th} 14^{th} 15^{th}

Total hours (Theory): 30

Total hours (Practical):00

Total hours: 30

DETAILED SYLLABUS

Chap. No.	Topic
1	**Introduction:** Needs for nontraditional machining processes, classification and comparative analysis
2	Abrasive jet machining: Fundamental principle, application process parameters, MRR models. Water jet machining: Fundamental principle, application process parameters
3	Chemical machining: Principle of operation, etch ants and mask ants, photochemical process, equipment, applications.
4	Analysis of material removal: Electrochemical machining: Process principle Dynamics of ECM Process, tool design, applications.
5	Ultrasonic machining: Physical principles Physical principles of USM, Process parameters, Transducers types materials and design
6	**Horn design**: Shaws model of MRR, other applications of Ultrasonic machining
7	Electrical discharge machining: Operating principles of EDM, Effects of Dielectric fluids, Electrode materials ,power generators, process parameters and their effects, flashing, wire EDM process, applications. Laser Beam Machining
8	**Lasing process:** Types of lasers (Gas and solid state), lasing mediums, laser material processing-cutting, drilling, surface treatment, special applications.

LESSON PLANNING

Lec No	Topic	Hours	% Weightage
1	Introduction: Needs for nontraditional machining processes, classification and comparative analysis	1	**25**
2	Abrasive jet machining: Fundamental principle	1	
3	application process parameters	1	
4	application process parameters	1	
5	MRR models.	1	
6	MRR models.	1	
7	Water jet machining: Fundamental principle	1	
8	process parameters	1	
9	Application	1	
10	Chemical machining: Principle of operation	1	
11	etchants and maskants	1	
12	photochemical process	1	
13	equipment, applications	1	
14	equipment, applications	1	
15	**Analysis of material removal:**	1	
16	Electrochemical machining: Process principle	1	**25**
17	Dynamics of ECM Process	1	
18	Dynamics of ECM Process	1	
19	Tool design, applications.	1	
20	Ultrasonic machining: Physical principles	1	
21	principles of USM,	1	
22	Process parameters,	1	
23	Transducers types materials and design	1	
24	**Horn design**:	1	
25	Shaws model of MRR,	1	
26	Shaws model of MRR	1	
27	other applications of Ultrasonic machining	1	**25**
28	Electrical discharge machining: Operating principles of EDM	1	
29	Effects of Dielectric fluids	1	
30	Electrode materials	1	
31	power generators	1	
32	process parameters and their effects, flushing,	1	
33	wire EDM process,	1	
34	Process parameters	1	
35	Applications.	1	**25**
36	Laser Beam Machining	1	
37	Principle	1	

38	Process parameters	1	
39	Lasing process:	1	
40	Types of lasers (Gas and solid state),	1	
41	lasing mediums,	1	
42	laser material processing-cutting,	1	
43	drilling, surface treatment,	1	
44	Special applications	1	
45	Case studies	1	
	TOTAL	**45**	**100**

STUDENTS LEARNING OUTCOMES:

At the end of the course

The students will gain an experience in the implementation of NTM concepts which are applied in the field of production

Reference Books:

1. Modern Machining Processes by P.C.Pandey & H.S. Shan, Tata McGraw Hill.
2. Advanced Machining Processes by Vijay K.Jain, Allied Publishers.
3. Nontraditional Manufacturing Processes by G.F. Benedict, Marcel Dekker Inc., NY.
4. Advanced Methods of Machining by McGeough, Chapman and Hall, London.
5. New Technology by A. Bhattacharya, Institute of Engineers, India.
6. Material & Processes in Manufacturing by Paul De Garmo, J.T. Black and Ronald A. Kohser,
7. Advanced Machining Processes By Hassan Abdel-Gawad El-Hofy Tata McGraw Hill, ISBN 0071453342 / 9780071453349 PHI

Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

Second Semester Master of Engineering (Mechanical-Production Engineering)

In Effect from Academic Year 2017-18

Subject Code: MEPR107-N-B	**Subject Title: PIPING SYSTEM DESIGN**

Teaching Scheme				**Total Credit**	**Evaluation Scheme**					**Total Marks**
L	**T**	**P**	**Total**		**THEORY**		**IE**	**CIA**	**Pract/ VIVO**	
					Hrs	**Marks**	**Marks**	**Marks**	**Marks**	
Hrs	**Hrs**	**Hrs**	**Hrs**							
3	**0**	**0**	**3**	**3**	**3**	**70**	**30**	**20**	**-**	**120**

LEARNING OBJECTIVES:

The educational objectives of this course are

- To learn various concepts related to piping.
- To get acquainted with piping design.

INSTRUCTIONAL METHOD AND PEDAGOGY (Continuous Internal Assessment (CIA) Scheme)

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed
- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures which may carry 05 Marks.
- Classroom participation and involvement in solving the problems may carries 05 Marks.
- Tutorial and assignments writing may carries 10 Marks.
- One internal exam of 30 Marks is conducted as a part of mid semester evaluation.

OUTLINE OF THE COURSE

SR.NO	CHAPTER NO	DATE/WEEK
1	1,2	1^{st} 2^{nd} 3^{rd}
2	3,4	4^{th} 5^{th} 6^{th}
3	5,6	7^{th} 8^{th} 9^{th}
4	7	10^{th} 11^{th} 12^{th}
5	8	13^{th} 14^{th} 15^{th}

Total hours (Theory): 45

Total hours (Practical):00

Total hours: 45

DETAILED SYLLABUS

SR NO	TOPIC
1.	Introduction to piping engineering
2.	Codes & standards for piping engineering & design
3.	Piping elements viz. pipes, fittings, flanges, gaskets, bolting, valves etc. Types of valves
4.	Piping drawing layout and instruments diagram, Equipment layout Basic of flow through pipes
5.	Pipe sizing & piping hydraulics ,Head sizing & piping hydraulics
6.	Head losses due to contraction and expansion, other types of losses Network analysis, Overall loss estimation through network analysis, optimizing piping network with respect to losses
7.	Design of liquid handling piping system, sizing for equal velocity, sizing for equal areas, optimal sizing, water hammer, Steam piping design, stream traps
8.	Flexibility analysis consideration for cryogenic piping Selection of support & expansion joints Instrumentation, Introduction to CAESER

LESSON PLANNING

Lecture	Topic	Hours	%

No			Weightage
1	Introduction to piping engineering	1	
2	Introduction to piping engineering	1	
3	Codes & standards for piping engineering & design	1	
4	Codes & standards for piping engineering & design	1	
5	Piping elements	1	
6	Pipes, fittings	1	**25**
7	Flanges	1	
8	Gaskets	1	
9	Bolting	1	
10	Types of valves	1	
11	Types of valves	1	
12	Piping drawing layout	1	
13	instruments diagram	1	
14	Equipment layout	1	
15	Basic of flow through pipes	1	
16	Basic of flow through pipes	1	
17	Pipe sizing & piping hydraulics	1	**25**
18	Pipe sizing & piping hydraulics	1	
19	Pipe sizing & piping hydraulics	1	
20	Head sizing & piping hydraulics	1	
21	Head sizing & piping hydraulics	1	
22	Head sizing & piping hydraulics	1	
23	Head losses due to contraction	1	
24	Head losses due to expansion	1	
25	other types of losses	1	
26	other types of losses	1	
27	Network analysis	1	
28	Network analysis	1	**25**
29	Network analysis	1	
30	Overall loss estimation through network analysis	1	
31	Overall loss estimation through network analysis	1	
32	optimizing piping network with respect to losses	1	
33	optimizing piping network with respect to losses	1	
34	Design of liquid handling piping system	1	
35	Design of liquid handling piping system	1	
36	sizing for equal velocity,	1	
37	sizing for equal areas	1	**25**
38	optimal sizing	1	
39	water hammer	1	
40	Steam piping design	1	
41	stream traps	1	

42	Flexibility analysis consideration for cryogenic piping Selection of support & expansion joints	1	
43	Flexibility analysis consideration for cryogenic piping Selection of support & expansion joints	1	
44	Instrumentation	1	
45	Introduction to CAESER	1	
	TOTAL	**45**	**100**

STUDENT LEARNING OUTCOME

- The students will gain an experience in applying the piping design procedure for the industrial applications.

RECOMMANDED STUDY MATERIAL

1. M.V.Joshi & V.V. Mahajani, “Process Equipment Design”, MacMillan, India Ltd., 1996.
2. J.F.Hanvey, “Pressure Vessels Design”, Von Nostrand Co. Ind., 1963
3. ASME code Section 8th div 1, div 2
4. K.P.Singh & A.L. Soler, “Mechanical Design of Heat Exchangers”, Arcturus Pub. Inc. N.J. 08003, USA. 1984
5. Demis R. Moss, Pressure Vessel Design Manual, Gulf Publishing Co., Houston, 1987. IS 2825
7. Sahu G.K., “Hand Book of Piping Design”, New Age International (P) Ltd. 1998,
8. ASHRAE fundamentals – 1985.

Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

Second Semester Master of Engineering (Mechanical-Production Engineering)

In Effect from Academic Year 2017-18

Subject Code: MEPR107-N-C	**Subject Title: INDUSTRIAL TRIBOLOGY**

Teaching Scheme				**Total Credit**	**Evaluation Scheme**					**Total Marks**
L	**T**	**P**	**Total**		**THEORY**		**IE**	**CIA**	**Pract./ VIVO**	
					Hrs	**Marks**	**Marks**	**Marks**	**Marks**	
Hrs	**Hrs**	**Hrs**	**Hrs**							
3	**0**	**0**	**3**	**3**	**3**	**70**	**30**	**20**	**-**	**120**

LEARNING OBJECTIVES:

The objective of this course is

- To learn various concepts related to tribology
- To have practical purview of wear, lubrication & applications

INSTRUCTIONAL METHOD AND PEDAGOGY Continuous Internal Assessment (CIA) Scheme)

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed
- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all units while conducting teaching & examination.
- Attendance is compulsory in lectures and Tutorial.
- One internal exam of 30 marks is conducted as a part of Mid semester evaluation.

OUTLINE OF THE COURSE

SR.NO	CHAPTER NO	DATE/WEEK
1	1,2	1^{st} 2^{nd} 3^{rd}
2	3,4	4^{th} 5^{th} 6^{th}
3	5,6	7^{th} 8^{th} 9^{th}
4	7	10^{th} 11^{th} 12^{th}
5	8	13^{th} 14^{th} 15^{th}

Total hours (Theory): 45
Total hours (Practical):00
Total hours: 45

DETAILED SYLLABUS

SR NO	TOPIC
1.	**Introduction:** Definition and Scope of tribology, Contact of solids, Surface topology, Surface interaction
2.	**Friction :** Definitions, Types, Friction laws, Modern theory of dry solid friction, Temperature of sliding surface
3.	Mechanism of rolling friction, Friction instability, Friction elastomers.
4.	**Wear:** Definition, Classification, Theories of adhesives, Abrasives, Surface fatigue and corrosive wear
5.	Miscellaneous wear theory such as Erosive, cavitation and Fretting wear, Wear of miscellaneous machine components such as gears, Plane bearings and rolling elements.
6.	**Lubrication:** Lubrication of bearing, Lubricant, Mineral Oil, Grease, Solid lubricant, Lubrication regime, Viscous flow
7.	Reynolds equation and its limitations, Hydrodynamic lubrication, Hydrostatic lubrication, Elasto-hydrodynamic lubrication, Boundary lubrication, Squeeze films.
8.	**Applications:** Application of tribology in manufacturing processes, Metal machining, Metal cutting, Tool wear, Action of lubricants, Friction welding, Extrusion process

LESSON PLANNING

Lecture No	Topic	Hours	% Weightage
1	**Introduction:**	1	
2	All over discussion about tribology	1	
3	Definition and Scope of tribology	1	
4	Contact of solids	1	
5	Surface topology	1	
6	Surface interaction	1	
7	Industrial application	1	**25**
8	Need, advantages & disadvantages	1	
9	**Friction :**	1	
10	Definitions, Types	1	
11	Friction laws,	1	
12	Modern theory of dry solid friction	1	
13	Temperature of sliding surface	1	
14	Mechanism of rolling friction	1	
15	Friction instability	1	
16	Friction elastomers.	1	
17	Difference between sliding friction & rolling friction	1	**25**
18	Friction theory	1	
19	**Wear:**	1	
20	Definition, Classification	1	
21	Theories of adhesives	1	
22	Abrasives	1	
23	Surface fatigue	1	
24	corrosive wear	1	
25	Miscellaneous wear theory such as Erosive	1	
26	Cavitation and Fretting wear	1	
27	Wear of miscellaneous machine components such as gears	1	
28	Plane bearings and rolling elements	1	
29	machine components	1	**25**
30	**Lubrication:**	1	
31	Lubrication of bearing, Lubricant	1	
32	Mineral Oil, Grease, Solid lubricant	1	
33	Lubrication regime, Viscous flow	1	
34	Reynolds equation and its limitations	1	
35	Hydrostatic lubrication	1	
36	Elasto-hydrodynamic lubrication	1	
37	Boundary lubrication, Squeeze films	1	**25**
38	Advantages and disadvantages	1	

39	**Applications:**	1	
40	Application of tribology in manufacturing processes	1	
41	Metal machining	1	
42	Metal cutting, Tool wear	1	
43	Action of lubricants	1	
44	Friction welding	1	
45	Extrusion process	1	
	TOTAL	**45**	**100**

STUDENT LEARNING OUTCOME

At the end of the course

- The students will gain an experience in applying the concepts of tribology in industrial scenario.

RECOMMANDED STUDY MATERIAL

1. Bharat Bhushan, “Introduction to Tribology”
2. N.J. Pearson, “Sliding Friction”
3. Frank Philip Bowden, “The Friction and Lubrication of Solids”, Oxford Classic Texts
4. Engineering Tribology P Sahoo Prentice Hall of India
5. Principles and Applications of Tribology D.F. Moore Pergamon Press
6. Fundamentals of Tribology Basu, Sengupta & Ahuja Prentice Hall of India
7. Industrial tribology by R B Patil, Tax-Max publications, Pune.

Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

Second Semester Master of Engineering (Mechanical-Production Engineering)

In Effect from Academic Year 2017-18

Subject Code: MEPR107-N-D	**Subject Title: MICRO AND NANO MANUFACTURING**

Teaching Scheme				**Total Credit**	**Evaluation Scheme**					**Total Marks**
L	**T**	**P**	**Total**		**THEORY**		**IE**	**CIA**	**Pract./ VIVO**	
					Hrs	**Marks**	**Marks**	**Marks**	**Marks**	
Hrs	**Hrs**	**Hrs**	**Hrs**							
3	**0**	**0**	**3**	**3**	**3**	**70**	**30**	**20**	**-**	**120**

LEARNING OBJECTIVES:

The objective of this course is

- To learn various concepts related to MICRO AND NANO machining processes & their applications

INSTRUCTIONAL METHOD AND PEDAGOGY

Continuous Internal Assessment (CIA) Scheme)

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed
- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all units while conducting teaching & examination.
- Attendance is compulsory in lectures and Tutorial.
- One internal exam of 30 marks is conducted as a part of Mid semester evaluation.

OUTLINE OF THE COURSE

SR.NO	CHAPTER NO	DATE/WEEK
1	1,2	1^{st} 2^{nd} 3^{rd}
2	3,4	4^{th} 5^{th} 6^{th}
3	5,6	7^{th} 8^{th} 9^{th}
4	7	10^{th} 11^{th} 12^{th}
5	8,9	13^{th} 14^{th} 15^{th}

Total hours (Theory): 45

Total hours (Practical):00

Total hours: 45

DETAILED SYLLABUS

SR NO	TOPIC
1	Introduction: Importance of Nano-technology, Emergence of Nanotechnology, Bottom-up and Top-down approaches, challenges in Nanotechnology.
2	Nanomaterials Synthesis and Processing: Methods for creating Nanostructures; Processes for producing ultrafine powders- Mechanical grinding; Wet Chemical Synthesis of nanomaterials- sol-gel process, Liquid solid reactions; Gas Phase synthesis of nanomaterials- Furnace, Flame assisted ultrasonic spray pyrolysis; Gas Condensation Processing(GPC), Chemical Vapour Condensation(CVC)-Cold Plasma Methods, Laser ablation, Vapour – liquid –solid growth, particle precipitation aided CVD, summary of Gas Condensation Processing (GPC).
3	Structural Characterization: X-ray diffraction, Small angle X-ray Scattering, Optical Microscope and their description, Scanning Electron Microscopy (SEM), Scanning Probe Microscopy (SPM), TEM and EDAX analysis, Scanning Tunneling Microscopy (STM), Atomic force Microscopy (AFM).
4	Spectroscopic characterizations: Basic concepts of spectroscopy, operational principle and application for analysis of nanomaterials, UV-VIS-IR Spectrophotometers, Principle of operation and application for band gap measurement, Raman spectroscopy.
5	Surface Characterization: X-ray Photoelectron Spectroscopy (XPS), Auger electron spectroscopy, Low Energy Ion Scattering Spectroscopy (LEISS), Secondary Ion Mass Spectroscopy (SIMS), Rutherford Backscattering Spectroscopy (RBS).
6	Thermal Characterization of Nanomaterials: DTA, TGA, DSC (Principle and Applications), Determination of thermo physical parameters.
7	MicrofabricationTechniques: Lithography, Thin Film Deposition and Doping, Etching and Substrate Removal, Substrate Bonding. MEMS Fabrication Techniques, Bulk Micromachining, Surface Micromachining,High- Aspect-Ratio Micromachining.

LESSON PLANNING

Lect No	Topic	Hours	% Weightage
1.	Introduction: Importance of Nano-technology	1	
2.	Emergence of Nanotechnology	1	
3.	Bottom-up and Top-down approaches	1	
4.	Challenges in Nanotechnology	1	
5.	Nanomaterials Synthesis and Processing	1	
6.	Methods for creating Nanostructures	1	**25**
7.	Processes for producing ultrafine powders	1	
8.	Mechanical grinding	1	
9.	Wet Chemical Synthesis of nanomaterials	1	
10	sol-gel process, Liquid solid reactions;	1	
11	Gas Phase synthesis of nanomaterials	1	
12	Furnace, Flame assisted ultrasonic spray pyrolysis	1	
13	Gas Condensation Processing(GPC)	1	
14	Chemical Vapour Condensation(CVC)	1	
15	Cold Plasma Methods, Laser ablation	1	
16	Vapour – liquid –solid growth	1	
17	particle precipitation aided CVD	1	**25**
18	Summary of Gas Condensation Processing (GPC)	1	
19	Structural Characterization: X-ray diffraction	1	
20	Small angle X-ray Scattering	1	
21	Optical Microscope and their description	1	
22	Scanning Electron Microscopy (SEM)	1	
23	Scanning Probe Microscopy (SPM)	1	
24	TEM and EDAX analysis	1	
25	Scanning Tunneling Microscopy (STM)	1	
26	Atomic force Microscopy (AFM)	1	
27	Spectroscopic characterizations	1	
28	Basic concepts of spectroscopy	1	
29	operational principle and application for analysis of nanomaterials,	1	**25**
30	UV-VIS-IR Spectrophotometers	1	
31	Principle of operation and application for band gap measurement	1	
32	Raman spectroscopy	1	
33	Surface Characterization: X -ray Photoelectron Spectroscopy (XPS)	1	
34	Auger electron spectroscopy,	1	
35	Low Energy Ion Scattering Spectroscopy (LEISS)	1	**25**
36	Secondary Ion Mass Spectroscopy (SIMS)	1	

37	Rutherford Backscattering Spectroscopy (RBS).	1	
38	Thermal Characterization of Nanomaterials:	1	
39	DTA, TGA, DSC (Principle and Applications)	1	
40	Determination of thermo physical parameters.	1	
41	MicrofabricationTechniques: Lithography	1	
42	Thin Film Deposition and Doping, Etching and Substrate Removal	1	
43	Substrate Bonding. MEMS Fabrication Technique	1	
44	Bulk Micromachining, Surface Micromachining	1	
45	High- Aspect-Ratio Micromachining.	1	
	TOTAL	**45**	**100**

STUDENTS LEARNING OUTCOME:

Explain different techniques for the synthesis and characterization of nanomaterials.
Design and analyze methods and tools for micro and nano manufacturing.
Select a micro and nanomanufacturing method and identify key variables to improve quality of MEMS.
Select appropriate industrially-viable process, equipment and tools for a specific product.

READING:

1. Mark James Jackson, Microfabrication and Nanomanufacturing, CRC Press, 2005.

2. Gabor L. Hornyak, H.F Tibbals, Joydeep Dutta & John J Moore, Introduction to Nanoscience and Nanotechnology, CRC Press, 2009.

3. Ray F. Egerton, Physical Principles of Electron Microscopy: An Introduction to TEM, SEM, and AEM, Springer, 2005.

4. Robert F Speyer, Thermal Analysis of Materials, Marcel Dekker Inc, New York, 1994.

5. B.D. Cullity - Elements of X-Ray Diffraction, 3rd edition, Prentice Hall, 2002.

6. Tai-Ran Hsu, “MEMS and Microsystems: Design and Manufacture,” McGraw- Hill, 2008.

Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

Second Semester Master of Engineering (Mechanical-Production Engineering)

In Effect from Academic Year 2017-18

Subject Code: MEPR107-N-E	**Subject Title: PRECISION ENGINEERING**

Teaching Scheme				**Total Credit**	**Evaluation Scheme**					**Total Marks**
L	**T**	**P**	**Total**		**THEORY**		**IE**	**CIA**	**Pract./ VIVO**	
					Hrs	**Marks**	**Marks**	**Marks**	**Marks**	
Hrs	**Hrs**	**Hrs**	**Hrs**							
3	**0**	**0**	**3**	**3**	**3**	**70**	**30**	**20**	**-**	**120**

LEARNING OBJECTIVES:

The objective of this course is

To learn various concepts related to TOLERANCE, ACCURACY & their applications.

INSTRUCTIONAL METHOD AND PEDAGOGY (Continuous Internal Assessment (CIA) Scheme)

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed
- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all units while conducting teaching & examination.
- Attendance is compulsory in lectures and Tutorial.
- One internal exam of 30 marks is conducted as a part of Mid semester evaluation.

OUTLINE OF THE COURSE

SR.NO	CHAPTER NO	DATE/WEEK
1	1,2	1^{st} 2^{nd} 3^{rd}
2	3,	4^{th} 5^{th} 6^{th}
3	4,	7^{th} 8^{th} 9^{th}
4	5,6	10^{th} 11^{th} 12^{th}
5	7	13^{th} 14^{th} 15^{th}

Total hours (Theory): 45

Total hours (Practical):00

Total hours: 45

DETAILED SYLLABUS:

SR NO	TOPIC
1.	**Tolerance and fits:** ISO and ISI designation, calculation of clearance and interference fits, probability of clearance and interference fits in transitional fits,examples of applications of various fits, concept of selective assembly, calculation of fits in selective assembly
2.	**Concept of part and machine tool accuracy:** Accuracy specification of parts and assemblies, accuracy of machine tools, alignment testing of machine tools.
3.	**Theory of dimensional chains:** Definitions, concept of dimensional chain or tolerance stack, Examples of right and wrong dimensioning. Basic theory of dimensional chains. Calculation of tolerances in dimensional chains.
4.	**Errors during machining:** Errors due to compliance of machine-fixture-tool-work piece (MFTW) System, influence of compliance on progressive decrease of error in a series of machining operations, theory of location, location errors, errors due to geometric Inaccuracy of machine tool, errors due to tool wear, errors due to thermal effects, errors due to clamping. Statistical method of accuracy analysis.
5.	**Surface roughness:** Definition and measurement, surface roughness indicators, (CLA, RMS, etc,.) and their comparison, influence of machining conditions, methods of obtaining high quality surfaces, Lapping, Honing, Super finishing and Burnishing processes.
6.	**Calculation of machining allowance:** In process dimensioning of work pieces with examples **Manufacturing methods of typical machine tool components:** Spindles, gears, and beds.

LESSON PLANNING

Lect No	Topic	Hours	% Weightage
1.	Tolerance and fits: ISO and ISI designation,	1	
2.	calculation of clearance and interference fits	1	
3.	calculation of clearance and interference fits	1	
4.	probability of clearance and interference fits in transitional fits	1	
5.	examples of applications of various fits	1	
6.	examples of applications of various fit	1	**25**
7.	concept of selective assembly	1	
8.	Calculation of fits in selective assembly.	1	
9.	Concept of part and machine tool accuracy:	1	
10.	Accuracy specification of parts and assemblies	1	
11.	accuracy of machine tools	1	
12.	Alignment testing of machine tools.	1	
13.	Theory of dimensional chains: Definitions	1	
14.	concept of dimensional chain or tolerance stack	1	
15.	Examples of right and wrong dimensioning.	1	
16.	Basic theory of dimensional chains.	1	
17.	Calculation of tolerances in dimensional chains.	1	
18.	Calculation of tolerances in dimensional chains.	1	**25**
19.	Calculation of tolerances in dimensional chains.	1	
20.	Errors during machining: Errors due to compliance of machine-fixture-tool-work piece (MFTW) System	1	
21.	influence of compliance on progressive decrease of error in a series of machining operations	1	
22.	theory of location	1	
23.	location errors	1	
24.	errors due to geometric Inaccuracy of machine tool	1	
25.	errors due to tool wear	1	
26.	errors due to thermal effects	1	
27.	errors due to clamping.	1	
28.	Statistical method of accuracy analysis.	1	
29.	Statistical method of accuracy analysis.	1	**25**
30.	Surface roughness:	1	
31.	Definition and measurement,	1	
32.	surface roughness indicators, (CLA, RMS, etc.) and their comparison	1	
33.	surface roughness indicators, (CLA, RMS, etc.) and their comparison	1	
34.	influence of machining conditions	1	
35.	methods of obtaining high quality surfaces	1	
36.	Lapping, Honing,	1	

37.	Super finishing and Burnishing processes.	1	
38.	Calculation of machining allowance: In process dimensioning of work pieces with examples	1	**25**
39.	In process dimensioning of work pieces with examples	1	
40.	Manufacturing methods of typical machine tool components: Spindles	1	
41.	Manufacturing methods of typical machine tool components: gears	1	
42.	Manufacturing methods of typical machine tool components :beds	1	
43.	Case studies	1	
44.	Case studies	1	
45.	Case studies	1	
	TOTAL	**45**	**100**

STUDENTS LEARNING OUTCOME

- Apply selective assembly concept for quality and economic production
- Assign tolerances using principles of dimensional chains for individual features of a part or assembly.
- Evaluate the part and machine tool accuracies

READING:

1. R.L.Murty, “Precision Engineering in Manufacturing”, New Age International Publishers, 1996.

2. V. Kovan, "Fundamentals of Process Engineering", Foreign Languages Publishing House, Moscow, 1975

3. Eary and Johnson, "Process Engineering for Manufacture"

4. J.L.Gadjala, "Dimensional control in Precision Manufacturing", McGraw Hill Publishers.

ME MECHANICAL-PRODUCTION ENGINEERING

SEMESTER-II

Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

Second Semester Master of Engineering (Mechanical Engineering)

In Effect from Academic Year 2017-18

Subject Code: MECC201-N	**Subject Title: TECHNICAL COMMUNICATION**

Teaching Scheme				**Total Credit**	**Evaluation Scheme**					
L	**T**	**P**	**Total**		**Theory**		**IE**	**CIA**	**Pract.**	**Total**
Hrs	**Hrs**	**Hrs**	**Hrs**		**Hrs**	**Marks**	**Marks**	**Marks**	**Marks**	**Marks**
2	**0**	**0**	**2**	**2**	**3**	**70**	**30**	**20**	**-**	**120**

LEARNING OBJECTIVES:

This subject intends to bring orientation towards technical communication for PG students. The PG Scholars shall acquire essential skills pertaining to technical communication which are required for various PG activities such as research, seminars, dissertation, report/paper writing, defending examination etc. The course would also help students in identifying different sources of information for literature review and data collection. It would further assist the PG scholars in understanding the drafting technical documentation including research paper/thesis/articles/reports. Further, the scholars are intended understand issues such as ethics, internet communication, gender & diversity issues etc. pertaining to technical communication.

INSTRUCTIONAL METHOD AND PEDAGOGY (Continuous Internal Assessment (CIA) Scheme)

1. At the start of course, the course delivery pattern , prerequisite of the subject will be discussed
2. Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all topics while teaching and conduction of all examinations.
3. Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation.
4. One/Two internal exams may be conducted and total/average/best of the same may be converted to equivalent of 30 marks as a part of internal theory evaluation.
5. Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carry an importance of ten marks in the overall internal evaluation.
6. Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overall internal evaluation.

OUTLINE OF THE COURSE:

Sr.	**Date/Week**	**Unit No.**	**Percentage Weight**	**Topic No**:

No.			age.	
1	1st ,2nd ,3rd	Unit :1,2	20	1
2	4th ,5th ,6th	Unit:3	20	2
3	7th ,8th ,9th	Unit:4	20	3
4	19th b ,11th ,12th	Unit:5	20	4
5	13th ,14th ,15th	Unit:6	20	5

Total Hours (Theory): 30
Total Hours (Lab): 00
Total Hours: 30

DETAILED SYLLABUS

1. Essence of Technical Communication: Analogy of Question/Answer to Problem/Solution. Steps in technical communication and practical guidelines. Hypothesis. Active-Passive voice, Direct-Indirect Speech.

2. Organization of technical report: Title, Authors, Affiliation, Abstract, Introduction, Literature survey, Methods, Result, Discussion, Figures, Tables, Conclusion, References, Acknowledgement, Communication with editor.

3. Patent Drafting and submission, preparing document for Technology Transfer, MOUs, Confidentiality agreement, SI prefixes, fundamental constants, standard Abbreviations & Scientific & Technological sign & symbols.

4. Wisdom of Internet Communication. Gender and diversity issues and stereotypes used in technical communication.

5. Ethical issues in engineering research, Avoid Plagiarism, citations methodology

6. Preparation & Presentation of research proposal for funding agencies. Poster presentations, Graphical Abstract and Highlights of Research article/proposal/Manuscript. Use of applicable simulation-platforms / open-source toolkits for scientific visualization of data.

LESSON PLANNING

Sr. No	LECTURE NO	Course Content	Hrs.	Percentage Weightage
1	1	Essence of Technical Communication	1	50%
2	2	Analogy of Question/Answer to Problem/Solution	1	
3	3	Steps in technical communication and practical guidelines	1	

4	**4**	Hypothesis	**1**	
5	**5**	Active-Passive voice, Direct-Indirect Speech	**1**	
6	**6**	Organization of technical report: Title, Authors,	**1**	
7	**7**	Affiliation, Abstract, Introduction, Literature survey	**1**	
8	**8**	Methods, Result, Discussion, Figures, Tables, Conclusion	**1**	
9	**9**	References, Acknowledgement	**1**	
10	**10**	Communication with editor	**1**	
11	**11**	Patent Drafting and submission	**1**	
12	**12**	preparing document for,	**1**	
13	**13**	Technology Transfer, MOUs	**1**	
14	**14**	Confidentiality agreement, SI prefixes	**1**	
15	**15**	fundamental constants	**1**	
16	**16**	standard Abbreviations & Scientific & Technological sign & symbols	**1**	**50%**
17	**17**	Wisdom of Internet Communication	**1**	
18	**18**	Gender and diversity issues	**1**	
19	**19**	stereotypes used in technical communication	**1**	
20	**20**	Ethical issues in engineering research	**1**	
21	**21**	Avoid Plagiarism	**1**	
22	**22**	citations methodology	**1**	
23	**23**	Preparation & Presentation of research proposal for funding agencies	**1**	
24	**24**	Poster presentations, Graphical	**1**	
25	**25**	Abstract and Highlights of Research article/proposal/Manuscript	**1**	
26	**26**	Use of applicable simulation-platforms / open-source toolkits for scientific visualization of data	**1**	
27	**27**	Case Study	**1**	
28	**28**	Case Study	**1**	
29	**29**	Case Study	**1**	
30	**30**	Case Study	**1**	
		TOTAL Hrs. Required To complete Task	**30**	

STUDENTS LEARNING OUTCOME:

At the end of this course, the student would be able

- To understand the process of research and learn the technical skills to communicate his/her research
- To learn identifying/drafting problem statement for his/her research domain
- To understand/draft different components of research papers
- To understand the significance of patenting and related drafting
- To understand notes taking, paraphrasing, elevator pitch, gender & diversity issues and ethical issues in technical communication

List of Reference Books:

- C. R. Kothari, “Research Methodology: Methods and Techniques”, New Age International Publishers
- Raman, Meenakshi and Sangeeta Sharma, “Technical Communication: Principle and Practice”, Oxford University Press.
- Stuart Johnson and Jon Scott, “ Study and communication skills for Biosciences, Oxford University press
- Robert A. Day, “Write and Publish a scientific Paper” Oryx Press
- Jennifer Peat, “Scientific Easy when you know how”, BMJ books
- Paul G. Chapin, “Research Projects and Research Proposals A Guide for Scientists seeking funding, University Press
- Sharon Gerson, Steven Geson, “Technical Writing: Process and Product”, Pearson Education.
- Sunita Mishra, C, Murlikrishna, “Communication Skills for Engineers”, Pearson Education.

List of References:

1. http://dl.acm.org/
2. http://springer.com/
3. http://sciencedirect.com/ (http://elsevier.com/)
4. http://ieeexplore.ieee.org/
5. https://scholar.google.co.in/
6. https://www.scopus.com/
7. https://iitbombayx.in/

E-Resources / Web Links:

1. http://courses.writing.ufl.edu/3254/Textbook/Lannon%20Instructor%20Manual%2012e.pdf
2. http://www.limat.org/data/research/Research%20Methodology.pdf
3. http://www.sociology.kpi.ua/wp-content/uploads/2014/06/Ranjit_Kumar-Research_Methodology_A_Step-by-Step_G.pdf
4. http://www.ndc.gov.ng/Lectures/Research-Methodology.pdf

Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

Second Semester Master of Engineering (Mechanical-Production Engineering)

In Effect from Academic Year 2017-18

Subject Code: MEPR202-N	**Subject Title: MECHANICS OF METAL FORMING**

Teaching Scheme				**Total Credit**	**Evaluation Scheme**					
L	**T**	**P**	**Total**		**Theory**		**IE**	**CIA**	**Pract./ VIVO**	**Total**
Hrs	**Hrs**	**Hrs**	**Hrs**		**Hrs**	**Marks**	**Marks**	**Marks**	**Marks**	**Marks**
4	**0**	**2**	**6**	**5**	**3**	**70**	**30**	**20**	**30**	**150**

LEARNING OBJECTIVES:

The educational objectives of this course are

- To learn various concepts related to metal forming process
- To have detailed analysis of metal forming principle to be applied in actual practice.

- **INSTRUCTIONAL METHOD AND PEDAGOGY**
- Continuous Internal Assessment (CIA) Scheme)
- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed
- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and Practical which may carries 05 Marks.
- Classroom participation and involvement in solving the problems in Lab may carries 05 Marks.
- Viva Voce will be conducted at the end of the semester of 30 Marks.
- One internal exam of 30 Marks is conducted as a part of mid semester evaluation.
- Experiments shall be performed in the laboratory related to course contents.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concept being taught in lectures.

OUTLINE OF THE COURSE

SR.NO	CHAPTER NO	DATE/WEEK
1	1,2	1^{st} 2^{nd} 3^{rd}
2	3	4^{th} 5^{th} 6^{th}
3	4	7^{th} 8^{th} 9^{th}
4	5,6	10^{th} 11^{th} 12^{th}
5	7,8	13^{th} 14^{th} 15^{th}

Total hours (Theory): 60

Total hours (Practical): 30

Total hours: 90

DETAILED SYLLABUS

SR NO	TOPIC
1.	**Basics of metal forming**: Mohr's circle - isotropic elasticity - yield theories
2.	Plastic stress- strain relationship - plastic work - the principle of normality - incremental plastic strain
3.	**Constitutive relationships:** Mechanical properties - work hardening -compression test, bulge test, plane strain compression test - plastic instability in tension tests
4.	Strain rate - super plasticity - slab analysis for sheet drawing - Extrusion and forging
5.	**Forging :** Upper bound solution for Extrusion - Indentation and plane strain forging, lower bound solution
6.	Slip line field theory and its solution - Formability and its testing
7.	**Sheet Metal forming**: Bending theory, Cold Rolling theory - Hill's anisotropic plasticity theory - Hill's general yield theory
8.	CAD/CAM applications in Extrusion, Forging and sheet metal Forming – Localized necking in biaxial stretching

LESSON PLANNING

Lecture No	Topic	Hours	% Weightage
1	Basics of metal forming	1	
2	Basics of metal forming	1	
3	Mohr's circle	1	
4	Mohr's circle	1	
5	isotropic elasticity	1	
6	isotropic elasticity	1	
7	yield theories	1	
8	yield theories	1	25
9	Plastic stress- strain relationship	1	
10	Plastic stress- strain relationship	1	
11	plastic work	1	
12	the principle of normality	1	
13	Incremental plastic strain.	1	
14	Incremental plastic strain.	1	
15	Constitutive relationships	1	
16	Mechanical properties	1	
17	work hardening	1	
18	work hardening	1	
19	compression test	1	
20	compression test	1	
21	bulge test	1	
22	bulge test	1	
23	plane strain compression test	1	25
24	plane strain compression test	1	
25	plastic instability in tension tests	1	
26	plastic instability in tension tests	1	
27	Strain rate	1	
28	Strain rate	1	
29	super plasticity	1	
30	super plasticity	1	
31	slab analysis for sheet drawing	1	
32	slab analysis for sheet drawing	1	
33	Extrusion	1	
34	Forging	1	25
35	Upper bound solution for Extrusion	1	
36	Upper bound solution for Extrusion	1	
37	Indentation and plane strain forging	1	

38	Indentation and plane strain forging	1	
39	lower bound solution	1	
40	lower bound solution	1	
41	Slip line field theory and its solution	1	
42	Slip line field theory and its solution	1	
43	Formability and its testing	1	
44	Formability and its testing	1	
45	Sheet Metal forming	1	
46	Sheet Metal forming	1	
47	Bending theory	1	
48	Cold Rolling theory	1	
49	Cold Rolling theory	1	
50	Hill's anisotropic plasticity theory	1	
51	Hill's anisotropic plasticity theory	1	
52	Hill's general yield theory	1	
53	Hill's general yield theory	1	25
54	CAD/CAM applications in Extrusion	1	
55	CAD/CAM applications in Extrusion	1	
56	CAD/CAM applications Forging	1	
57	CAD/CAM applications Forging	1	
58	Localized necking in biaxial stretching	1	
59	Localized necking in biaxial stretching	1	
60	Localized necking in biaxial stretching	1	
	TOTAL	**60**	**100**

LIST OF EXPERIMENTS

SR NO	TITLE OF PRACTICAL
1	DEMONSTRATE THE CONCEPT OF SLIP LINE FIELD THEORY WITH IN DETAIL CASE STUDY.
2	ANALYSIS OF DIRECT CHILLED VERTICAL CONTINUOUS CASTING OF ALUMINUM ALLOYS
3	ANALYSIS OF DIRECT CHILLED VERTICAL CONTINUOUS CASTING OF MAGNESIUM ALLOYS
4	ANALYSIS OF UPPER BOUND THEORY WITH SHEET METAL FORMING WORK
5	ANALYSIS OF UPPER BOUND THEORY WITH WIRE DRAWING
6	ANALYSIS OF LOWER BOUND THEORY WITH OPEN DIE FORGING
7	ANALYSIS OF LOWER BOUND THEORY WITH CLOSED DIE FORGING
8	TO DESIGN AND OPTIMIZE THE BENDING PRESS FOR COLD ROLLING PROCESS OF "C" CHANNEL BY APPLICATION OF THE HILL'S THEORY TO ACHIEVE CLOSE TOLERANCES IN TERMS OF FLATNESS, TO PREVENT BUTT, CURL AND TO ACHIEVE ANTI WARP QUALITY
9	TO DESIGN AND OPTIMIZE THE BENDING PRESS FOR COLD ROLLING PROCESS OF I BEAM BY APPLICATION OF THE HILL'S THEORY
10	COMPUTATION OF NECKING IN BIAXIAL STRETCHING IN SHEET METAL FORMING

STUDENT LEARNING OUTCOME

At the end of the course

The students will gain an experience in the implementation of metal forming techniques concepts which are applied in the field of production.

RECOMMANDED STUDY MATERIAL

1. Hosford W.F and Caddell, R.M, "Metal Forming Mechanics and Metallurgy", Prentice Hall, 1983.
2. Narayanasamy R., "Theory of Plasticity", Ahuja Publications, 2000.
3. Scrope Kalpakjian, "Manufacturing processes for Engineering Materials", Addision Wesley, 1997.
4. Metal forming: Processes and Analysis – B. Avitzer-Tata-MGH
5. Mechanical Metallurgy – Dieter-MGH

Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

Second Semester Master of Engineering (Mechanical-Production Engineering)

In Effect from Academic Year 2017-18

Subject Code: MEPR203-N	**Subject Title: ADVANCE WELDING TECHNOLOGY**

Teaching Scheme				**Total Credit**	**Evaluation Scheme**					
L	**T**	**P**	**Total**		**Theory**		**IE**	**CIA**	**Pract/ VIVO**	**Total**
Hrs	**Hrs**	**Hrs**	**Hrs**		**Hrs**	**Marks**	**Marks**	**Marks**	**Marks**	**Marks**
3	**0**	**2**	**5**	**4**	**3**	**70**	**30**	**20**	**30**	**150**

LEARNING OBJECTIVES:

The objective of this course is

- To learn various concepts related to welding, its application
- To have practical purview of various welding process, welding standards, advanced welding process.

- **INSTRUCTIONAL METHOD AND PEDAGOGY**
- Continuous Internal Assessment (CIA) Scheme)
- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed
- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all units while conducting teaching & examination.
- Attendance is compulsory in lectures and Tutorial.
- Viva Voce will be conducted at the end of the semester of 30 Marks.
- One internal exam of 30 marks is conducted as a part of Mid semester evaluation.

OUTLINE OF THE COURSE

SR.NO	CHAPTER NO	DATE/WEEK
1	1,2	1^{st} 2^{nd} 3^{rd}
2	3,4	4^{th} 5^{th} 6^{th}
3	5	7^{th} 8^{th} 9^{th}
4	6	10^{th} 11^{th} 12^{th}
5	7,8	13^{th} 14^{th} 15^{th}

Total hours (Theory): 45

Total hours (Practical): 30

Total hours: 75

DETAILED SYLLABUS

SR NO	TOPIC
1	**Physics of welding arc:** characteristics of arc and mode of metal transfer, welding fluxes and coatings - type and classification; electrode codes and their critical evaluation
2	**Welding machine characteristics** conventional and pulsed power sources, inverter type, power sources for resistance welding
3	**Weldability:** weldability of cast iron, plain carbon and low alloy steels, stainless steels
4	**Determination of preheat temperature**: Use of Schaeffler's diagram, weldability tests, heat flow in welding - significance, theory of heat flow, cooling rate determination, selection of welding parameters based on heat flow analysis
5	Residual stress and distortion - theory of residual stresses and distortion calculation, welding codes, joint design, analysis of fracture and fatigue of welded joints - fracture, energy consideration, fracture toughness testing and its application to welded joints
6	**Automated welding systems:** microprocessor control of arc welding and resistance welding, quality assurance in welding, welding fumes and their effect on the environment
7	**Modern welding processes like:** EBW, LBW, Under water Welding, Ultrasonic welding etc. welding of ceramics, plastics and composites

LESSON PLANNING

Lecture	Topic	Hours	%

No			Weightage
1	Physics Of Welding Arc	1	
2	Characteristics Of Arc And Mode Of Metal Transfer	1	
3	Welding Fluxes And Coatings	1	
4	Type And Classification	1	
5	Electrode Codes	1	
6	Critical Evaluation	1	
7	Welding Machine Characteristics	1	25
8	Conventional And Pulsed Power Sources Inverter Type	1	
9	Power Sources For Resistance Welding	1	
10	Detail description of power source	1	
11	Weldability Of Cast Iron	1	
12	Plain Carbon	1	
13	Low Alloy Steels	1	
14	Weldability Of Stainless Steels	1	
15	Determination Of Preheat Temperature	1	25
16	Heat distribution	1	
17	Use Of Schaeffler's Diagram	1	
18	Weldability Tests	1	
19	Heat Flow In Welding	1	
20	Significance	1	
21	Theory Of Heat Flow	1	
22	Cooling Rate Determination	1	
23	Selection Of Welding Parameters Based On Heat Flow Analysis	1	
24	Importance of parameters based on heat flow	1	
25	Residual Stress And Distortion - Theory Of Residual Stresses	1	
26	Distortion Calculation	1	
27	Welding Codes, Joint Design	1	
28	Analysis Of Fracture	1	
29	Fatigue Of Welded Joints – Fracture	1	25
30	Energy Consideration	1	
31	Fracture Toughness Testing	1	
32	Its Application To Welded Joints	1	
33	Automated Welding Systems	1	
34	Microprocessor Control Of Arc Welding	1	
35	Microprocessor Control Of Resistance Welding	1	
36	Quality Assurance In Welding	1	
37	Welding Fumes And Their Effect On The Environment	1	
38	Modern Welding Processes	1	
39	EBW	1	
40	LBW	1	25
41	Under Water Welding	1	

42	Ultrasonic Welding Etc. Welding Of Ceramics	1	
43	Its industrial application	1	
44	Welding of Plastics	1	
45	Welding of Composites	1	
	TOTAL	**45**	**100**

LIST OF EXPERIMENTS

SR NO	TITLE OF EXPERIMENT
1	EFFECT OF VARIOUS WELDING PARAMETERS ON BEAD CHARACTERISTICS IN MMAW PROCESS
2	EFFECT OF VARIOUS WELDING PARAMETERS ON BEAD CHARACTERISTICS IN ARC WELDING
3	DETERMINATION OF PREHEAT TEMPERATURE USING SCHAEFFLER'S DIAGRAM
4	SELECTION OF WELDING PARAMETERS BASED ON HEAT FLOW ANALYSIS
5	STUDY OF JOINT DESIGN BASED ON WELDABILITY
6	SELECTION OF WELDING PARAMETERS BASED ON HEAT FLOW ANALYSIS
7	ANALYSIS OF DISTORTION IN WELDED JOINT BASED ON RESIDUAL STRESSES
8	WELDABILITY ANALYSIS OF CAST IRON
9	WELDABILITY ANALYSIS OF PLAIN CARBON AND LOW ALLOY STEELS
10	WELDABILITY ANALYSIS OF STAINLESS STEELS

STUDENT LEARNING OUTCOME

At the end of the course

The students will gain an experience in the implementation of welding techniques concepts which are applied in the field of production.

RECOMMANDED STUDY MATERIAL

1. Dr. R.S. Parmar “Welding Processes and Technology” Khanna Publishers
2. Welding Technology, R. Bittle, TMH
3. American Society for Metals, Metal Hand Book Vol.6
4. Welding Process Technology-Houldcraft PT-Cambridge Univ. Press

Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

Second Semester Master of Engineering (Mechanical-Production Engineering)

In Effect from Academic Year 2017-18

Subject Code: MEPR204-N	**Subject Title: ADVANCED MATERIAL TECHNOLOGY & METALLURGY**

Teaching Scheme				**Total Credit**	**Evaluation Scheme**					
L	**T**	**P**	**Total**		**Theory**		**IE**	**CIA**	**Pract/ VIVO**	**Total**
Hrs	**Hrs**	**Hrs**	**Hrs**		**Hrs**	**Marks**	**Marks**	**Marks**	**Marks**	**Marks**
4	**0**	**2**	**6**	**5**	**3**	**70**	**30**	**20**	**30**	**150**

LEARNING OBJECTIVES:

The educational objectives of this course are

- To learn various aspects of materials selection, their application.
- To have practical purview of various production techniques

INSTRUCTIONAL METHOD AND PEDAGOGY

- Continuous Internal Assessment (CIA) Scheme)
- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed
- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and Practical which may carries 05 Marks.
- Classroom participation and involvement in solving the problems in Lab may carries 05 Marks.
- Viva Voce will be conducted at the end of the semester of 30 Marks.
- One internal exam of 30 Marks is conducted as a part of mid semester evaluation.
- Experiments shall be performed in the laboratory related to course contents.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concept being taught in lectures.

OUTLINE OF THE COURSE

SR.NO	**CHAPTER NO**	**DATE/WEEK**
1	1,2	1^{st} 2^{nd} 3^{rd}
2	3	4^{th} 5^{th} 6^{th}
3	4,5	7^{th} 8^{th} 9^{th}
4	6,7	10^{th} 11^{th} 12^{th}
5	8	13^{th} 14^{th} 15^{th}

Total hours (Theory): 60

Total hours (Practical): 30

Total hours: 90

DETAILED SYLLABUS

SR NO	Topic
1	**Materials and Classification:** Solid materials- Classification, Ceramics, composites and metal glasses, selection and application of tool steel, Magnetic alloys, Copper, aluminum and magnesium alloys, Bearing alloys, Super hard materials, Plastics, Alloying techniques-Thermal, mechanical and chemical methods, Power metallurgy techniques, Macro and micro analysis of materials, Macro analysis of ferrous and non ferrous materials, Dendritic structures, Segregation and bonding, Heterogeneity formed through treatment and mechanical working
2	**Mechanical Properties:** Strengthening mechanism of materials, elements of dislocation theories, Strain hardening, Grain size control, Single crystal growth, Reinforcing fibres for polymers, Composite structure, determination of mechanical properties of materials
3	Dynamic tests, Fracture and toughness tests, Low temperature and high temperature tests, Creep characteristics, Hot hardness tests, Total intragranular cracking and aggressive media, Ceramics and composites, Insulation, Strength and aging of plastics and recrystallisation, Formability, Forgebility and drawability of materials, Powder processing of materials, Ceramic processing, Composite processing, Features controlling machinability of materials, thermal treatment for better mach inability of metals, Universal mach inability index
4	**Modern Materials and Alloys:** Super alloys-refractory materials, Ceramic and their applications, Low melting alloys, Shape memory alloys, Advanced Composites-Particulate and dispersioned composites, Metal matrix and ceramic matrix composites, Carbon-Carbon composites
5	Ti and Ni based alloys for gas turbine applications, Managing and cryogenic steels- Newer materials and their treatment for automobile applications, materials for Naval and nuclear systems. Smart and Nano materials.
6	**Polymers** : polymerization, Structure and properties of thermoplastics and thermosets, Engineering applications, Property modifications, Mechanical, thermal behaviour of composites with polymer matrix, ceramics glasses
7	Motivation for selection, cost basis and service requirements - Selection for mechanical properties, strength, toughness, fatigue and creep - Selection for surface durability corrosion and wear resistance – Relationship between materials selection and processing - Case studies in materials selection with relevance to aero, auto, marine, machinery and nuclear applications
8	**Heat Treatment of ferrous &Non-Ferrous Metals**: Iron Carbon phase diagram; TTT diagram; different microstructures;transformations; Annealing, Stress relieving; Spherodizing; Normalizing; Hardening; Tempering; Austemepring; Martempering; Quenching; Quenchants; Quenching media; Surface hardening; Harden ability; Sub-zero treatment; Thermo-mechanical treatment; Chemical Treatment; Tool steel and their

	heat treatment; cast Iron and their heat treatment. Aluminum and its alloys; Heat treatable and non heat-treatable aluminum alloys; Classification of heat treatment of aluminum alloys; Heat treatment of Aluminum and its alloys; Heat treatment of Magnesium and its alloys; Heat treatment of Titanium and its alloys; Heat treatment of Copper and its alloys; Heat treatment of Nickel and its alloys, Energy Economy in heat treatment

LESSON PLANNING

Lecture No	Topic	Hours	% Weightage
1.	Solid materials- Classification, Ceramics, composites and metal glasses, selection and application of tool steel	1	25
2.	Magnetic alloys, Copper, aluminum and magnesium alloys	1	
3.	Bearing alloys, Super hard materials, Plastics,	1	
4.	Alloying techniques-Thermal, mechanical and chemical methods	1	
5.	Power metallurgy techniques	1	
6.	Macro and micro analysis of materials	1	
7.	Macro analysis of ferrous and non ferrous materials	1	
8.	Dendritic structures	1	
9.	Segregation and bonding, Heterogeneity formed through treatment and mechanical working	1	
10.	Strengthening mechanism of materials	1	
11.	elements of dislocation theories, Strain hardening	1	
12.	Grain size control, Single crystal growth	1	
13.	Reinforcing fibres for polymers	1	
14.	Composite structure, determination of mechanical properties of materials	1	
15.	Dynamic tests, Fracture and toughness tests	1	
16.	Low temperature and high temperature tests	1	25
17.	Creep characteristics, Hot hardness tests	1	
18.	Total intragranular cracking and aggressive media,	1	
19.	Ceramics and composites	1	
20.	Insulation, Strength and aging of plastics and recrystallisation	1	
21.	Formability, Forgebility and drawability of materials	1	
22.	Powder processing of materials	1	
23.	Ceramic processing, Composite processing	1	
24.	Features controlling machinability of materials	1	
25.	thermal treatment for better mach inability of metals	1	
26.	Universal mach inability index	1	
27.	Super alloys-refractory materials	1	
28.	Ceramic and their applications	1	
29.	Low melting alloys, Shape memory alloys	1	
30.	Advanced Composites-Particulate and dispersioned composites, Metal matrix and ceramic matrix composites	1	

31.	Carbon-Carbon composites	1	
32.	Ti and Ni based alloys for gas turbine applications	1	
33.	Managing and cryogenic steels- Newer materials and their treatment for automobile applications	1	
34.	Materials for Naval and nuclear systems. Smart and Nano materials.	1	
35.	polymerization, Structure and properties of thermoplastics and thermosets	1	
36.	Engineering applications, Property modifications, Mechanical,	1	
37.	thermal behaviour of composites with polymer matrix, ceramics glasses	1	
38.	Motivation for selection, cost basis and service requirements	1	
39.	Selection for mechanical properties, strength, toughness, fatigue and creep	1	
40.	Selection for surface durability corrosion and wear resistance	1	25
41.	Relationship between materials selection and processing	1	
42.	Case studies in materials selection with relevance to aero, auto, marine, machinery and nuclear applications	1	
43.	Iron Carbon phase diagram	1	
44.	TTT diagram ;different microstructures;	1	
45.	Transformations	1	
46.	Annealing, Stress relieving;	1	
47.	Spherodizing; Normalizing	1	
48.	Hardening; Tempering;	1	
49.	Austemepring; Martempering; Quenching	1	
50.	Quenchants; Quenching media	1	
51.	Surface hardening; Harden ability;	1	
52.	Sub-zero treatment; Thermo-mechanical treatment;	1	
53.	Chemical Treatment; Tool steel and their heat treatment	1	25
54.	cast Iron and their heat treatment.	1	
55.	Aluminum and its alloys; Heat treatable and non heat-treatable aluminum alloys;	1	
56.	Heat treatment of Aluminum and its alloys;	1	
57.	Heat treatment of Magnesium and its alloys;	1	
58.	Heat treatment of Titanium and its alloys;	1	
59.	Heat treatment of Copper and its alloys;	1	
60.	Heat treatment of Nickel and its alloys, Energy Economy in heat treatment	1	
	TOTAL	**60**	**100**

LIST OF EXPERIMENTS

Sr. No.	Practical Content
1	PERFORMANCE OF HARDNESS TEST & HOT HARDNESS TEST ON VARIOUS FERROUS & NON FERROUS METALS
2	PERFORMANCE OF TOUGHNESS TEST
3	PERFORMANCE OF CREEP TEST
4	PERFORMANCE OF STRAIN HARDENING TEST
5	THERMAL ANALYSIS OF FERROUS MATERIALS
6	FABRICATION AND TENSILE TESTING OF MILD STEEL TO JUDGE THE MECHANICAL PROPERTIES
7	MATERIALS SELECTION FOR VARIOUS APPLICATIONS
8	DETERMINATION OF MECHANICAL PROPERTIES OF POLYMER
9	METALLOGRAPHY OF VARIOUS FERROUS & NON FERROUS MATERIALS
10	PERFORMANCE OF FRACTURE TEST & OBSERVATION UNDER SEM

STUDENT LEARNING OUTCOME

At the end of the course

The students will gain an experience in the selection of materials for various applications.

RECOMMANDED STUDY MATERIAL

1. Engineering Materials and Applications P. Flinn and P.K. Trojan MIR Publications
2. Engineering Materials: Polymers, Ceramics and Composites A.K Bhargava PHI
3. Manufacturing processes for Engineering Materials Serope Kalpakjian Wesley Publishing Co.
4. An introduction to Physical Metallurgy S.H. Avner McGraw Hill
5. Advances in Materials and Their Applications P. Rama Rao Wiley Eastern
6. Mechanical Metallurgy Dieter McGraw Hill
7. Principles of Heat Treatment of Steels R.C. Sharma New Age International (P)
8. Heat Treatment: Principle and Techniques T.V. Rajan, C.P. Sharma

Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

Second Semester Master of Engineering (Mechanical-Production Engineering)

In Effect from Academic Year 2017-18

Subject Code: MEPR205-N	**Subject Title: SEMINAR-2**

Teaching Scheme				**Total Credit**	**Evaluation Scheme**					
L	**T**	**P**	**Total**		**Theory**		**IE**	**CIA**	**Pract/ VIVO**	**Total**
Hrs	**Hrs**	**Hrs**	**Hrs**		**Hrs**	**Marks**	**Marks**	**Marks**	**Marks**	**Marks**
0	**0**	**2**	**2**	**1**	**-**	**-**	**-**	**30**	**100**	**130**

LEARNING OBJECTIVES:

The educational objectives of this course are

- To present a problem oriented in depth knowledge of Seminar
- To address the underlying concepts and methods behind Seminar

INSTRUCTIONAL METHOD AND PEDAGOGY (Continuous Internal Assessment (CIA) Scheme)

- Attendance is compulsory in laboratory, which may carries five marks in overall evaluation.
- Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overall internal evaluation.

Total Hours (Theory): 00

Total Hours (Lab): 30

Total Hours: 30

DETAILED SYLLABUS

Students will do literature review and prepare a project report on relevant topic and give the presentation.

STUDENTS LEARNING OUTCOME:

On successful completion of the course

- The student can identify different areas of Seminar
- Can find the applications of all the areas in day to day life.

Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

First/Second/Third Semester Master of Engineering (Mechanical-Production Engineering)

In Effect from Academic Year 2017-18

Subject Code: MEPR206-N-A	**Subject Title: DESIGN OF MACHINE TOOLS**

Teaching Scheme				**Total Credit**	**Evaluation Scheme**					
L	**T**	**P**	**Total**		**Theory**		**IE**	**CIA**	**Pract/ VIVO**	**Total**
Hrs	**Hrs**	**Hrs**	**Hrs**		**Hrs**	**Marks**	**Marks**	**Marks**	**Marks**	**Marks**
4	**0**	**2**	**6**	**5**	**3**	**70**	**30**	**20**	**30**	**150**

LEARNING OBJECTIVES:

The objective of this course is

- To learn various concepts related to designing of various machine tool parts
- To have practical purview of various elements of machine tool structure, spindle, power screw.

INSTRUCTIONAL METHOD AND PEDAGOGY (Continuous Internal Assessment (CIA) Scheme)

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed
- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all units while conducting teaching & examination.
- Attendance is compulsory in lectures and Tutorial.
- Viva Voce will be conducted at the end of the semester of 30 Marks.
- One internal exam of 30 marks is conducted as a part of Mid semester evaluation

OUTLINE OF THE COURSE

SR.NO	**CHAPTER NO**	**DATE/WEEK**
1	1,7	1^{st} 2^{nd} 3^{rd}
2	2	4^{th} 5^{th} 6^{th}
3	3	7^{th} 8^{th} 9^{th}
4	4,5	10^{th} 11^{th} 12^{th}
5	6	13^{th} 14^{th} 15^{th}

Total hours (Theory): 60

Total hours (Practical): 30

Total hours: 90

DETAILED SYLLABUS

SR NO	Topic
1	**Machine Tool Drive:** Working and auxiliary motion in machine, Machine tool drives, Hydraulic transmission, Mechanical transmission, General requirements of machine tool design, Layout of machine tools.
2	**Regulation of Speed and Feed Rates:** Aim of speed feed regulation, stepped regulation of speed, design of speed box, Design of feed box, Special cases of gear box design, regulation of speed and feed rates.
3	**Design of Machine Tool Structure:** Fundamentals of machine tool structures and their requirements, Design criteria of machine tool structure, Static and dynamic stiffness, Design of beds and columns, Design of housing models, Techniques in design of machine tool structure.
4	**Design of Guide-ways and power Screws:** Function and type of guide-ways, design of slide-ways, Protecting devices for slide-ways, Design of power screws. Design of antifriction recirculation ball type lead screw, linear motion.
5	**Design of Spindles and Spindle Supports:** Materials for spindles, Design of spindles, Antifriction bearings, Sliding bearings.
6	**Dynamics of Machines Tools:** General procedure of assessing dynamic stability of EES, Cutting processing, Closed loop system, Dynamic characteristics of cutting process, Stability analysis.
7	**Machine tool testing**

LESSON PLANNING

Lecture No	Topic	Hours	% Weightage
1	**Machine Tool Drives**	1	
2	Working and auxiliary motion in machine	1	
3	Machine tool drives	1	
4	Hydraulic transmission	1	
5	Mechanical transmission	1	
6	General requirements of machine tool design	1	
7	Layout of machine tools	1	
8	**Dynamics of Machines Tools**	1	25
9	General procedure of assessing dynamic stability of EES	1	
10	Cutting processing	1	
11	Closed loop system	1	
12	Dynamic characteristics of cutting process,	1	
13	Stability analysis	1	
14	**Machine tool testing**	1	
15	Various types of Machine tool testing application and use	1	
16	**Regulation of Speed and Feed Rates: Overview**	1	
17	Aim of speed feed regulation	1	
18	Stepped regulation of speed	1	
19	Design of speed box	1	
20	Design Problem practice based on speed box	1	
21	Design Problem practice based on speed box	1	
22	Design Problem practice based on speed box	1	
23	Design Problem practice based on speed box	1	25
24	Design of feed box	1	
25	Design Problem practice based on Feed box	1	
26	Design Problem practice based on Feed box	1	
27	Special cases of gear box design	1	
28	Design Problem practice based on Special cases of gear box design	1	
29	Design Problem practice based on Special cases of gear box design	1	
30	Regulation of speed and feed rates	1	
31	**Design of Machine Tool Structure:** overview	1	
32	Fundamentals of machine tool structures and their requirements	1	
33	Design criteria of machine tool structure	1	
34	Static and dynamic stiffness	1	
35	Design of beds and column	1	25
36	Design problem practice based on Bed and Column	1	
37	Design problem practice based on Bed and Column	1	
38	Design problem practice based on Bed and Column	1	
39	Design of housing models	1	

40	Design problem practice based on Housing Models	1	
41	Techniques in design of machine tool structure	1	
42	Design of Guide-ways and power Screws	1	
43	Design problem practice based on Guide way and power screw	1	
44	Function and type of guide-ways	1	
45	design of slide-ways	1	
46	Design problem practice based on Slide ways	1	
47	Design problem practice based on Slide ways	1	
48	Protecting devices for slide-ways	1	
49	Design of power screws	1	
50	Design problem practice based on Power screw	1	
51	Design problem practice based on power screw	1	
52	Design of antifriction recirculation ball type lead screw, linear motion	1	
53	Design problem practice based on antifriction recirculation ball type lead screw	1	25
54	**Design of Spindles and Spindle Supports:**	1	
55	Materials for spindles	1	
56	Design of spindles	1	
57	Design problem practice based on Spindles	1	
58	Design problem practice based on Spindles	1	
59	Antifriction bearings	1	
60	Sliding bearings	1	
	TOTAL	**60**	**100**

LIST OF EXPERIMENTS

1	DESIGN OF SPEED BOX OF LATHE
2	DESIGN OF FEED BOX OF LATHE
3	DESIGN OF MACHINE TOOL BED FOR MILLING,GRINDING
4	ASSESSMNET OF DYNAMIC STABILITY OF GRINDING
5	TOOL LAYOUT OF MACHINE TOOL VIZ.LATHE,MILLING,GRINDING,DRILLING
6	DESIGN OF HOUSING OF LATHE,MILLING,GRINDING
7	DESIGN OF GUIDE-WAYS OF LATHE,MILLING,GRINDING
8	DESIGN OF POWER SCREWS OF CNC MACHINE
9	DESIGN OF SPINDLES FOR MILLING MACHINE,LATHE
10	MACHINE TOOL TESTING OF VARIOUS MACHINE TOOLS

STUDENT LEARNING OUTCOME

At the end of the course

The students will gain an experience in the implementation of design procedure for various machine tool parts like spindle, power screw, bed etc.

RECOMMANDED STUDY MATERIAL

1. Machine Tool Design- N.K. Mehta Tata McGraw Hill
2. Design Principles of Metal Cutting Machine tool- F.Koenigsberger-Pergamon press
3. Machine Tool design Handbook CMTI Banglore
4. Sen and Bhattacharya, “Principles of Machine Tools”, New Central Book Agencies, 1975.
5. Boothroyd,G., “Fundamentals of Metal Machining and Machine Tools”, Mc Graw Hill,1985.
6. Acherkan, “Machine Tool Design”, Vol 2 & 3, MIR Pub, 1973.

Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

First/Second/Third Semester Master of Engineering (Mechanical-Production Engineering)

In Effect from Academic Year 2017-18

Subject Code: MEPR206-N-B	**Subject Title: EXPERIMENTAL TECHNIQUES AND DATA ANALYSIS**

Teaching Scheme				**Total Credit**	**Evaluation Scheme**					
L	**T**	**P**	**Total**		**Theory**		**IE**	**CIA**	**Pract/ VIVO**	**Total**
Hrs	**Hrs**	**Hrs**	**Hrs**		**Hrs**	**Marks**	**Marks**	**Marks**	**Marks**	**Marks**
4	**0**	**2**	**6**	**5**	**3**	**70**	**30**	**20**	**30**	**150**

LEARNING OBJECTIVES:

The objective of this course is

- To learn various concepts of experimental techniques and data analysis

INSTRUCTIONAL METHOD AND PEDAGOGY (Continuous Internal Assessment (CIA) Scheme)

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed
- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all units while conducting teaching & examination.
- Attendance is compulsory in lectures and Tutorial.
- Viva Voce will be conducted at the end of the semester of 30 Marks.
- One internal exam of 30 marks is conducted as a part of Mid semester evaluation.

OUTLINE OF THE COURSE

SR.NO	**CHAPTER NO**	**DATE/WEEK**
1	1	1^{st} 2^{nd} 3^{rd}
2	2	4^{th} 5^{th} 6^{th}
3	3	7^{th} 8^{th} 9^{th}
4	4	10^{th} 11^{th} 12^{th}
5	5	13^{th} 14^{th} 15^{th}

Total hours (Theory): 60
Total hours (Practical): 30
Total hours: 90
DETAILED SYLLABUS

Chap. No.	Topic
1	Measurement of Cutting Forces: Strain gauge and piezoelectric transducers and their characteristics. Dynamometer construction, Bridge circuits. Instrumentation and calibration. Displacement and strain measurements by photoelasticity. Holography, interferometer, Moir techniques, strain gauge rosettes
2	Temperature Measurement: Circuits and instrumentation for different transducers viz, bimetallic, expanding fluid, electrical resistance, thermister, thermocouples, pyrometers. Flow Measurement: Transducers for flow measurements of Non-compressible and compressible fluids. Obstruction and drag methods. Vortex shredding flow meters. Ultrasonic, Laser Dopler and Hotwire anemometer. Flow visualization techniques, Shadow graphs, Schlieren photography. Interferometer.
3	Metallurgical Studies: Optical and electron microscopy, X-Ray diffraction, Bragg's Law and its application for studying crystal structure and residual stresses. Electron spectroscopy, electron microprobe. Surface Measurements: Micro hardness, roughness, accuracy of dimensions and forms. 3-D co-ordinate measuring machines.
4	Experiment design & data analysis: Statistical methods, Randomized block design, Latin and orthogonal squares, factorial design. Replication and randomization. Data Analysis: Deterministic and random data, uncertainty analysis, tests for significance: Chi-square, student's't' test. Regression modeling, direct and interaction effects. ANOVA, F-test. Time Series analysis, Autocorrelation and autoregressive modeling
5	Taguchi Methods: Experiment design and planning with Orthogonal arrays and linear graphs. Additive cause effect model. Optimization of response level. Identification of Design and noise factors. Performance evaluation and Optimization by signal to noise ratios. Concept of loss function and its application

LESSON PLANNING

Lecture No	Topic	Hours	% Weightage
1.	Measurement of Cutting Forces:	1	
2.	Strain gauge and piezoelectric transducers and their characteristics.	1	
3.	Dynamometer construction	1	
4.	Bridge circuits.	1	
5.	Instrumentation and calibration.	1	
6.	Displacement and strain measurements by photoelasticity.	1	
7.	Holography	1	
8.	interferometer	1	25
9.	Moir techniques	1	
10.	strain gauge rosettes	1	
11.	Temperature Measurement:	1	
12.	Circuits and instrumentation for different transducers viz. bimetallic	1	
13.	expanding fluid	1	
14.	electrical resistance, thermister	1	
15.	Thermocouples, pyrometers.	1	
16.	Flow Measurement: Transducers for flow measurements of Non-compressible and compressible fluids.	1	
17.	Obstruction and drag methods.	1	
18.	Vortex shredding flow meters. Ultrasonic	1	
19.	Laser Dopler and Hotwire anemometer.	1	
20.	Flow visualization techniques, Shadow graphs	1	
21.	Schlieren photography.	1	
22.	Interferometer.	1	
23.	Metallurgical Studies: Optical and electron microscopy	1	25
24.	X-Ray diffraction,	1	
25.	Bragg's Law and its application for studying crystal structure and residual stresses.	1	
26.	Electron spectroscopy	1	
27.	Electron microprobe.	1	
28.	Surface Measurements: Micro hardness	1	
29.	roughness,	1	
30.	Accuracy of dimensions and forms.	1	
31.	3-D co-ordinate measuring machines.	1	
32.	Experiment design & data analysis	1	
33.	Experiment design & data analysis	1	
34.	Statistical methods	1	
35.	Randomized block design	1	25
36.	Latin and orthogonal squares	1	
37.	Factorial design.	1	
38.	Factorial design.	1	
39.	Replication and randomization.	1	

40.	Data Analysis: Deterministic and random data	1	
41.	Data Analysis: Deterministic and random data	1	
42.	uncertainty analysis, tests for significance: Chi-square	1	
43.	Student's't' test.	1	
44.	Student's 't' test.	1	
45.	Regression modeling	1	
46.	direct and interaction effects	1	25
47.	ANOVA, F-test. Time Series analysis,	1	
48.	Autocorrelation and autoregressive modeling	1	
49.	Autocorrelation and autoregressive modeling	1	
50.	Taguchi Methods: Experiment design and planning with Orthogonal arrays and linear graphs.	1	
51.	Taguchi Methods: Experiment design and planning with Orthogonal arrays and linear graphs	1	
52.	Taguchi Methods: Experiment design and planning with Orthogonal arrays and linear graphs	1	
53.	Additive cause effect model.	1	
54.	Optimization of response level.	1	
55.	Identification of Design and noise factors.	1	
56.	Identification of Design and noise factors.	1	
57.	Performance evaluation and Optimization by signal to noise ratios.	1	
58.	Performance evaluation and Optimization by signal to noise ratios.	1	
59.	Concept of loss function and its application	1	
60.	Concept of loss function and its application	1	
	TOTAL	**60**	**100**

LIST OF PRACTICALS

Sr. No.	Title of Practical
1	TO DETERMINE CHIP TOOL INTERFACE TEMPERATURE USING THERMOCOUPLE PRINCIPLE.
2	TO DETERMINE THE EFFECT OF CUTTING PARAMETERS ON THE CUTTING FORCE IN METAL CUTTING.
3	DETERMINATION OF FLOW USING OBSTRUCTION METHODS.
4	DETERMINATION OF CRYSTAL STRUCTURE BY X-RAY DIFFRACTION METHOD FOR A GIVEN MATERIAL.
5	UNCERTAINTY ANALYSIS & SIGNIFICANCE TEST USING CHI SQUARE FOR A GIVEN SET OF CONDITIONS.
6	REGRESSION MODELING FOR OPTIMIZING THE PARAMETERS IN EDM.
7	EXPERIMENTAL DESIGN BY TAGUCHI METHOD FOR THE PERFORMANCE PARAMETERS IN EDM.
8	PERFORMANCE EVALUATION AND OPTIMIZATION BY SIGNAL TO NOISE RATIOS FOR THE PERFORMANCE PARAMETERS IN EDM.
9	DISPLACEMENT AND STRAIN MEASUREMENTS BY PHOTOELASTICITY UNDER DIFFERENT LOADING CONDITION.
10	MEASUREMENT OF SURFACE ROUGHNESS OF THE COMPONENT WHICH HAS UNDERGONE VARIOUS MACHINING PROCESS.

STUDENTS LEARNING OUTCOMES:

At the end of the course

The students will gain an insight to various experimental and data analysis techniques be applied in the field of engineering

Reference Books:

1. Holman, J.P.: Experimental Methods for Engineers, McGraw Hill Int., New York.
2. Venkatesh, V.C., and Chandrasekharan, Experimental Methods in Metal Cutting, Prentice Hall of India, Delhi.
3. Davis, O.V. The Design and Analysis of Industrial Experiments, Longman, London.
4. Box and Jenkins; Time Series analysis, Forecasting and control, Holden Day, San Francisco.
5. Dove and Adams, Experimental stress analysis and motion measurement, Prentice Hall of India, Delhi.
6. Tapan P. Bagchi, Taguchi Methods Explained, Prentice Hall of India, Delhi.

Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

Second Semester Master of Engineering (Mechanical-Production Engineering)

In Effect from Academic Year 2017-18

Subject Code: MEPR206-N-C	**Subject Title: ROBOTICS & ARTIFICIAL INTELLIGENCE**

Teaching Scheme				**Total Credit**	**Evaluation Scheme**					
L	**T**	**P**	**Total**		**Theory**		**IE**	**CIA**	**Pract/ VIVO**	**Total**
Hrs	**Hrs**	**Hrs**	**Hrs**		**Hrs**	**Marks**	**Marks**	**Marks**	**Marks**	**Marks**
4	**0**	**2**	**6**	**5**	**3**	**70**	**30**	**20**	**30**	**150**

LEARNING OBJECTIVES:

The objective of this course is

- To learn various concepts related to manipulator kinematics, robotic cell design, robot programming.

LESSON PLANNING

SR.NO	CHAPTER NO	DATE/WEEK	%WEIGTAGE
1	1,2	1^{st} 2^{nd} 3^{rd}	20
2	3	4^{th} 5^{th} 6^{th}	20
3	4,5,6	7^{th} 8^{th} 9^{th}	20
4	7,8	10^{th} 11^{th} 12^{th}	20
5	9	13^{th} 14^{th} 15^{th}	20

Total hours (Theory): 60

Total hours (Practical): 30

Total hours: 90

DETAILED SYLLABUS

Chap. No.	Topic
1	**Introduction** Automation and Robotics, Robot anatomy, robot configuration, motions joint notation work volume, robot drive system, control system and dynamic performance, precision of movement.
2	**Control system and components** Basic concept and modals controllers control system analysis, robot activation and feedback components. Positions sensors, velocity sensors, actuators sensors, power transmission system.
3	**Motion analysis and control:** Manipulator kinematics, position representation forward transformation, homogeneous transformation, manipulator path control, robot dynamics, configuration of robot controller.
4	**End effectors:** Grippers-types, operation, mechanism, force analysis, tools as end effectors consideration in gripper selection and design.
5	**Sensor:** Desirable features, tactile, proximity and range sensors, uses sensors in robotics
6	**Machine vision:** Functions, Sensing and Digitizing-imaging, Devices, Lighting techniques, Analog to digital single conversion, Image storage, Image processing and Analysis-image data reduction, Segmentation feature extraction. Object recognition, training the vision system, Robotics application.
7	**Robot cell design and application**: Robot work cell design and control, Safety in Robotics, Robot cell layouts, Multiple Robots and machine interference, Robots cycle time analysis, Industrial application of robots.
8	**Robot programming:** Methods of Robot Programming, Characteristics of task level languages lead through programming methods, Motion interpolation, Artificial intelligence, Basics, Goals of artificial intelligence, AI techniques, Problem representation in AI, Problem reduction and solution techniques, Application of AI and ES in Robots.
9	**Artificial intelligence and expert systems** Concepts and definition of AI, AI Problems, The Underlying assumption, What is an AI technique?, AI characteristics, AI versus Natural Intelligence, Applications of AI, Etc. **Problems, Problem Spaces, and Search:** Defining the Problem as State Space Search, Production Systems, Problem Characteristics, Production Systems Characteristics, Issues in the Design of Search Programs, Advantages and Disadvantages of DFS & BFS Techniques. **Heuristic Search Techniques:** What is heuristic?, Heuristic Function, Importance of Heuristic Function, Examples, Search Techniques: Generate – and – Test, Hill Climbing, Best-First Search, Problem reduction, Constraint – Satisfaction, Means- Ends Analysis. . **Structured Representation Approaches:** Semantic Networks, Frames, Conceptual Dependency, Scripts, etc. **Expert system & neural network:** Fuggy Logic, Application of AI in manufacturing**,** Use of software in AI

LIST OF PRACTICALS

Sr. No.	Practical Content
1	KINEMATIC ANALYSIS OF VARIUS ROBOTIC CONFIGUTRATION
2	KINEMATIC ANALYSIS OF MANIPULATOR USING D-H MATRIX
3	DYNAMIC ANALYSIS OF MANIPULATOR
4	FORCE ANALYSIS OF END EFFECTOR FOR A GIVEN APPLICATION
5	MACHINE VISION ANALYSIS IN MANUFACTURING
6	PROGRAMMING OF A ROBOT FOR PICK & PLACE APPLICATION USING TEACH METHOD
7	VALIDATION OF CUTTING PARAMETER OPTIMIZATION OF SURFACE FINISH IN TURNING USING ANN
8	HEURISTIC SEARCH USING HILL CLIMBING FOR A GIVEN APPLICATION
9	USE OF FUZZY LOGIC IN PRACTICAL APPLICATION LIKE WASHING MACHINE
10	TO GET AQUIANTED WITH USE OF AI SOFTWARE FOR VARIOUS APPLICATIONS IN MANUFACTURING

INSTRUCTIONAL METHOD AND PEDAGOGY (Continuous Internal Assessment (CIA) Scheme)

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed
- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all units while conducting teaching & examination.
- Attendance is compulsory in lectures and Tutorial.
- Viva Voce will be conducted at the end of the semester of 30 Marks.
- One internal exam of 30 marks is conducted as a part of Mid semester evaluation.

STUDENTS LEARNING OUTCOMES:

At the end of the course

- The students will gain an idea related to robot anatomy, motion analysis and implementation related to hazardous applications.
- Gain an overview of AI

Reference Books:

1. Introduction to Robotics Analysis, Systems, Applications by Saeed B Niku PHI.
2. A Robot Engg text book by Moshen Shahinpoor, Harper and Row Publishers,NY.
3. Fundamentals of Robotics – Analysis and Control, Robert J Schilling, PHI.
4. Robotic technology, Principles and practice – Werner G Holz book – Van Nostrand Reinhold Co NY.
5. Robotic Engineering – An Integrated Approach by Richard D Klaffer, Thomas A Chmielewski, Michael Negin – PHI.
6. Robot Dynamics and Control – Mark W Spong, M Vidyasagar – Wiley India.
7. Intro to Robotics, Mechanics and Control by John J Craig, Pearson Education.
8. Modelling and Control of Vehicular and robotic systems by Sisil Kumararawadu – Narosa Publishing house.
9. Industrial Robots by Ganesh S Hegde – Laxmi Publications.
10. Fu K.S., Gonzalez R.C. and Lee C.S.G., "Robotics Control, Sensing, Vision and Intelligence", Mc Graw Hill, 1987.
11. Richard D, Klafter, Thomas, A, Chmielewski, Michael Negin, "Robotics Engineering – An Integrated Approach", Prentice-Hall of India Pvt. Ltd., 1984.
12. Deb S.R." Robotics Technology and Flexible Automation", Tata McGraw -Hill, 1994.
13. Groover Mikell, P., Mitchell Weis, Roger, N. Nagel, Nicholas G. Odrey," Industrial Robotics Technology, Programming and Applications", McGraw -Hill, Int. 1986.
14. Timothy Jordanides et al,"Expert Systems and Robotics ", Springer –Verlag, New York, May 1991.
15. Artificial Intelligence, Elaine Rich, Kevin Knight, Second Edition, Tata McGraw-Hill.
16. Decision Support Systems and Intelligent Systems, Efraim Turban and Jay E. Aronson, Sixth Edition 2002, Pearson Education Asia.
17. Principles of Artificial Intelligence by NILSON.

Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

Second Semester Master of Engineering (Mechanical-Production Engineering)

In Effect from Academic Year 2017-18

Subject Code: MEPR207-N-A	**Subject Title: MECHATRONICS**

Teaching Scheme				**Total Credit**	**Evaluation Scheme**					**Total Marks**
L	**T**	**P**	**Total**		**THEORY**		**IE**	**CIA**	**PR. / VIVO**	
					Hrs	**Marks**	**Marks**	**Marks**	**Marks**	
Hrs	**Hrs**	**Hrs**	**Hrs**							
3	**0**	**0**	**3**	**3**	**3**	**70**	**30**	**20**	**-**	**120**

LEARNING OBJECTIVES:

The objective of this course is

To learn various concepts related to controls, signals, hydraulic systems

INSTRUCTIONAL METHOD AND PEDAGOGY Continuous Internal Assessment (CIA) Scheme

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed
- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all units while conducting teaching & examination.
- Attendance is compulsory in lectures and Tutorial.
- One internal exam of 30 marks is conducted as a part of Mid semester evaluation.

OUTLINE OF THE COURSE

SR.NO	CHAPTER NO	DATE/WEEK
1	1,2	1^{st} 2^{nd} 3^{rd}
2	3,4	4^{th} 5^{th} 6^{th}
3	5,6	7^{th} 8^{th} 9^{th}
4	7	10^{th} 11^{th} 12^{th}
5	8	13^{th} 14^{th} 15^{th}

Total hours (Theory): 45

Total hours (Practical):00

Total hours: 45

DETAILED SYLLABUS

Chap. No.	Topic
1	**Mechatronics:** Integrated Design issues-Key element
2	Design process-Advanced approaches in Mechatronics
3	**Sensors & Transducers** Introduction to sensors and transducers, Sensors for motion and position measurement
4	Torque and tactile sensors, flow sensors, temperature sensing devices, ultrasonic sensors, range sensors
5	Force sensors, vibration control using magneto structure transducers, fiber optic devices in mechatronics
6	**DC and AC Drives:** stepper motor, servo motor, fluid power-design elements, piezoelectric actuators
7	**Introduction to signals:** systems and controls, system representation, Linearization of Non linear systems, time delays
8	**Measures of system performance**: Root locus and Bode plots. Sensors for condition monitoring, Mechatronic control in Automated manufacturing, Artificial Intelligence and Fuzzy Logic applications in Mechatronics, Micro Sensors and Case studies.

LESSON PLANNING

Lec No	Topic	Hours	% Weightage
1	**Mechatronics:**	1	
2	Integrated Design issues-Key element	1	
3	Integrated Design issues-Key element	1	
4	Integrated Design issues-Key element	1	
5	Integrated Design issues-Key element	1	
6	Design process Advanced approaches in Mechatronics	1	25
7	Design process Advanced approaches in Mechatronics	1	
8	Design process Advanced approaches in Mechatronics	1	
9	Design process Advanced approaches in Mechatronics	1	
10	Design process Advanced approaches in Mechatronics	1	
11	Introduction to sensors and transducers	1	
12	Introduction to sensors and transducers	1	
13	Introduction to sensors and transducers	1	
14	Introduction to sensors and transducers	1	
15	Sensors for motion	1	
16	Sensors for motion	1	
17	Sensors for position	1	25
18	Sensors for position	1	
19	Torque and tactile sensors	1	
20	Torque and tactile sensors	1	
21	Torque and tactile sensors	1	
22	flow sensors	1	
23	flow sensors	1	25
24	temperature sensing devices,	1	

25	ultrasonic sensors,	1	
26	range sensors	1	
27	Force sensors,	1	
28	vibration control using magneto structure transducers	1	
29	fiber optic devices in mechatronics	1	
30	stepper motor,	1	
31	servo motor,	1	
32	fluid power-design elements,	1	
33	piezoelectric actuators	1	
34	**Introduction to signals:**	1	25
35	systems and controls,	1	
36	system representation,	1	
37	Linearization of Non linear systems	1	
38	time delays	1	
39	Root locus and Bode plots.	1	
40	Root locus and Bode plots.	1	
41	Sensors for condition monitoring	1	
42	Mechatronic control in Automated manufacturing	1	
43	Artificial Intelligence and Fuzzy Logic applications in Mechatronics	1	
44	Artificial Intelligence and Fuzzy Logic applications in Mechatronics	1	
45	Micro Sensors and Case studies	1	
	TOTAL	**45**	**100**

STUDENTS LEARNING OUTCOMES:

At the end of the course
The students will gain an experience in the implementation of various sensors, signals for industrial automation.

References:

1. Devadas Shetty and Richard A. Kolk, “Mechatronics system design” - PWS publishing company.1997
2. " Mechatronics Theory and Applications" - Edited by BOSCH, 1998
3. W.Bolton, “Mechatronics”, Longmen, 1999
4. “Mechatronics ", Edited by HMT,Bangalore 1998.
5. D.A. Bradly, D. Dawson, N.C.Burd and A.J. Loader, “Mechatonics” - Electronics in Products and Processes, Chapmall and Hall, 1993.

Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

Second Semester Master of Engineering (Mechanical-Production Engineering)

In Effect from Academic Year 2017-18

Subject Code: MEPR207-N-B	**Subject Name: QUALITY ENGINEERING & MANAGEMENT**

Teaching Scheme				**Total Credit**	**Evaluation Scheme**					**Total Marks**
L	**T**	**P**	**Total**		**THEORY**		**IE**	**CIA**	**PR. / VIVO**	
					Hrs	**Marks**	**Marks**	**Marks**	**Marks**	
Hrs	**Hrs**	**Hrs**	**Hrs**							
3	**0**	**0**	**3**	**3**	**3**	**70**	**30**	**20**	**-**	**120**

LEARNING OBJECTIVES:

The objective of this course is

- To learn various concepts related to quality
- To have an overview of various quality techniques.

INSTRUCTIONAL METHOD AND PEDAGOGY (Continuous Internal Assessment (CIA) Scheme)

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all units while conducting teaching & examination.
- Attendance is compulsory in lectures and Tutorial.
- One internal exam of 30 marks is conducted as a part of Mid semester evaluation.

OUTLINE OF THE COURSE

SR.NO	CHAPTER NO	DATE/WEEK
1	1,8	1^{st} 2^{nd} 3^{rd}
2	2,3	4^{th} 5^{th} 6^{th}
3	4	7^{th} 8^{th} 9^{th}
4	5,6	10^{th} 11^{th} 12^{th}
5	7	13^{th} 14^{th} 15^{th}

Total hours (Theory): 45

Total hours (Practical):00

Total hours: 45

DETAILED SYLLABUS

Chap No.	Topic
1	**Basics of quality :** process capability analysis, quality gurus and their philosophies.TQM
2	Quality standards – ISO 9000 series and 14000 series – Design of experiments – Anova analysis
3	**Statistical process control:** Concepts, Various SPC tools, Fishbone diagram, measures of central tendency, measures of dispersion, skewness, kurtosis, line of regression, binomial, poisson and normal distribution, acceptance sampling, SPC limitations
4	**Reliability :** Failure rate analysis, Mean failure rate, Mean time to failure (MTTF), Mean time between failures (MTBF). Graphical representation of fd, Z and R. Generalization in graphic and integral form. Hazard model. System reliability, availability, maintenance – reliability centered maintenance (RCT), total preventive maintenance (TPM), and overall equipment effectiveness (OEE) model.
5	IS2500 plans – MIL STD 105E – Taguchi methods
6	Quality function deployment – FMEA, Poka Yoke– Quality circles - Total quality management –Kaizen.
7	**Quality of design:** Concurrent engineering, its benefits, design for manufacturing, concepts of JIT, value engineering, agile manufacturing & lean manufacturing. Quality Planning: SWAT Analysis, strategic planning, Organization culture.
8	**New Concepts:** Introduction to 6 Sigma, Business Process Re-Engineering, bench marking

LESSON PLANNING

Lecture No	Topic	Hours	% Weightage
1.	**Basics of quality**	1	25
2.	process capability analysis,	1	
3.	Quality gurus and their philosophies.	1	
4.	Quality gurus and their philosophies.	1	
5.	TQM	1	
6.	Quality standards –	1	
7.	ISO 9000 series and 14000 series –	1	
8.	Design of experiments –	1	
9.	Anova analysis	1	
10.	Statistical process control:	1	
11.	Concepts,	1	
12.	Various SPC tools,	1	25
13.	Fishbone diagram,	1	
14.	measures of central tendency,	1	
15.	measures of dispersion,	1	
16.	skewness,	1	
17.	kurtosis,	1	
18.	line of regression,	1	
19.	binomial,	1	
20.	poisson and normal distribution,	1	
21.	acceptance sampling,	1	
22.	SPC limitations	1	
23.	Reliability :	1	25
24.	Failure rate analysis,	1	
25.	Mean failure rate,	1	
26.	Mean time to failure (MTTF),	1	
27.	Mean time between failures (MTBF).	1	
28.	Graphical representation of fd, Z and R.	1	
29.	Generalization in graphic and integral form.	1	
30.	Hazard model.	1	
31.	System reliability,	1	
32.	availability, maintenance –	1	
33.	reliability centered maintenance (RCT),	1	
34.	total preventive maintenance (TPM),	1	25
35.	Overall equipment effectiveness (OEE) model.	1	
36.	IS2500 plans – MIL STD 105E –	1	
37.	Taguchi methods	1	
38.	Quality function deployment –	1	
39.	FMEA	1	

40.	Poka Yoke	1	
41.	Concurrent engineering, its benefits, design for manufacturing,	1	
42.	Concepts of JIT, value engineering, agile manufacturing & lean manufacturing.	1	
43.	Quality Planning: SWOT Analysis, strategic planning,	1	
44.	Organization culture.	1	
45.	Introduction to 6 Sigma, Business Process Re- Engineering, bench marking	1	
	TOTAL	**45**	**100**

STUDENTS LEARNING OUTCOMES:

At the end of the course

- The students will gain an experience in the implementation of quality concepts for continuous improvement.

Reference Books:

1. Juran J.M and Frank MGryna "Quality Planning and analysis", Tata Mc Graw Hill, 1990.
2. Genichi Taguchi, "Quality Engineering in Production System", Mc Graw Hill, 1989.
3. Gabriel A Pall, "Quality Process Management", Prentice Hall, 1987.
4. Total Quality Management: Poornima M. Charantimath, Pearson education (Singapore) Pvt. Ltd.
5. Managing for Total Quality: N. Logothetis, Prentice Hall of India Pvt. Ltd.
6. Competitive Manufacturing Management: John M. Nicholas, Mc Graw Hill
7. Managing Quality: Barrie G. Dole, Blackwell publishing
8. TQM – an integrated approach – Samunel K Ho, Crest pubslishing House.
9. Total Quality Management – Dr. S. Kumar, Laxmi Publication Pvt. Ltd.

Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

Second Semester Master of Engineering (Mechanical-Production Engineering)

In Effect from Academic Year 2017-18

Subject Code: MEPR207-N-C	**Subject Name: MACHINE TOOL DYNAMICS**

Teaching Scheme				**Total Credit**	**Evaluation Scheme**					**Total Marks**
L	**T**	**P**	**Total**		**THEORY**		**IE**	**CIA**	**PR. / VIVO**	
					Hrs	**Marks**	**Marks**	**Marks**	**Marks**	
Hrs	**Hrs**	**Hrs**	**Hrs**							
3	**0**	**0**	**3**	**3**	**3**	**70**	**30**	**20**	**-**	**120**

LEARNING OBJECTIVES:

The objective of this course is

- To learn various concepts related to dynamics of machine tool
- To have practical purview of various vibration damping techniques

INSTRUCTIONAL METHOD AND PEDAGOGY Continuous Internal Assessment (CIA) Scheme

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed
- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all units while conducting teaching & examination.
- Attendance is compulsory in lectures and Tutorial.
- Viva Voce will be conducted at the end of the semester of 30 Marks.
- One internal exam of 30 marks is conducted as a part of Mid semester evaluation.

OUTLINE OF THE COURSE

SR.NO	**CHAPTER NO**	**DATE/WEEK**
1	1,2	1^{st} 2^{nd} 3^{rd}
2	3,4	4^{th} 5^{th} 6^{th}
3	5,6	7^{th} 8^{th} 9^{th}
4	7	10^{th} 11^{th} 12^{th}
5	8	13^{th} 14^{th} 15^{th}

Total hours (Theory): 45

Total hours (Practical):00

Total hours: 45

DETAILED SYLLABUS

Chap. No.	Topic
1	**Vibration theory**: Review of systems with one and two degrees of freedom, damped, undamped free and forced vibrations, beat phenomenon
2	Transmissibility of vibration and vibration isolation. Vibration measurement.
3	Eigen value problem using lumped mass technique, application to simple structures with damping
4	**Chatter in Machine tools**: Basic pattern of chatter in metal cutting. Regenerative chatter, node coupling. Limit width of cut. Importance of negative real component of receptance. Dynamic cutting force co-efficient
5	Prediction of machine tools instability. Study of chatter behavior of lathe, drilling and milling machines. C.I.R.P., rig stick-slip phenomenon
6	**Stability of Machine tools**: Individual steps in the procedure-Directional factors cutting tests
7	Measurement of dynamic data by excitation tests. Evaluation of the test examples of the analysis of the stability of machine tools like Horizontal knee-type milling machine, vertical knee-type milling machine, center lathes
8	**Damping in Machine tools:** Material and system damping. Dampers – Dynamic, impact and active type. Methods of improving damping in machine tools. Examples of the use of dampers, practical design consideration. Dynamic measurement of forces and vibration – Oscillating tools. Vibration isolation system.

LESSON PLANNING

Lect No	Topic	Hours	% Weightage
1.	**Vibration theory**:	1	25
2.	Review of systems with one and two degrees of freedom,	1	
3.	damped,	1	
4.	undamped free vibrations	1	
5.	Forced vibrations, beat phenomenon.	1	
6.	Transmissibility of vibration and vibration isolation.	1	
7.	Vibration measurement.	1	
8.	Eigen value problem using lumped mass technique	1	
9.	Eigen value problem using lumped mass technique	1	
10.	Eigen value problem using lumped mass technique	1	
11.	application to simple structures	1	
12.	application to simple structures	1	25
13.	**Chatter in Machine tools**:	1	
14.	Basic pattern of chatter in metal cutting.	1	
15.	Regenerative chatter	1	
16.	node coupling	1	
17.	Limit width of cut.	1	
18.	Importance of negative real component of receptance.	1	
19.	Importance of negative real component of receptance.	1	
20.	Dynamic cutting	1	
21.	force co-efficient	1	
22.	Prediction of machine tools instability.	1	
23.	Prediction of machine tools instability.	1	25
24.	Study of chatter behavior of lathe	1	
25.	Study of chatter behavior of drilling	1	
26.	Study of chatter behavior of milling machines.	1	
27.	C.I.R.P.	1	
28.	C.I.R.P.	1	
29.	rig stick-slip phenomenon	1	
30.	rig stick-slip phenomenon	1	
31.	**Stability of Machine tools**:	1	
32.	Individual steps in the procedure	1	
33.	Individual steps in the procedure	1	
34.	Directional factors cutting tests	1	25
35.	Measurement of dynamic data by excitation tests.	1	

36.	Evaluation of the test examples of the analysis of the stability of machine tools like Horizontal knee-type milling machine	1	
37.	The analysis of the stability of machine tools like Horizontal knee-type milling machine,	1	
38.	The analysis of the stability of machine tools like vertical knee-type milling machine, center lathes	1	
39.	The analysis of the stability of machine tools like center lathes	1	
40.	**Damping in Machine tools**:	1	
41.	Material and system damping.	1	
42.	Dampers – Dynamic, impact and active type.	1	
43.	Methods of improving damping in machine tools. Examples of the use of dampers	1	
44.	Practical design consideration. Dynamic measurement of forces and vibration – Oscillating tools.	1	
45.	Vibration isolation system.	1	
	TOTAL	**45**	**100**

LIST OF TUTORIALS

Sr. No.	**TITLE OF THE TUTORIAL**
1	TO FIND THE NATURAL FREQUENCY OF SINGLE DEGREE OF THE GIVEN SYSTEM
2	TO FIND NATURAL FREQUENCY OF TWO DEGREE OF THE GIVEN SYSTEM
3	ANALYSIS OF STABILITY OF CENTRE LATHE
4	ANALYSIS OF STABILITY OF HORIZONTAL MILLING MACHINE
5	ANALYSIS OF STABILITY OF VERTICAL MILLING MACHINE
6	PREDICTION OF CHATTER BEHAVIOR IN LATHE
7	PREDICTION OF CHATTER BEHAVIOR IN MILLING MACHINE
8	MEASUREMENT OF FORCES AND VIBRATIONS IN LATHE
9	MEASUREMENT OF FORCES AND VIBRATIONS IN MILLING MACHINE
10	DIRECTIONAL FACTORS CUTTING TESTS IN LATHE, MILLING AND DRILLING MACHINE

STUDENTS LEARNING OUTCOMES:

At the end of the course the students will gain an experience vibration analysis of machine tools.

References:

1. F. Koenisberger and J. Tlusty, Machine Tool Structure, Porgamon press, 1970.
2. G. Sweeney, Vibration of Machine Tools, Machinery Publishing Co. 1971.
3. Walter C. Hurty and M.F. Bubinstein, Dynamics of Structures, Prentice Hall, 1967.
4. W.T.Thomson, Vibration Theory And Applications, Vibration Theory And Applications, 1965.
5. S.A. Tobias, Machine Tool Vibrations, Blackie publications, 1965.

Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

Second Semester Master of Engineering (Mechanical-Production Engineering)

In Effect from Academic Year 2017-18

Subject Code: MEPR207-N-D	**Subject Name: PLASTIC PROCESSING**

Teaching Scheme				**Total Credit**	**Evaluation Scheme**					**Total Marks**
L	**T**	**P**	**Total**		**THEORY**		**IE**	**CIA**	**PR. / VIVO**	
					Hrs	**Marks**	**Marks**	**Marks**	**Marks**	
Hrs	**Hrs**	**Hrs**	**Hrs**							
3	**0**	**0**	**3**	**3**	**3**	**70**	**30**	**20**	**-**	**120**

LEARNING OBJECTIVES:

The objective of this course is

- To learn various concepts related to plastic processing machining
- To have practical purview of design of mould for processing of plastics

INSTRUCTIONAL METHOD AND PEDAGOGY (Continuous Internal Assessment (CIA) Scheme)

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed
- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all units while conducting teaching & examination.
- Attendance is compulsory in lectures and Tutorial.
- One internal exam of 30 marks is conducted as a part of Mid semester evaluation.

OUTLINE OF THE COURSE

SR.NO	CHAPTER NO	DATE/WEEK	%WEIGTAGE
1	1,2	1^{st} 2^{nd} 3^{rd}	20
2	3,4	4^{th} 5^{th} 6^{th}	20
3	5	7^{th} 8^{th} 9^{th}	20
4	6	10^{th} 11^{th} 12^{th}	20
5	7,8	13^{th} 14^{th} 15^{th}	20

Total hours (Theory): 45

Total hours (Practical):00

Total hours: 45

DETAILED SYLLABUS

Chap No.	Topic
1	**Plastic materials:** Classification of plastic materials, their physical and mechanical properties, selection of plastics for various applications, advantages and limitations of using plastics Mechatronics-Intergrated Design issues-Key element.
2	**Melt processing techniques:** Polymer processing techniques such as extrusion, compression and transfer moulding
3	Injection moulding, blow moulding, thermoforming, rotational moulding, calendaring, Bag moulding reaction moulding. Classification of polymer processing operations. Simple model flows for analysing processing operations with examples.
4	**Constructional features of mold:** constructional features of core and cavity plates, mold size and strength, cavity material, and fabrication, mold placement, constructional features and layout of runners and gates.
5	**Product design of moulded products:** Various considerations such as wall thickness, fillets and radii, ribs, under, cuts, drafts, holes, threads, inserts parting lines, etc. surface treatment mould design for avoiding warpage. Standards for tolerances on moulded articles.
6	**Design of molds for plastic processing:** Methodical mold design, determination of economical number of cavities, melt rheology, temperature control of injection molds, calculation of mold opening force and ejection force. Detail design of cooling system, ejection system and gating system. Moulding thermoplastics, thermosets, expandable polysterene, foamed engineering plastics, molds for reaction injection molding.
7	**Computer applications in plastic molding:** Use of various softwares for mold flow analysis, optimum gate location and defect analysis.

8	**Design:** Design of component for balanced flow, optimization of process parameters of plastic molding.

LESSON PLANNING

Lect No	Topic	Hours	% weightage
1.	**Plastic materials:**	1	25
2.	Classification of plastic materials	1	
3.	physical and mechanical properties of plastics	1	
4.	selection of plastics for various applications	1	
5.	selection of plastics for various applications	1	
6.	Advantages and limitations of using plastics	1	
7.	Mechatronics-Intergrated Design issues	1	
8.	Key element	1	
9.	**Melt processing techniques:** Polymer processing techniques such as extrusion	1	
10.	compression and transfer moulding	1	
11.	compression and transfer moulding	1	
12.	Injection moulding,	1	25
13.	blow moulding	1	
14.	Thermoforming	1	
15.	rotational moulding	1	
16.	Calendaring	1	
17.	Bag moulding,	1	
18.	Reaction moulding.	1	
19.	Classification of polymer processing operations.	1	
20.	Classification of polymer processing operations.	1	
21.	Simple model flows for analysing processing operations with examples	1	
22.	**Constructional features of mold:**	1	
23.	constructional features of core and cavity plates,	1	
24.	mold size and strength,	1	
25.	cavity material, and fabrication,	1	
26.	mold placement	1	
27.	constructional features and layout of runners and gates	1	
28.	**Product design of moulded products:** Various considerations such as wall thickness, fillets and radii, ribs, under, cuts, drafts, holes, threads,	1	

	inserts parting lines, etc. surface treatment mould design for avoiding warpage.		25
29.	Standards for tolerances on moulded articles	1	
30.	**Design of molds for plastic processing:** Methodical mold design,	1	
31.	determination of economical number of cavities, melt rheology,	1	
32.	temperature control of injection molds,	1	
33.	Calculation of mold opening force and ejection force.	1	
34.	Detail design of cooling system,	1	
35.	Ejection system and gating system.	1	
36.	Moulding thermoplastics,	1	
37.	thermosets, expandable polysterene,	1	
38.	foamed engineering plastics,	1	
39.	molds for reaction injection molding	1	
40.	**Computer applications in plastic molding**	1	
41.	Use of various softwares for mold flow analysis, optimum gate location and defect analysis	1	25
42.	Design	1	
43.	Design of component for balanced flow,	1	
44.	Design of component for balanced flow,	1	
45.	optimization of process parameters of plastic molding	1	
	TOTAL	**45**	**100**

STUDENTS LEARNING OUTCOMES:

At the end of the course

The students will gain an experience plastic processing techniques.

References

1. A.W. Birley, B. Howarth, Hana, “Mechanics of plastics processing properties”,
2. J.E. Mark, R. West, “Inorganic Polymers”, H.P. Alocock, Prentice Hall, 1992
3. Fried, “Poly. Science and Technology”, Prentice Hall
4. Frados, “Plastic Engg. Hand Book”
5. Pattan, “Plastic Technology”
6. Glanill, “Plastic Engg. Data Book”
7. Charles Harper, “Handbook of Plastics Technologies”, McGraw-Hill.

Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

Second Semester Master of Engineering (Mechanical-Production Engineering)

In Effect from Academic Year 2017-18

Subject Code: MEPR207-N-E	**Subject Name: SURFACE TREATMENT PROCESSES**

Teaching Scheme				**Total Credit**	**Evaluation Scheme**					**Total Marks**
L	**T**	**P**	**Total**		**THEORY**		**IE**	**CIA**	**PR. / VIVO**	
					Hrs	**Marks**	**Marks**	**Marks**	**Marks**	
Hrs	**Hrs**	**Hrs**	**Hrs**							
3	**0**	**0**	**3**	**3**	**3**	**70**	**30**	**20**	**-**	**120**

LEARNING OBJECTIVES:

The objective of this course is

- To learn various concepts related to application of various surface treatment processes for protection against corrosion, wear

INSTRUCTIONAL METHOD AND PEDAGOGY [Continuous Internal Assessment (CIA) Scheme]

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed
- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all units while conducting teaching & examination.
- Attendance is compulsory in lectures and tutorial.
- One internal exam of 30 marks is conducted as a part of mid semester evaluation.

OUTLINE OF THE COURSE

SR.NO	CHAPTER NO	DATE/WEEK
1	1,8	1^{st} 2^{nd} 3^{rd}
2	2,3	4^{th} 5^{th} 6^{th}
3	4	7^{th} 8^{th} 9^{th}
4	5,6	10^{th} 11^{th} 12^{th}
5	7	13^{th} 14^{th} 15^{th}

Total hours (Theory): 45

Total hours (Practical):00

Total hours: 45

DETAILED SYLLABUS

Chap. No.	Topic
1	**Introduction of Surface dependent properties:** Classification and scope of surface engineering in metals, ceramics, polymers and composites, tailoring of surfaces of advanced materials. Surface protection (Physical)
2	Surface dependent engineering properties, viz., wear, friction, corrosion, fatigue, reflectivity, emissivity, etc.; common surface initiated engineering failures; mechanism of surface degradation; importance and necessity of surface engineering
3	**Various Surface Cleaning Processes:** Classification and Selection of Cleaning processes. Acid and Alkaline, Salt bath, Ultrasonic, Mechanical cleaning, Pickling and descaling, etc. Process details of each, applications of each, Environmental concern of each
4	**Surface modification techniques:** classification, principles, methods, and technology used, conventional surface engineering methods: Diffusion coatings like carburizing, nitriding, cyaniding, hot dipping, galvanizing, anodizing ,Aluminizing, Phosphetising etc.
5	Diamond and Diamond like Carbon thin films and coatings for engineering surfaces .Electrochemistry and electro-deposition; electro less deposition Scope and application of conventionally deposited materials; advantages and limitations of above mentioned processes.
6	**Other Surface engineering processes:** Influence of manufacturing processes on various surface properties of an engineering component; scope of surface engineering in augmentation of surface properties. Other processes used in surface engineering – Thermal spray coatings, Physical vapor deposition, Chemical vapour deposition
7	Process, applications. Mass production; surface engineering problems related to substrate characteristics. Plasma enhanced Surface engineering, Ion Implantation.
8	**Evaluation of engineered properties:** control properties, response properties; surface geometry – characterization techniques (conventional and recent trends); coating thickness measurements – laboratory techniques and special techniques for accurate routine thickness measurements; adhesion measurement – conventional methods and recent developments; **Recent trends in surface engineering:** Measurement of mechanical properties of engineered surface in nano scale; Evaluation of tribological characteristics of engineered surface in macro, micro and nano scale, simulation of actual application environment in tribometer. Use of Laser in Surface Engineering

LESSON PLANNING

Lect No	Topic	Hours	% Weightage
1.	Introduction of Surface dependent properties:	1	25
2.	Classification and scope of surface engineering in metals	1	
3.	ceramics, polymers and composites, tailoring of surfaces of Advanced materials.	1	
4.	Surface protection (Physical)	1	
5.	Surface dependent engineering properties, viz., wear, friction, corrosion, fatigue	1	
6.	reflectivity, emissivity, etc.	1	
7.	common surface initiated engineering failures	1	
8.	mechanism of surface degradation	1	
9.	importance and necessity of surface engineering	1	
10.	Classification and Selection of Cleaning processes.	1	
11.	Acid and Alkaline, Salt bath, Ultrasonic	1	
12.	Mechanical cleaning, Pickling and descaling, etc.	1	25
13.	Process details of each, applications of each, Environmental concern of each	1	
14.	Classification	1	
15.	principles, methods	1	
16.	technology used	1	
17.	conventional surface engineering methods:	1	
18.	Diffusion coatings like carburizing	1	
19.	nitriding, cyaniding	1	
20.	hot dipping	1	
21.	Galvanizing	1	
22.	anodizing	1	
23.	Aluminizing, Phosphetising etc.	1	25
24.	Diamond and Diamond like Carbon thin films and coatings for engineering surfaces .Electrochemistry and electro-deposition	1	
25.	electro less deposition Scope and application of conventionally deposited materials; advantages and limitations of above	1	

	mentioned processes.		
26.	Influence of manufacturing processes on various surface properties of an engineering component	1	
27.	scope of surface engineering in augmentation of surface properties.	1	
28.	Other processes used in surface engineering – Thermal spray coatings,	1	
29.	Physical vapor deposition	1	
30.	Chemical vapour deposition	1	
31.	Evaluation of engineered properties:	1	
32.	control properties, response properties	1	
33.	Surface geometry – characterization and techniques (conventional and recent trends)	1	
34.	coating thickness measurements – laboratory techniques and special techniques for accurate routine thickness measurements;	1	25
35.	adhesion measurement –conventional methods and recent Developments	1	
36.	Recent trends in surface engineering:	1	
37.	Measurement of mechanical properties of engineered surface in nano scale	1	
38.	Evaluation of tribological characteristics of engineered surface in macro scale	1	
39.	Evaluation of tribological characteristics of engineered surface in macro scale	1	
40.	Evaluation of tribological characteristics of engineered surface in macro scale	1	
41.	micro and nano scale,	1	
42.	Simulation of actual application environment in tribometer.	1	
43.	Use of Laser in Surface Engineering	1	
44.	Use of Laser in Surface Engineering	1	
45.	Case studies	1	
	TOTAL	**45**	**100**

STUDENTS LEARNING OUTCOMES:

At the end of the course The students will gain an experience in surface treatment processes

References:

1. ASM Hand Book, Vol. 5, “Surface Engineering”.
2. Tool & Manufacturing Engineers Hand book, Vol.3, ‘ Materials Finishing and Coating’

ME MECHANICAL-PRODUCTION ENGINEERING

SEMESTER-III

Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

Third Semester Master of Engineering (Mechanical-Production Engineering)

In Effect from Academic Year 2017-18

Subject Code: MEPR301-N	**Subject Title: TOOL & DIE DESIGN**

Teaching Scheme				**Total Credit**	**Evaluation Scheme**					
L	**T**	**P**	**Total**		**Theory**		**IE**	**CIA**	**Pract/ VIVO**	**Total**
Hrs	**Hrs**	**Hrs**	**Hrs**		**Hrs**	**Marks**	**Marks**	**Marks**	**Marks**	**Marks**
4	**0**	**2**	**6**	**5**	**3**	**70**	**30**	**20**	**30**	**150**

LEARNING OBJECTIVES:

The educational objectives of this course are

- To understand the importance of Tool Design in various manufacturing industry.
- To have practical purview of various dies design techniques

INSTRUCTIONAL METHOD AND PEDAGOGY (Continuous Internal Assessment (CIA) Scheme)

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed
- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and Practical which may carries 05 Marks.
- Classroom participation and involvement in solving the problems in Lab may carry 05 Marks.
- Viva Voce will be conducted at the end of the semester of 30 Marks.
- One internal exam of 30 Marks is conducted as a part of mid semester evaluation.
- Experiments shall be performed in the laboratory related to course contents.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concept being taught in lectures.

OUTLINE OF THE COURSE:

SR. NO.	CHAPTER NO	DATE/WEEK
1	1,2	1^{st} ,2^{nd} ,3^{rd}
2	3	4^{th} ,5^{th} ,6^{th}
3	4	7^{th} ,8^{th} ,9^{th}
4	5	19^{th} b ,11^{th} ,12^{th}
5	6,7	13^{th} ,14^{th} ,15^{th}

Total Hours (Theory): 60

Total Hours (Lab): 30

Total Hours: 90

DETAILED SYLLABUS

SR NO	Topic
1	**Cutting Tool Design:** Fundamentals of Cutting tools design, cutting tools and their principal elements, Tool geometry, system of nomenclatures and their interrelations, setting for the grinding of various basic cutting tool (turning, drilling, milling)
2	**Analyses and Design of Jigs and Fixture:** Principles of jig and fixture design, Dual cylinder location, diamond pin analysis, V-block analysis, design principles of centralisers, various mechanisms and design of equalizers, analysis for optimum number of clamping forces required and calculation of their magnitudes, concept of modular fixtures, design of fixtures for NC/CNC machines, computer applications in fixture design and analysis.
3	**Design of press tools:** Components of die design, design of die blocks, punches and strippers, methods of holding punches, sketches of stock stops, Design procedure for progressive dies, compound dies and combination dies for press tool operation forging die design for drop and machine forging parts. Computer applications in press tool design.
4	**Design of forging dies:** Grain flow considerations, parting line selection, draft, design problems involving ribs, bosses and fillets. Flash and flash control, determination of number of impressions required and their sequence, design steps and analysis of forging dies, detail calculations, shrinkage, cavity shapes, heat transfer considerations, cooling and ejection systems, automation in forging operations, computer aided design and analysis.
5	**Design of injection molds:** Principles of melt processing, product considerations, determination of economical number of

	cavities, temperature control of injection molds, calculation of mold opening force and ejection force. Detail design of cooling system, ejection system and gating system. Moldability features, mold flow analysis.
6	**Die casting die design:** Metals for die casting, specific details of die construction, casting ejectors, side cores, loose die pieces, slides, types of cores, directional solidification, types of feeders, die venting, water cooling, design aspects of die casting dies, defects.
7	**Tooling for Automats**: Cam design for automats, gauge design – gauge allowances and tolerance – materials for gauges. Economics of Tooling: Selection of economical method – amortization of tooling costs.

LESSON PLANNING

Lecture No	Topic	Hours	% Weightage
1	Fundamentals of Cutting tools design	1	**25**
2	cutting tools and their principal elements	1	
3	Tool geometry	1	
4	system of nomenclatures and their interrelations	1	
5	setting for the grinding of various basic cutting tool (turning drilling, milling)	1	
6	Principles of jig and fixture design	1	
7	Dual cylinder location, diamond pin analysis	1	
8	V-block analysis	1	
9	design principles of centralisers	1	
10	various mechanisms and design of equalizers	1	
11	analysis for optimum number of clamping forces required and calculation of their magnitudes, concept of modular fixtures	1	
12	design of fixtures for NC/CNC machines	1	
13	Computer applications in fixture design and analysis.	1	
14	Components of die design	1	
15	design of die blocks, punches and strippers	1	
16	methods of holding punches, sketches of stock stops	1	
17	Design procedure for progressive dies	1	**25**
18	Compound dies and combination dies for press tool operation forging die design for drop and machine forging parts.	1	
19	Computer applications in press tool design.	1	
20	Components of die design	1	
21	Grain flow considerations	1	
22	parting line selection	1	
23	design problems involving ribs	1	
24	Flash and flash control	1	

25	determination of number of impressions required and their sequence	1	
26	design steps and analysis of forging dies	1	
27	Shrinkage	1	
28	heat transfer considerations	1	
29	automation in forging operations	1	
30	Principles of melt processing	1	
31	product considerations	1	
32	determination of economical number of cavities	1	
33	temperature control of injection molds	1	
34	Calculation of mold opening force and ejection force.	1	
35	Detail design of cooling system	1	**25**
36	Ejection system and gating system.	1	
37	Moldability features	1	
38	Mold flow analysis	1	
39	Metals for die casting	1	
40	specific details of die construction	1	
41	casting ejectors, side core	1	
42	loose die pieces, slides	1	
43	types of cores	1	
44	directional solidification	1	
45	types of feeders	1	
46	die venting	1	
47	water cooling	1	
48	design aspects of die casting dies	1	
49	Defects.	1	
50	gauge design	1	
51	gauge design	1	
52	gauge allowances	1	
53	Tolerance	1	**25**
54	Materials for gauges.	1	
55	Economics of Tooling	1	
56	Economics of Tooling	1	
57	Selection of economical method	1	
58	Selection of economical method	1	
59	amortization of tooling costs	1	
60	amortization of tooling costs	1	
	TOTAL	**60**	**100**

LIST OF EXPERIMENTS

Sr. No.	Practical Content
1	BENDING SPRING BACK CALCULATION IN BENDING PROCESS OF VARIOUS MATERIALS
2	PREDICTION OF FORMABILITY LIMITS FOR DUCTILE MATERIALS
3	PROCESS ANALYSIS OF AXYSYMMETRIC DEEP DRAWN PARTS
4	PRODUCT DESIGN FOR SHEET METAL FORMING
5	NUMERICAL ANALYSIS OF FORMING PROCESSES
6	PROCESS MODELING OF SHEET METAL PROCESS USING CAD
7	TESTING OF SHEET METAL FOR VARIOUS DEFECTS
8	ANALYSIS OF WELD CONTOURS IN SUPER PLASTIC FORMING PROCESS
9	EVALUATE THE EFFECT OF DEEP DRAWING PARAMETERS ON ITS EFFICIENCY
10	CASE STUDY ON LASER CUTTING; TWB FORMING

STUDENT LEARNING OUTCOME

At the end of the course

- The students will gain an experience in tool design meant for various applications to be applied in the field of production.

RECOMMANDED STUDY MATERIAL

9. Cole: “Tool Design”
10. Donaldson: “Tool Design”, Tata McGraw Hill.
11. ASTM: “Fundamentals of Tool design

Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

Third Semester Master of Engineering (Mechanical-Production Engineering)

In Effect from Academic Year 2017-18

Subject Code: MEPR302-N	**Subject Title: DISSERTATION PHASE-I**

Teaching Scheme				**Total Credit**	**Evaluation Scheme**					**Total Marks**
L	**T**	**P**	**Total**		**THEORY**		**IE**	**CIA**	**Pract/ VIVO**	
					Hrs	**Marks**	**Marks**	**Marks**	**Marks**	
Hrs	**Hrs**	**Hrs**	**Hrs**							
-	**-**	**-**	**-**	**15**	**-**	**-**	**-**	**50**	**150**	**200**

LEARNING OBJECTIVES: The objective of this course is

To select a topic based on industrial problem and/or requirement as per the current scenario and work accordingly

Total hours (Theory): 180

Total hours (Practical):90

Total hours: 270

STUDENTS LEARNING OUTCOMES:

At the end of the course

The students will gain an experience in reviewing various research papers, understanding various newer concepts of problem solving and finalizing the topic related to the course for the work.

ME MECHANICAL-PRODUCTION ENGINEERING DEPARTMENT ELECTIVE-V

Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

Third Semester Master of Engineering (Mechanical-Production Engineering)

In Effect from Academic Year 2017-18

Subject Code: MEPR303-N-A	**Subject Title: OPTIMIZATION TECHNIQUES**

Teaching Scheme				**Total Credit**	**Evaluation Scheme**					
L	**T**	**P**	**Total**		**Theory**		**IE**	**CIA**	**Pract/ VIVO**	**Total**
Hrs	**Hrs**	**Hrs**	**Hrs**		**Hrs**	**Marks**	**Marks**	**Marks**	**Marks**	**Marks**
4	**0**	**2**	**6**	**5**	**3**	**70**	**30**	**20**	**30**	**150**

LEARNING OBJECTIVES:

The objective of this course is

To learn various techniques of optimization and applying it to real life problems.

INSTRUCTIONAL METHOD AND PEDAGOGY (Continuous Internal Assessment (CIA) Scheme)

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed
- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all units while conducting teaching & examination.
- Attendance is compulsory in lectures and Tutorial.
- Viva Voce will be conducted at the end of the semester of 30 Marks.
- One internal exam of 30 marks is conducted as a part of Mid semester evaluation.

OUTLINE OF THE COURSE

SR.NO	CHAPTER NO	DATE/WEEK
1	1	1^{st} 2^{nd} 3^{rd}
2	2	4^{th} 5^{th} 6^{th}
3	3	7^{th} 8^{th} 9^{th}
4	4	10^{th} 11^{th} 12^{th}
5	5	13^{th} 14^{th} 15^{th}

Total hours (Theory): 60

Total hours (Practical):30

Total hours: 90

DETAILED SYLLABUS

Chap. No.	Topic
1	**Statement of Optimization Problem:** Linear Programming: Simplex Method Revised Simplex Method, Sensitivity Analysis, Parametric Programming, and Transportation Problem.
2	**Nonlinear Programming**: Approach, Convergence and Scaling of Design variables; Unconstrained Optimization Direct Search Methods: Random Search, Univariate. Simplex Method; Indirect Search Methods: Steepest Descent, Conjugate Gradient, Newton, Quasi Newton, DFP Methods
3	Nonlinear Programming Constrained Optimization Direct Methods: Lagrange Multipliers, Kuhn-Tucker conditions, Beal's method, Indirect Method: Penalty Function and Applications
4	**Introduction to Dynamic Programming**: Concept of Sub optimization and the principle of optimality; Linear and Continuous Dynamic Programming with Applications; Introduction to Integer Programming; Cutting Plane Method; Branch and Bound method; Introduction to Genetic Algorithms, particle swarm optimization
5	**Sequencing and Scheduling**: Project Scheduling by PERT-CPM; Probability and cost consideration in Project scheduling; Queuing Theory, Single and multi server models; Queues with combined arrivals and departures; Queues with priorities for service.

LESSON PLANNING

Lect No	Topic	Hours	% Weightage
1.	Linear Programming:	1	
2.	Simplex Method	1	
3.	Simplex Method	1	
4.	Revised Simplex Method	1	
5.	Revised Simplex Method	1	
6.	Sensitivity Analysis	1	
7.	Sensitivity Analysis	1	
8.	Sensitivity Analysis	1	**25**
9.	Parametric Programming	1	
10.	Parametric Programming	1	
11.	Parametric Programming	1	
12.	Parametric Programming	1	
13.	Transportation Problem.	1	
14.	Transportation Problem.	1	
15.	Transportation Problem.	1	
16.	**Nonlinear Programming**:	1	
17.	Approach	1	
18.	Convergence and Scaling of Design variables	1	
19.	Unconstrained Optimization Direct Search Methods	1	
20.	Random Search	1	
21.	Univariate. Simplex Method	1	
22.	Indirect Search Methods: Steepest Descent	1	
23.	Steepest Descent	1	**25**
24.	Steepest Descent	1	
25.	Conjugate Gradient	1	
26.	Conjugate Gradient	1	
27.	Newton ,Quasi Newton	1	
28.	Newton ,Quasi Newton	1	
29.	DFP Methods	1	
30.	DFP Methods	1	
31.	Nonlinear Programming Constrained Optimization Direct Methods:	1	
32.	Lagrange Multipliers	1	**25**
33.	Lagrange Multipliers	1	

34.	Kuhn-Tucker conditions	1	
35.	Kuhn-Tucker conditions	1	
36.	Beal's method	1	
37.	Indirect Method:	1	
38.	Penalty Function and Applications	1	
39.	Penalty Function and Applications	1	
40.	Concept of Sub optimization and the principle of optimality	1	
41.	Concept of Sub optimization and the principle of optimality	1	
42.	Linear and Continuous Dynamic Programming with Applications	1	
43.	Linear and Continuous Dynamic Programming with Applications	1	
44.	Introduction to Integer Programming	1	
45.	Introduction to Integer Programming	1	
46.	Cutting Plane Method	1	
47.	Cutting Plane Method	1	
48.	Branch and Bound method	1	
49.	Branch and Bound method	1	
50.	Introduction to Genetic Algorithms	1	
51.	Introduction to Genetic Algorithms	1	
52.	particle swarm optimization	1	**25**
53.	particle swarm optimization	1	
54.	Project Scheduling by PERT-CPM	1	
55.	Probability and cost consideration in Project scheduling	1	
56.	Queuing Theory	1	
57.	Single and multi server models	1	
58.	Queues with combined arrivals and departures	1	
59.	Queues with priorities for service	1	
60.	Project Scheduling by PERT-CPM	1	
	TOTAL	**60**	**100**

LIST OF PRACTICALS

Sr. No.	Title of Practical
1	PROBLEM SOLVING BY LPP IN MATLAB
2	PROBLEM SOLVING BY SIMPLEX METHOD IN MATLAB
3	PROBLEM SOLVING ON TRANSPORTATION
4	PROBLEM SOLVING BY STEEPEST DESCENT METHODS IN MATLAB
5	PROBLEM SOLVING BY CONJUGATE GRADIENT IN MATLAB
6	PROBLEM SOLVING BY NEWTON IN MATLAB
7	PROBLEM SOLVING BY QUASI NEWTON IN MATLAB
8	PROBLEM SOLVING BY DFP METHODS IN MATLAB
9	PROBLEM SOLVING OF NONLINEAR PROGRAMMING CONSTRAINED SITUATION OPTIMIZATION BY LAGRANGE MULTIPLIERS
10	PROBLEM SOLVING OF NONLINEAR PROGRAMMING CONSTRAINED SITUATION OPTIMIZATION BY KUHN-TUCKER CONDITIONS
11	PROBLEM SOLVING OF NONLINEAR PROGRAMMING CONSTRAINED SITUATION OPTIMIZATION BY BEAL'S METHOD
12	PROBLEM SOLVING OF NONLINEAR PROGRAMMING CONSTRAINED SITUATION OPTIMIZATION BY PENALTY FUNCTION AND APPLICATIONS
13	PROBLEM SOLVING BY DYNAMIC PROGRAMMING
14	PROBLEM SOLVING BY GENETIC ALGORITHMS
15	PROBLEM SOLVING BY PARTICLE SWARM OPTIMIZATION TECHNIQUE
16	INTRODUCTION TO INTEGER PROGRAMMING; CUTTING PLANE METHOD; BRANCH AND BOUND METHOD

STUDENTS LEARNING OUTCOMES:

At the end of the course the students will gain an experience in the implementation of optimization techniques for minimization of cost or maximization of production.

Reference Book:

1. Rao S.S. Engineering Optimization Theory and Practice, New Age Int. Pub., 3rd Ed., 1996.

2. Haug, E.J. and Arora, J.S., Applied optimal design Wiley Inter Science Publication, NY, 1979.

3. Douglas J. Willde, Globally optimal design John Wiley & Sons, New York, 1978

4. Johnson Ray C., Optimum design of mechanical elements, John Wiley & Sons, 1981.

5. S.D. Sharma, "Operations Research", Khanna Publications, 2001.

6. David Goldberg, Genetic Algorithms, Pearson Publications, 2006.

7. Prem Kumar Gupta, "Operations Research", S Chand Publications, 2008

8. Maurice cleric, Particle Swarm optimization, ISTE Publications, 2006.

Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

Third Semester Master of Engineering (Mechanical-Production Engineering)

In Effect from Academic Year 2017-18

Subject Code: MEPR303-N-B	**Subject Title: RAPID PROTOTYPING AND TOOLING SYSTEM**

Teaching Scheme				**Total Credit**	**Evaluation Scheme**					
L	**T**	**P**	**Total**		**Theory**		**IE**	**CIA**	**Pract/ VIVO**	**Total**
Hrs	**Hrs**	**Hrs**	**Hrs**		**Hrs**	**Marks**	**Marks**	**Marks**	**Marks**	**Marks**
4	**0**	**2**	**6**	**5**	**3**	**70**	**30**	**20**	**30**	**150**

LEARNING OBJECTIVES:

The objective of this course is

To learn various concepts related to rapid prototyping.

INSTRUCTIONAL METHOD AND PEDAGOGY (Continuous Internal Assessment (CIA) Scheme)

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed
- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all units while conducting teaching & examination.
- Attendance is compulsory in lectures and Tutorial.
- Viva Voce will be conducted at the end of the semester of 30 Marks.
- One internal exam of 30 marks is conducted as a part of Mid semester evaluation.

OUTLINE OF THE COURSE

SR.NO	CHAPTER NO	DATE/WEEK
1	1,2,3	1^{st} 2^{nd} 3^{rd}
2	4	4^{th} 5^{th} 6^{th}
3	5,6	7^{th} 8^{th} 9^{th}
4	7	10^{th} 11^{th} 12^{th}
5	8	13^{th} 14^{th} 15^{th}

Total hours (Theory): 60

Total hours (Practical):30

Total hours: 90

DETAILED SYLLABUS

Chap. No.	Topic
1	**Product Development Cycle**
2	**Influence of Innovations on Product Development:** Impact on economy, export competitiveness, design as a strategy to win international market and Innovation process
3	**Rapid Product Development:** An Overview virtual prototyping and testing technology, Physical Prototyping and Rapid Manufacturing technologies and Synergic Integration Technologies
4	**Virtual Prototyping and Testing:** Geometric modeling: Types of Geometric models and Solid Models Reverse engineering: Acquiring Point Data, Constructing 3D model and Applications. Virtual augmented reality: Requirement of devices and technologies and applications Computer Aided Engineering: Application of FEA in Engineering, the concept of descretization, steps in FEA and automatic mesh generation. Design for X: Design for manufacture and design for assembly and other Facets of DFX
5	**Physical Prototyping and Rapid Manufacturing Computer Numerical Control:** Comparison between NC and conventional machines, features of CNC Machine Tool and programming
6	**Computer Aided Process Planning:** Methodology, evaluation, types, CAD/CAM Integration and CAPP Features **Rapid Prototyping:** dawn of slice age, benefits, applications, important issues and popular RP process **Rapid Tooling:** Indirect rapid tooling process
7	**Synergic Integration** **Concurrent Engineering:** Benefits, methodology, integration and transactions **Product Data Management:** Product data classifications, Process Management and benefits **Computer Integrated Manufacturing:** Components, barriers to CIM. Implementation, case study, development and research
8	**Rapid Prototyping and Rapid Tooling:** Methods, Stereo lithography, Fused-deposition modeling, Selective laser sintering, Laminated-object manufacturing, Ballistic particle manufacturing, Solid base curing and Direct manufacturing and rapid tooling

LESSON PLANNING

Lecture No	Topic	Hours	% Weightage
1.	Product Development Cycle	1	
2.	Impact on economy,	1	
3.	export competitiveness	1	
4.	export competitiveness	1	
5.	export competitiveness	1	
6.	design as a strategy to win international market and Innovation	1	
7.	design as a strategy to win international market and Innovation	1	
8.	design as a strategy to win international market and Innovation	1	
9.	Innovation process	1	**25**
10.	Innovation process	1	
11.	Innovation process	1	
12.	Rapid Product Development:	1	
13.	An Overview virtual prototyping and testing technology	1	
14.	An Overview virtual prototyping and testing technology	1	
15.	Physical Prototyping and Rapid Manufacturing technologies	1	
16.	Physical Prototyping and Rapid Manufacturing technologies	1	
17.	Synergic Integration Technologies	1	
18.	Synergic Integration Technologies	1	
19.	Virtual Prototyping and Testing:	1	
20.	Geometric modeling	1	
21.	Types of Geometric models and Solid Models Reverse engineering	1	
22.	Types of Geometric models and Solid Models Reverse engineering	1	
23.	Acquiring Point Data	1	
24.	Constructing 3D model and Applications	1	
25.	Constructing 3D model and Applications	1	
26.	Constructing 3D model and Applications	1	**25**
27.	Virtual augmented reality	1	
28.	Virtual augmented reality	1	
29.	Requirement of devices and technologies and applications Computer Aided Engineering	1	
30.	Requirement of devices and technologies and applications Computer Aided Engineering	1	
31.	Application of FEA in Engineering, the concept of descretization, steps in FEA and automatic mesh generation	1	
32.	steps in FEA and automatic mesh generation	1	
33.	steps in FEA and automatic mesh generation	1	
34.	Design for X: Design for manufacture and design for assembly and other Facets of DFX	1	**25**

35.	Design for X: Design for manufacture and design for assembly and other Facets of DFX	1	
36.	Design for X: Design for manufacture and design for assembly and other Facets of DFX	1	
37.	Comparison between NC and conventional machines, features of CNC Machine Tool and programming	1	
38.	Comparison between NC and conventional machines, features of CNC Machine Tool and programming	1	
39.	Methodology, evaluation, types, CAD/CAM Integration and CAPP Features	1	
40.	Methodology, evaluation, types, CAD/CAM Integration and CAPP Features	1	
41.	**Rapid Prototyping:** dawn of slice age, benefits, applications, important issues and popular RP process	1	
42.	**Rapid Prototyping:** dawn of slice age, benefits, applications, important issues and popular RP process	1	
43.	**Rapid Prototyping:** dawn of slice age, benefits, applications, important issues and popular RP process	1	
44.	**Rapid Tooling:** Indirect rapid tooling process	1	
45.	**Rapid Tooling:** Indirect rapid tooling process	1	
46.	**Synergic Integration** **Concurrent Engineering:** Benefits, methodology, integration and transactions	1	
47.	**Synergic Integration** **Concurrent Engineering:** Benefits, methodology, integration and transactions	1	
48.	**Product Data Management:** Product data classifications, Process Management and benefits **Computer Integrated Manufacturing:** Components, barriers to CIM. Implementation, case study, development and research	1	
49.	**Product Data Management:** Product data classifications, Process Management and benefits **Computer Integrated Manufacturing:** Components, barriers to CIM. Implementation, case study, development and research	1	**25**
50.	**Rapid Prototyping and Rapid Tooling:**	1	
51.	Methods, , sintering, Laminated-object manufacturing,	1	
52.	Stereo lithography, Fused-deposition modeling, Selective laser	1	
53.	Ballistic particle manufacturing	1	
54.	Solid base curing and Direct manufacturing	1	
55.	Solid base curing and Direct manufacturing	1	
56.	Solid base curing and Direct manufacturing	1	
57.	rapid tooling	1	

58.	rapid tooling	1	
59.	Case studies	1	
60.	Case studies	1	
TOTAL		**60**	**100**

LIST OF PRACTICALS

Sr. No.	**Practical Content**
1	ANALYSIS OF PRODUCT DEVELOPMENT CYCLE IN TERMS OF SUSTAINABILTY IN THE MARKET
2	PART CODING USING COMPUTER AIDED PROCESS PLANNING FOR A GIVEN PRODUCT
3	ANALYSIS OF A PRODUCT FOR DATA AQUIRING BASED ON REVERSE ENGINEERING
4	ANALYSIS OF A PRODUCT FOR 3D MODELLING FOR REVERSE ENGINEERING
5	ANALYSIS OF A PRODUCT BASED ON DFM
6	ANALYSIS OF A PRODUCT BASED ON DFA
7	ANALYSIS OF A PRODUCT BASED ON CONCURRENT ENGINEERING
8	IMPLEMENTATION OF COMPUTER INTEGRATED MANUFACTURING FOR INDUSTRIAL AUTOMATION
9	PROGRAMMING OF CNC MACHINES USING G & M CODES
10	CASE STUDY ON CAD/CAM INTERFACING

INSTRUCTIONAL METHOD AND PEDAGOGY (Continuous Internal Assessment (CIA) Scheme)

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed
- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all units while conducting teaching & examination.
- Attendance is compulsory in lectures and Tutorial.
- Viva Voce will be conducted at the end of the semester of 30 Marks.
- One internal exam of 30 marks is conducted as a part of Mid semester evaluation.

STUDENTS LEARNING OUTCOMES:

At the end of the course

The students will gain an experience in the implementation of RPT for newer product development.

References Books:

1. Rapid Product Development- Synergic integration of time-compression technologies

K. P. Karunakaran, V. P. Bapat, Sreenath Babu Akula P. D. Solanki Gaurav Gupta, V.R. Prasanth, Saket Anand, Arnab Sarkar and S. Venkatkrishnan

2. Manufacturing Processes for Engineering Materials -Serope Kalpakjion and Steven R. Schmid- Pearson Education.

Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

Third Semester Master of Engineering (Mechanical-Production Engineering)

In Effect from Academic Year 2017-18

Subject Code: MEPR303-N-C	**Subject Title: DESIGN AND METALLURGY OF WELDED JOINTS**

Teaching Scheme				**Total Credit**	**Evaluation Scheme**					
L	**T**	**P**	**Total**		**Theory**		**IE**	**CIA**	**Pract/ VIVO**	**Total**
Hrs	**Hrs**	**Hrs**	**Hrs**		**Hrs**	**Marks**	**Marks**	**Marks**	**Marks**	**Marks**
4	**0**	**2**	**6**	**5**	**3**	**70**	**30**	**20**	**30**	**150**

LEARNING OBJECTIVES:

The educational objectives of this course are

- To understand the importance of Sheet Metal Processing in various engineering applications
- To have practical purview of various production techniques

INSTRUCTIONAL METHOD AND PEDAGOGY

- Continuous Internal Assessment (CIA) Scheme)
- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed
- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and Practical which may carries 05 Marks.
- Classroom participation and involvement in solving the problems in Drawing Lab may carries 05 Marks.
- Viva Voce will be conducted at the end of the semester of 30 Marks.
- One internal exam of 30 Marks is conducted as a part of mid semester evaluation.
- Experiments shall be performed in the laboratory related to course contents.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concept being taught in lectures.

OUTLINE OF THE COURSE

SR.NO	CHAPTER NO	DATE/WEEK
1	1	1^{st} 2^{nd} 3^{rd}
2	2,3	4^{th} 5^{th} 6^{th}
3	4,5	7^{th} 8^{th} 9^{th}
4	6	10^{th} 11^{th} 12^{th}
5	7,8	13^{th} 14^{th} 15^{th}

Total hours (Theory): 60

Total hours (Practical): 30

Total hours: 90

DETAILED SYLLABUS

SR NO	TOPIC
1	**Introduction to sheet metal:** forming lines, sheet- tool-machine tool as a system, properties and grades of sheet metal available, their applications, manufacturing and testing procedure
2	Products manufacturable using sheet metals, formability, analytical prediction of forming limits, strain path, strain distribution, product design for sheet metal forming
3	**Separating processes**: Separating processes like shearing, fine blanking, plasma cutting and bending, laser cutting and bending.
4	bending and springback calculations, bend sequencing, drawing of sheets, draw ratio, LDR, process analysis, process analysis of axysymmetric deep drawn parts
5	**Super plastic forming:** Super plastic forming and diffusion bonding processes, sheet joining processes, deformation and weld contours
6	TWB forming, warm forming, sheet and tube hydro forming, roll forming
7	**Presses:** Different types of presses, press structures, drives, safety devices, part handling, multiple point blank holding, press brakes, counter pressure bending devices, transfer presses
8	Process modeling and analysis, scope of CAD/CAM in sheet metal forming, numerical analysis of forming processes.

LESSON PLANNING

Lecture No	Topic	Hours	% Weightage
61.	forming lines	1	
62.	sheet- tool-machine tool as a system	1	
63.	properties and grades of sheet metal available	1	
64.	applications of various grades of sheet metal available	1	
65.	manufacturing and testing procedure	1	
66.	Products manufacturable using sheet metals	1	
67.	formability,	1	
68.	formability,	1	
69.	analytical prediction of forming limits	1	
70.	analytical prediction of forming limits	1	
71.	analytical prediction of forming limits	1	**25**
72.	strain path	1	
73.	strain path	1	
74.	strain limit	1	
75.	strain distribution	1	
76.	product design for sheet metal forming	1	
77.	product design for sheet metal forming	1	
78.	Separating processes	1	
79.	Shearing,blanking	1	
80.	plasma cutting and bending	1	
81.	laser cutting and bending.	1	
82.	Bending	1	
83.	Spring back calculations	1	
84.	Spring back calculations	1	
85.	bend sequencing	1	
86.	drawing of sheets	1	**25**
87.	draw ratio	1	
88.	draw ratio	1	
89.	LDR	1	
90.	LDR	1	
91.	process analysis	1	
92.	process analysis of axysymmetric deep drawn parts	1	
93.	process analysis of axysymmetric deep drawn parts	1	
94.	Super plastic forming	1	
95.	diffusion bonding processes	1	
96.	diffusion bonding processes	1	
97.	sheet joining processes	1	**25**
98.	deformation and weld contours	1	
99.	deformation and weld contours	1	

100.	TWB forming,	1	
101.	warm forming	1	
102.	sheet and tube hydro forming	1	
103.	sheet and tube hydro forming	1	
104.	roll forming	1	
105.	Different types of presses	1	
106.	Different types of presses	1	
107.	press structures	1	
108.	drives, safety devices	1	
109.	part handling, multiple point blank holding,	1	
110.	press brakes, counter pressure bending devices	1	
111.	transfer presses	1	
112.	Process modeling and analysis	1	**25**
113.	Process modeling and analysis	1	
114.	Process modeling and analysis	1	
115.	scope of CAD/CAM in sheet metal forming	1	
116.	scope of CAD/CAM in sheet metal forming	1	
117.	Numerical analysis of forming processes.	1	
118.	Numerical analysis of forming processes.	1	
119.	Case studies	1	
120.	Case studies	1	
TOTAL		**60**	**100**

LIST OF EXPERIMENTS

Sr. No.	**Practical Content**
1	BENDING SPRING BACK CALCULATION IN BENDING PROCESS OF VARIOUS MATERIALS
2	PREDICTION OF FORMABILITY LIMITS FOR DUCTILE MATERIALS
3	PROCESS ANALYSIS OF AXYSYMMETRIC DEEP DRAWN PARTS
4	PRODUCT DESIGN FOR SHEET METAL FORMING
5	NUMERICAL ANALYSIS OF FORMING PROCESSES
6	PROCESS MODELING OF SHEET METAL PROCESS USING CAD
7	TESTING OF SHEET METAL FOR VARIOUS DEFECTS
8	ANALYSIS OF WELD CONTOURS IN SUPER PLASTIC FORMING PROCESS
9	EVALUATE THE EFFECT OF DEEP DRAWING PARAMETERS ON ITS EFFICIENCY
10	CASE STUDY ON LASER CUTTING; TWB FORMING

STUDENT LEARNING OUTCOME

At the end of the course

The students will gain an experience in the sheet process implementation.

RECOMMANDED STUDY MATERIAL

12. American Soc. For Metals, Metals Handbook, 10th Edition, Vol 15, on Metal Forming, ASM, Metals Park, Ohio, 1989.
13. David, A., Smith (Editor), Die Design Handbook, SME publications, Michigan, 1990.
14. Lange, K., Handbook of Metal Forming McGraw Hill, 1985.
15. Eary, D. F., and Reed, E. A., Techniques of Pressworking Sheet metal and Engineering,
16. Willium F. Hosfford and Robert Caddell,Metal forming: Mechanics and Metallurgy,
17. SME: Tool and Manufacturing Engineers Handbook, vol.2.
18. Rowe G.W., “Principles of Industrial Metalworking Processes”, Edward Arnold publication.
19. Sadhu Singh, “Theory of Plasticity and Metal forming Processes”, Khanna publishers.
20. Ivana Suchy, “Handbook of Die Design”, 2nd Edition McGraw-Hill.

ME MECHANICAL-PRODUCTION ENGINEERING

SEMESTER-IV

Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

Fourth Semester Master of Engineering (Mechanical-Production Engineering)

In Effect from Academic Year 2017-18

Subject Code: MEPR401-N	**Subject Title: MID SEMESTER THESIS PROGRESS REVIEW**

Teaching Scheme				**Total Credit**	**Evaluation Scheme**					**Total Marks**
L	**T**	**P**	**Total**		**THEORY**		**IE**	**CIA**	**Pract/ VIVO**	
					Hrs	**Marks**	**Marks**	**Marks**	**Marks**	
Hrs	**Hrs**	**Hrs**	**Hrs**							
-	**-**	**-**	**-**	**05**	**-**	**-**	**-**	**50**	**150**	**200**

LEARNING OBJECTIVES:

The objective of this course is

- To review the partial work carried out during the term based on the topic selected.

Total hours (Theory): 120

Total hours (Practical):30

Total hours: 150

STUDENTS LEARNING OUTCOMES:

At the end of the course

The students will gain an experience in solving the problem by applying the newer concepts, optimization techniques for the topic being decided.

Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

Fourth Semester Master of Engineering (Mechanical-Production Engineering)

In Effect from Academic Year 2017-18

Subject Code: MEPR402-N	**Subject Title: DISSERTATION PHASE-II**

Teaching Scheme				**Total Credit**	**Evaluation Scheme**					**Total Marks**
L	**T**	**P**	**Total**		**THEORY**		**IE**	**CIA**	**Pract/ VIVO**	
					Hrs	**Marks**	**Marks**	**Marks**	**Marks**	
Hrs	**Hrs**	**Hrs**	**Hrs**							
-	**-**	**-**	**-**	**20**	**-**	**-**	**-**	**100**	**200**	**300**

LEARNING OBJECTIVES:

The objective of this course is

To provide and/or implement the technique/method finalized for a given problem.

Total hours (Theory): 180

Total hours (Practical):120

Total hours: 300

STUDENTS LEARNING OUTCOMES:

At the end of the course

The students will gain an overall experience of the industrial scenario, problems and various techniques.