INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad -500 043

MECHANICALENGINEERING

COURSE DESCRIPTOR

Course Title	**SPECIAL MANUFACTURING PROCESS**				
Course Code	BCCB17				
Programme	M.Tech				
Semester	II	CAD/CAM			
Course Type	Elective				
Regulation	IARE - R18				
Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	3	-	3	3	2
Chief Coordinator	Dr. G. Naveen Kumar, Associate Professor, ME				
Course Faculty	Dr. G. Naveen Kumar, Associate Professor, ME				

I. COURSE OVERVIEW:

The primary objective of this course is to introduce the concept of manufacturing technology with the help of various processes widely employed in industries. This course is designed to provide students with an overview of a wide variety of manufacturing processes. The fundamental principles behind the processes will be discussed with the intent of providing a working knowledge of a broad range of manufacturing processes.

II. COURSE PRE-REQUISITES:

Level	Course Code	Semester	Prerequisites	Credits
UG	BCCB17	IV	Production Technology	3

III. MARKSDISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total Marks
Special Manufacturing Process	70 Marks	30 Marks	100

IV. DELIVERY / INSTRUCTIONAL METHODOLOGIES:

✔	Chalk & Talk	✔	Quiz	✔	Assignments	✘	MOOCs
✔	LCD / PPT	✔	Seminars	✘	Mini Project	✔	Videos
✘	Open Ended Experiments						

V. EVALUATION METHODOLOGY:

The course will be evaluated for a total of 100 marks, with 30 marks for Continuous Internal Assessment (CIA) and 70 marks for Semester End Examination (SEE). Out of 30 marks allotted for CIA during the semester, marks are awarded by taking average of two CIA examinations or the marks scored in the make-up examination.

Semester End Examination (SEE): The SEE is conducted for 70 marks of 3 hours duration. The syllabus for the theory courses is divided into fiveunits and each unit carries equal weightage in terms of marks distribution. The question paper pattern is as follows. Two full questions with "either" or "choice" will be drawn from each unit. Each question carries 14 marks. There could be a maximum of two sub divisions in a question.

The emphasis on the questions is broadly based on the following criteria:

50 %	To test the objectiveness of the concept.
50 %	To test the analytical skill of the concept OR to test the application skill of the concept.

Continuous Internal Assessment (CIA):
CIA is conducted for a total of 30 marks (Table 1), with 25 marks for Continuous Internal Examination (CIE), 05 marks for Quiz/ Alternative Assessment Tool (AAT).

Table 1: Assessment pattern for CIA

Component	**Theory**		**Total Marks**
Type of Assessment	CIE Exam	Quiz / AAT	
CIA Marks	25	05	30

Continuous Internal Examination (CIE):
Two CIE exams shall be conducted at the end of the 8th and 16th week of the semester respectively. The CIE exam is conducted for 25 marks of 2 hours duration consisting of two parts. Part–A shall have five compulsory questions of one mark each. In part–B, four out of five questions have to be answered where, each question carries 5 marks. Marks are awarded by taking average of marks scored in two CIE exams.

Quiz / Alternative Assessment Tool (AAT):
Two Quiz exams shall be online examination consisting of 25 multiple choice questions and are be answered by choosing the correct answer from a given set of choices (commonly four). Marks shall be awarded considering the average of two quizzes for every course. The AAT may include seminars, assignments, term paper, open ended experiments, five minutes video and MOOCs.

VI. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes (POs)		Strength	Proficiency assessed by
PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineeringfundamentals, and an engineering specialization to the solution of complex engineering problems.	3	Presentation on real-world problems
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences	2	Seminar
PO 3	**Design / development of solutions:** Competence to design a system, component or process to meet societal needs within realistic constraints.	2	Assignments
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	2	Seminar
PO 5	**Modern tool usage:** An ability to formulate solve complex engineering problem using modern engineering and information Technology tools.	1	Seminar

3 = High; 2 = Medium; 1 = Low

VII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes (PSOs)		Strength	Proficiency assessed by
PSO 1	**Professional Skills:** To produce engineering professional capable of synthesizing and analyzing mechanical systems including allied engineering streams.	3	Assignments
PSO 2	**Problem solving skills:** An ability to adopt and integrate current technologies in the design and manufacturing domain to enhance the employability.	2	Projects
PSO 3	**Successful career and Entrepreneurship:** To build the nation, by imparting technological inputs and managerial skills to become technocrats.	1	Guest Lectures

3 = High; 2 = Medium; 1 = Low

VIII. COURSE OBJECTIVES (COs):

The course should enable the students to:	
I	Comprehensive understanding of different manufacturing processes for product development.
II	Apply casting, metal joining and forming processes for various industries.
III	Select process parameters, equipment for material processing

IX. COURSE LEARNING OUTCOMES (CLOs):

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
BCCB17.01	CLO 1	Understand various manufacturing processes used in various industries.	PO 1	3
BCCB17.02	CLO 2	Explain the steps involved in casting processes	PO 1	3

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
BCCB17.03	CLO 3	Use design principles to incorporate sprue,runner,gates, and risers in foundry practice.	PO 1	3
BCCB17.04	CLO 4	Evaluate properties of sand for use in sand casting.	PO 2	2
BCCB17.05	CLO 5	Solve problems and find methods to rectify casting defects.	PO 2	2
BCCB17.06	CLO 6	Demonstrate the preparation of moulds for various casting processes	PO 2	2
BCCB17.07	CLO 7	Describe applications of various casting processes	PO 4	1
BCCB17.08	CLO 8	Explain principles of welding, brazing and soldering processes.	PO 4	1
BCCB17.09	CLO 9	Demonstrate use of welding equipment for various industrial applications.	PO 5	2
BCCB17.10	CLO 10	Demonstrate use of Brazing and soldering equipment for various industrial applications.	PO 5	2
BCCB17.11	CLO 11	Explain design of welded joints, residual stresses, distortion and control.	PO 3	3
BCCB17.12	CLO 12	Explain causes and remedies of welding defects.	PO 3	3
BCCB17.13	CLO 13	Compare destructive and non-destructive testing techniques.	PO 3	3
BCCB17.14	CLO 14	Understand the effect of heat input in welds.	PO 1, PO 5	3
BCCB17.15	CLO 15	Understand the importance of sheet metal forming, bending, and deep drawing.	PO 2	2
BCCB17.16	CLO 16	Compare extrusion and forging processes to identify advantages and limitations.	PO 2	2
BCCB17.17	CLO 17	Enable students to understand various manufacturing processes for industrial applications.	PO 1, PO 2	3
BCCB17.18	CLO 18	Enable students to understand importance of manufacturing for life long learning, Higher Education and competitive exams.	PO 1, PO 5	3

3 = High; 2 = Medium; 1 = Low

X. MAPPING COURSE LEARNING OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

(CLOs)	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO 1	3	2											1		
CLO 2	3	2											1		
CLO 3		3	2											1	
CLO 4			2		2								3		
CLO 5		1	3										2		
CLO 6		1			2								2		

(CLOs)	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO 7			3	2										1	
CLO 8	3		3	2	3								2		
CLO 9		3													
CLO 10	3			3										3	
CLO 11	2	2		3										2	
CLO 12	3			3	2								2		
CLO 13	3		3	3										2	
CLO 14				3	2									2	
CLO 15	3	2	3	3									2	3	
CLO 16	3	2	3		3									2	
CLO 17	2	2			3									2	
CLO 18		3												2	

3 = High; 2 = Medium; 1 = Low

XI. ASSESSMENT METHODOLOGIES–DIRECT

CIE Exams	PO 1, PO 2, PO 3, PO 4, PO 5	SEE Exams	PO 1, PO 2, PO 3, PO 4, PO 5	Assignments	PO 3	Seminars	PO 2, PO 4, PO 5
Laboratory Practices	PO 3	Student Viva	PO 3	Mini Project	-	Certification	-

XII. ASSESSMENT METHODOLOGIES-INDIRECT

✔	Early Semester Feedback	✔	End Semester OBE Feedback
✔	Assessment of Mini Projects by Experts		

XIII. SYLLABUS

UNIT-I	SURFACE TREATMENT	Classes:09
Surface treatment: Scope, cleaners, methods of cleaning, surface coating types, and ceramic and organic methods of coating, economics of coating, electro forming, chemical vapor deposition, thermal spraying, ion implantation, diffusion coating, diamond coating and cladding.		
UNIT-II	PROCESSING OF CERAMICS	Classes: 09

Processing of ceramics: Applications, characteristics, classification, processing of particulate ceramics, powder preparations, consolidation, drying, sintering, hot compaction, area of application, finishing of ceramics; Processing of composites: Composite layers, particulate and fiber reinforced composites, elastomers, reinforced plastics, metal matrix composites, ceramic matrix composites, polymer matrix composites.		
UNIT-III	**FABRICATION OF MICROELECTRONIC DEVICES**	**Classes: 09**
Fabrication of microelectronic devices: Crystal growth and wafer preparation, film deposition oxidation, lithography, bonding and packaging, reliability and yield. Printed Circuit boards, computer aided design in micro electronics, surface mount technology, integrated circuit economics.		
UNIT-IV	**E-MANUFACTURING**	**Classes: 09**
E-manufacturing: Nano manufacturing techniques and micromachining, high Speed machining and hot machining.		
UNIT-V	**RAPID PROTOTYPING**	**Classes: 09**
Rapid prototyping: Working principles, methods, stereo lithography, laser Sintering, fused deposition method, applications and limitations, rapid tooling, techniques of rapid manufacturing		
Text Books:		
1. Kalpakijian, "Manufacturing Engineering and Technology", Adisson Wesley,1995. 2. R. A. Lindburg, "Process and Materials of Manufacturing",PHI, 1st Edition,1990. 3. Rao. R. Thummala, Eugene, J. Rymaszewski,Van Nostrand Renihold, "Microelectronicpackaging handbook", 1st Edition, 2013.		
Reference Books:		
1. Rao. R. Thummala, Eugene, J. Rymaszewski,Van Nostrand Renihold, "Microelectronicpackaging handbook", 1st Edition, 2013. 2. Tai-Run Hsu, "MEMS & Micro Systems Design and manufacture", Tata McGraw Hill, 1stEdition, 2002		

XIV. COURSE PLAN:

The course plan is meant as a guideline. Probably there may be changes.

Lecture No	Topics to be covered	Course Learning Outcomes (CLOs)	Reference
1-4	What are the operating temperatures for treated surfaces?	CLO 1	T1:3.1 R1:3.1
5-7	What is Siltek Deactivation?	CLO 1	T1:3.2.5 R1:3.3.4
8-10	What are the unique benefits of Siltek deactivation?	CLO 1	T1:3.1.5 R1:3.1.3
11-14	Does anyone else offer an equivalent to Siltek deactivation?	CLO 2	T1:9.1 R1:5.1
15-16	What is the maximum temperature limit for Siltek deactivated glass?	CLO 2	T1:9.2.1 R1:5.2.3
17-20	What materials can be surface treated?	CLO 3	T1:9.4.2 R1:5.3
21-23	What are the advantages of using negative rake on ceramic cutting tools?	CLO 3	R2:9.16 R6:27.5
24-26	What are the advantages of using negative rake on cemented carbide cutting tools?	CLO 4	R2:9.16.12 R6:27.1
27-28	Write about ceramic matrix composites?	CLO 5	R2:9.64 R6:30.2

Lecture No	Topics to be covered	Course Learning Outcomes (CLOs)	Reference
29-30	What are the necessary conditions for the effective use of ceramic tools?	CLO 5	R2:9.55 R6:29.3
31-32	What are the three main variables to be considered in application and selection of turning tools?	CLO 6	T1:7.1.1 R1:4.6
33-34	Write about polymer matrix composites?	CLO 7	T1:7.1 R1:3.6.1
35	What is the Crystal growth?	CLO 8	T1:7.1.1 R1:4.6
36-37	How the wafer preparation method is performed?	CLO 8	T1:7.2 R1:4.2
38	What is the film deposition oxidation	CLO 9	T1:8.3 R6:6.5
39	What is the lithography?	CLO 10	T1:8.7 R1:4.8.12
40-41	What is the Fabrication of microelectronic devices?	CLO 11	T1:8.4 R1:4.5
42	What is bonding and packaging?	CLO 12	T1:8.9 R1:4.8.15
43-44	What is Nano machining?	CLO 13	T1:8.6 R1:4.8.15
45-47	What is micromachining?	CLO 14	T1:8.1 R1:4.8.6
48-49	Write process parameter for True cutting speed	CLO 15	T1:7.4 R1:4.4
50-52	Write process parameter for metal removal rate	CLO 16	T1:7.4.2 R1:4.4.1
53-55	What is hot machining?	CLO 17	T1:7.4.4 R1:4.4.2
56-57	Write Advantages and disadvantages of hot machining	CLO 18	T1:7.3 R1:4.3

XV. GAPS IN THE SYLLABUS - TO MEET INDUSTRY / PROFESSION REQUIREMENTS:

S NO	Description	Proposed Actions	Relevance with POs	Relevance with PSOs
1	Advances in manufacturing processes	Seminars / Guest Lectures / NPTEL	PO 1, PO 2, PO 3	PSO 1
2	Interaction of materials and manufacturing processes	Seminars / Guest Lectures / NPTEL	PO 2, PO 5	PSO 2
3	Recommended practices in casting, welding, and forming	Assignments / Laboratory Practices	PO 1, PO 3, PO 4	PSO 2

Prepared by:
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