



# INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad -500 043

## CIVIL ENGINEERING

### COURSE DESCRIPTOR

<b>Course Title</b>	<b>IDEATION AND PRODUCT DEVELOPMENT</b>				
<b>Course Code</b>	AEC201				
<b>Programme</b>	B.Tech				
<b>Semester</b>	VI	CSE   IT   ECE  EEE   CE  ME  AE			
<b>Course Type</b>	Skill				
<b>Regulation</b>	IARE - R16				
<b>Course Structure</b>	<b>Theory</b>			<b>Practical</b>	
	<b>Lectures</b>	<b>Tutorials</b>	<b>Credits</b>	<b>Laboratory</b>	<b>Credits</b>
	-	-	-	2	1
<b>Chief Coordinator</b>	Dr. G Manisha , Associate Professor, ECE				
<b>Course Faculty</b>	Dr. G Manisha , Associate Professor, ECE Dr. P Munaswamy , Professor, ECE Dr. M V Krishna Rao , Professor, ECE Dr. V Sivanagaraju , Professor, ECE				

#### I. COURSE OVERVIEW:

This course deals with developing innovative products in all fields of Engineering and Sciences. This course also emphasizes on social and societal responsibilities of the present day youth to strive for the betterment of the society. This course also deals with effects of the knowledge management process motivated by reward systems on innovative product development performance.

#### II. COURSE PRE-REQUISITES:

Level	Course Code	Semester	Prerequisites	Credits
UG	AHS106	V	Research and Content Development	1

#### III. MARKS DISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total Marks
Ideation and Product Development	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:

Each laboratory will be evaluated for a total of 100 marks consisting of 30 marks for internal assessment and 70 marks for semester end lab examination. Out of 30 marks of internal assessment, continuous lab assessment will be done for 20 marks for the day to day performance and 10 marks for the final internal lab assessment.

**Semester End Examination (SEE):** The semester end lab examination for 70 marks shall be conducted by two examiners, one of them being Internal Examiner and the other being External Examiner, both nominated by the Principal from the panel of experts recommended by Chairman, BOS.

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

20 %	To test the preparedness for the experiment.
20 %	To test the performance in the laboratory.
20 %	To test the calculations and graphs related to the concern experiment.
20 %	To test the results and the error analysis of the experiment.
20 %	To test the subject knowledge through viva – voce.

#### Continuous Internal Assessment (CIA):

CIA is conducted for a total of 30 marks (Table 1), with 20 marks for continuous lab assessment during day to day performance, 10 marks for final internal lab assessment.

Table 1: Assessment pattern for CIA

Component	Laboratory		Total Marks
	Day to Day Performance	Final Internal Lab Assessment	
CIA Marks	20	10	30

**Continuous Internal Examination (CIE):**

One CIE exams shall be conducted at the end of the 16<sup>th</sup> week of the semester. The CIE exam is conducted for 10 marks of 3 hours duration.

Preparation	Performance	Calculations and Graph	Results and Error Analysis	Viva	Total
2	2	2	2	2	10

**VI. HOW PROGRAM OUTCOMES ARE ASSESSED:**

Program Outcomes (POs)		Strength	Proficiency assessed by
PO 1	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	3	Lectures, Assignments, Exercises
PO 2	<b>Problem analysis:</b> 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 5	<b>Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.	2	Design Exercises
PO 9	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary Settings.	1	Micro projects.
PO 10	<b>Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	1	Seminars, Paper Presentations.
PO 12	<b>Life-long learning:</b> Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	2	Development of Mini Projects

**3 = High; 2 = Medium; 1 = Low**

**VII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:**

Program Specific Outcomes (PSOs)		Strength	Proficiency assessed by
PSO 1	<b>ENGINEERING KNOWLEDGE:</b> Graduates shall demonstrate sound knowledge in analysis, design, laboratory investigations and construction aspects of civil engineering infrastructure, along with good foundation in mathematics, basic sciences and technical communication.	3	Lectures and Assignments
PSO 2	<b>BROADNESS AND DIVERSITY:</b> Graduates will have a broad understanding of economical, environmental, societal, health and safety factors involved in infrastructural development, and shall demonstrate ability to function within multidisciplinary teams with competence in modern tool usage.	-	-

Program Specific Outcomes (PSOs)		Strength	Proficiency assessed by
PSO 3	<b>SELF-LEARNING AND SERVICE:</b> Graduates will be motivated for continuous self-learning in engineering practice and/ or pursue research in advanced areas of civil engineering in order to offer engineering services to the society, ethically and responsibly.	1	Guest lectures

**3 = High; 2 = Medium; 1 = Low**

#### VIII. COURSE OBJECTIVES:

The course should enable the students to:	
I	To Develop next generation Entrepreneurs and Creative Leaders to resolve live challenges.
II	To Understand about the future needs of industries
III	To Transform innovative ideas into successful businesses.
IV	To Use a range of creative thinking tools to develop Out of the Box Ideas.
V	To develop Breakthrough Innovators and Dynamic Thinkers.

#### IX. COURSE OUTCOMES (COs):

The course should enable the students to:	
CO1	Understand the basic concepts of implementing novel techniques in developing innovative products
CO2	Analyze the need with respect to current market and recent trends
CO3	Analyze cost effectiveness of products
CO4	Develop a prototype of product
CO5	Commercialize the product

#### X. 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
AEC201.01	CLO 1	Deliver high quality functional product prototypes of commercial quality (bold and doing instead of just talking, how to prototype, importance of prototyping and ideation).	PO 1, PO 2	3
AEC201.02	CLO 2	Develop innovative solutions to real-world problems.	PO 1, PO 2	3
AEC201.03	CLO 3	Learn project management and planning - understanding, importance of clear delegation of tasks and responsibilities.	PO 1, PO 2 PO 9	3
AEC201.04	CLO 4	Importance of good communication (ways and medias of communication, interacting with different people with different backgrounds).	PO 2, PO 5 PO 9, PO 12	2
AEC201.05	CLO 5	Work in in multi-disciplinary and/or geographically distributed teams working remotely in National / International environment.	PO 5, PO 10	2

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
AEC201.06	CLO 6	Conduct patent searches and analyze prior intellectual property	PO 2, PO 12	2

3= High; 2 = Medium; 1 = Low

**XI. MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:**

Course Outcomes	Program Outcomes and Program Specific Outcomes							
	PO 1	PO 2	PO 5	PO 9	PO 10	PO12	PSO 1	PSO 3
CO 1	3	2					3	
CO 2	3	2	2	2			3	
CO 3		2	2	1		1	2	2
CO 4			2		2			2
CO 5		2				2		2

3 = High; 2 = Medium; 1 = Low

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

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

3 = High; 2 = Medium; 1 = Low

**XIII. ASSESSMENT METHODOLOGIES – DIRECT**

CIE Exams	PO1,PO2, PO5,PO9, PO10,PO12, PSO1, PSO3	SEE Exams	PO1,PO2, PO5,PO9, PO10,PO12, PSO1, PSO3	Assignments	PO1,PO2, PO5,PO9, PO10,PO12, PSO1, PSO3	Seminars	PO1,PO2, PO5,PO9, PO10,PO12, PSO1, PSO3
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Laboratory Practices	PO1,PO2, PO5,PO9, PO10,PO12, PSO1, PSO3	Student Viva	PO1,PO2, PO5,PO9, PO10,PO12, PSO1, PSO3	Mini Project	PO1,PO2, PO5,PO9, PO10,PO12, PSO1, PSO3	Term Paper	-
Certification	-						

#### XIV. ASSESSMENT METHODOLOGIES – INDIRECT

✓	Early Semester Feedback	✓	End Semester OBE Feedback
✗	Assessment of Mini Projects by Experts		

#### XV. SYLLABUS

<b>WEEK 1</b>	<b>SUCCESSFUL TEAM FORMATION AND MANAGEMENT</b>
<b>SUCCESSFUL TEAM FORMATION AND MANAGEMENT</b>	
<b>WEEK 2</b>	<b>INTRODUCTION TO USER-CENTRED DESIGN</b>
<b>INTRODUCTION TO USER-CENTRED DESIGN</b>	
<b>WEEK 3</b>	<b>IDEATION AND USE OF PERSONAS AND POVs</b>
<b>IDEATION AND USE OF PERSONAS AND POVs</b>	
<b>WEEK 4</b>	<b>NEED FINDING</b>
<b>NEED FINDING</b>	
<b>WEEK 5</b>	<b>EMBEDDED MICROCONTROLLERS FOR CONSUMER PRODUCTS</b>
<b>EMBEDDED MICROCONTROLLERS FOR CONSUMER PRODUCTS</b>	
<b>WEEK 6</b>	<b>HUMAN FACTORS IN ENGINEERING DESIGN</b>
<b>HUMAN FACTORS IN ENGINEERING DESIGN</b>	
<b>WEEK 7</b>	<b>CRITICAL EXPERIENCE AND CRITICAL FUNCTION PROTOTYPING</b>
<b>CRITICAL EXPERIENCE AND CRITICAL FUNCTION PROTOTYPING</b>	
<b>WEEK 8</b>	<b>DARK HORSE AND ‘FUNKY’ PROTOTYPING</b>
<b>DARK HORSE AND ‘FUNKY’ PROTOTYPING</b>	
<b>WEEK 9</b>	<b>RAPID PROTOTYPING AND MANUFACTURING</b>
<b>RAPID PROTOTYPING AND MANUFACTURING</b>	
<b>WEEK 10</b>	<b>DESIGN FOR MANUFACTURE</b>
<b>DESIGN FOR MANUFACTURE</b>	

<b>WEEK 11</b>	<b>USER TESTING</b>
<b>USER TESTING</b>	
<b>WEEK 12</b>	<b>USE OF VIDEO/ELECTRONIC MEDIA FOR COMMUNICATION</b>
<b>USE OF VIDEO/ELECTRONIC MEDIA FOR COMMUNICATION</b>	
<b>WEEK 13</b>	<b>START-UPS AND ENTREPRENEURSHIP</b>
<b>START-UPS AND ENTREPRENEURSHIP</b>	
<b>WEEK 14</b>	<b>INTELLECTUAL PROPERTY</b>
<b>INTELLECTUAL PROPERTY</b>	
<b>Reference Books:</b>	
<ol style="list-style-type: none"> <li>1. Product Design: Techniques in Reverse engineering &amp; New Product development. K Otto &amp; K Wood. Prentice Hall, 2001. ISBN 0-13-0212271-7 TCD Shelf Mark. HL-236-568.</li> <li>2. Invention by design: how engineers get from thought to thing, Petroski H. Cambridge, Mass., London, Harvard University Press, 1996. ISBN 0674463676. TCD Shelf Mark. HL-201-280.</li> <li>3. Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation, Tim Brown, Harper Business, 2009, ISBN 978-0061766084.</li> <li>4. Creative Confidence: Unleashing the Creative Potential Within Us All, Tom &amp; David Kelley, Crown Business, 2013, ISBN 978-0385349369.</li> </ol>	

## **XVI. COURSE PLAN:**

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

<b>Lecture No</b>	<b>Topics to be covered</b>	<b>Course Learning Outcomes (CLOs)</b>	<b>Reference</b>
1-3	Successful team formation and management	CLO 1, CLO 2	1-3
4-8	Introduction to user-centred design	CLO 3	4-8
9-11	Ideation and use of personas and POVs	CLO 4	9-11
11-13	Need finding	CLO 3	11-13
14-15	Embedded Microcontrollers for consumer products	CLO 3	14-15
16-21	Human factors in engineering design	CLO 4	16-21
21-25	Critical Experience and Critical Function Prototyping	CLO 5	21-25
26-30	Dark Horse and 'Funky' prototyping	CLO 6	26-30
31-35	Rapid prototyping and manufacturing	CLO 2	31-35
36-40	Design for manufacture	CLO 3	36-40
41-44	User testing	CLO 4	41-44
45-49	Use of video/electronic media for communication	CLO 5	45-49

50-51	Start-ups and entrepreneurship	CLO 6	50-51
52-53	Intellectual Property	CLO 5	52-53

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

S NO	DESCRIPTION	PROPOSED ACTIONS	RELEVANCE WITH POs	RELEVANCE WITH PSOs
1	Design Thinking Process	Case Studies / YouTube Videos	PO 2, PO 9	PSO 1

**Prepared by**

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**HOD, CE**