INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad -500 043

CIVILENGINEERING

COURSE DESCRIPTOR

Course Title	SURVEYING				
Course Code	ACE002				
Programme	B.Tech				
Semester	III	CE			
Course Type	Core				
Regulation	IARE - R16				
Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	3	1	4	3	2
Chief Coordinator	Mr. B Suresh, Assistant Professor				
Course Faculty	Mr. B Suresh, Assistant Professor Mr. P Vinay Kumar, Assistant Professor				

I. COURSE OVERVIEW:

Surveying is the technique, profession, science and art of making all essential measurements to determine the relative position of points or physical and cultural details above, on, or beneath the surface of the Earth, and to depict them in a their objective, surveyors use elements of mathematics (geometry and trigonometry), physics, engineering and law. Surveyor measures certain dimensions that generally occur on the surface of the Earth. Surveying equipment, such as levels and theodolites, are used for accurate measurement of angular deviation, horizontal, usable form, or to establish the position of points or details. These points are usually on the surface of the earth, and they are often used to establish land maps and boundaries for ownership or governmental purposes. To accomplish vertical and slope distances. With computerization, electronic distance measurement (EDM), total stations, GPS surveying and laser scanning have supplemented (and to a large extent supplanted) the traditional optical instruments.

II. COURSE PRE-REQUISITES:

Level	Course Code	Semester	Prerequisites
UG	AHS002	I	Linear algebra and ordinary differential equations

III. MARKSDISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total Marks
Surveying	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 five units 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, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	2	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	1	Presentation on real-world problems
PO 5	**Modern tool usage:** 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	1	Open Ended Experiments

3 = High; 2 = Medium; 1 = Low

VII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

	Program Specific Outcomes (PSOs)	Strength	Proficiency assessed by
PSO 1	**Engineering knowledge:** 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	2	Assignments
PSO 2	**Broadness and Diversity:** 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.	3	Open Ended Experiments
PSO 3	**Self-learning and Service:** 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.	-	-

3 = High; 2 = Medium; 1 = Low

VIII. COURSE OBJECTIVES (COs):

The course should enable the students to:	
I	Evaluate the basic principles of surveying and its classification.
II	Identify, formulate and solve the problems in the field of advanced surveying.
III	Determine the contour points and their importance in surveying.
IV	Analyze survey data and design the civil engineering projects.

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
ACE002.01	CLO 1	Analyze the sources of errors in linear measurements.	PO 1	2
ACE002.02	CLO 2	Evaluate the corrections for true length, true area and true volumes of calculated data	PO 1	2
ACE002.03	CLO 3	Determine the errors in chain and tape length	PO 1	2
ACE002.04	CLO 4	Obtain directions of a surveying line with a prismatic compass.	PO 2	1
ACE002.05	CLO 5	Determine the bearing angles by a prismatic compass	PO 2	1
ACE002.06	CLO 6	Draw a traverse and calculate area enclosed within the traverse.	PO 2	1
ACE002.07	CLO 7	Measure the corrected bearing angles without local attraction	PO 2	1
ACE002.08	CLO 8	Differentiate the whole circle and quadrant bearing systems	PO 5	1
ACE002.09	CLO 9	Draw cross section and prepare a contour maps for road works, rail works, canals etc.	PO 2	1
ACE002.10	CLO 10	Predict Reduced Levels with reference to a common assumed datum	PO 2	1
ACE002.11	CLO 11	sketch the profile the of land from the reduced levels	PO 1	2
ACE002.12	CLO 12	Differentiate the basic concepts in leveling such as datum and bench mark etc.	PO 1	2
ACE002.13	CLO 13	Calculate the volume of earth work, the sectional areas of the cross- section	PO 1	2
ACE002.14	CLO 14	Compute an area of filed which is surrounded by irregular boundaries	PO 2, PO 5	1
ACE002.15	CLO 15	Calculate an area by latitudes and departures of a closed traverse	PO 2	1
ACE002.16	CLO 16	Explain the importance of theodolite and the principle of measuring angles in horizontal and vertical plains.	PO 2	1
ACE002.17	CLO 17	Understand the components of theodolite and errors in elimination of parallax	PO 1	2
ACE002.18	CLO 18	Calculate the error of closure in a closed traverse	PO 1	2
ACE002.19	CLO 19	Differentiate the advantages of global positioning system and geographical information	PO 2, PO 5	1
ACE002.20	CLO 20	Analyze the basic principle of total station in recording the field data.	PO 2	1
ACE002.21	CLO 21	Derive an equation for calculation of heights and distances using principles of tacheomertic survey	PO 1	2
ACE002.22	CLO 22	Derive an equation for calculation of heights and distances using principles of triangulation survey	PO 5	1
ACE002.23	CLO 23	Advanced Surveying: Basic principles of total station, global positioning system and geographic information system.	PO 5	1

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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		
CLO 2	3														
CLO 3	1														
CLO 4		2											2		
CLO 5		2													
CLO 6		1												2	
CLO 7		2													
CLO 8					2										
CLO 9		1													
CLO 10		2													
CLO 11	3													2	
CLO 12	3														
CLO 13	2														
CLO 14		1			2								2		
CLO 15		1													
CLO 16		2											2		
CLO 17	3														
CLO 18	2												2		
CLO 19		2			2										
CLO 20	2														
CLO 21	3												2		
CLO 22					1										
CLO 23					1									2	

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XI. ASSESSMENT METHODOLOGIES–DIRECT

CIE Exams	PO 1; PO2; PO5	SEE Exams	PO 1; PO2; PO5	Assignments	PO 2	Seminars	-
Laboratory Practices	PO 5	Student Viva	-	Mini Project	-	Certification	-
Term Paper	-						

XII. ASSESSMENT METHODOLOGIES-INDIRECT

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

XIII. SYLLABUS

UNIT-I	INTRODUCTION, LINEAR AND ANGULAR MEASUREMENTS

Definitions, primary divisions of surveying, objectives, principles and classifications, plan and map, errors due to wrong scale. Linear and angular measurements; Direct and in direct methods, use of chain and tape, errors inchaining, meridians, azimuths and bearings, declination, dip, computation of angle, errors due to local attraction..

UNIT-II	LEVELING AND CONTOURING

Leveling: Concept and terminology, temporary and permanent adjustments, method of leveling, height of instrument and rise and fall method; Contouring: Characteristics and uses of contours; Methods of conducting contour surveys and their plotting.

UNIT-III	COMPUTATION OF AREAS AND VOLUMES:

Computation of areas directly from field measurements methods, computation of areas along irregular boundaries and regular boundaries.

Embankments and cutting for a level section and two level sections with and without transverse slopes, determination of the capacity of reservoir, volume of barrow pits.

UNIT-IV	THEODOLITE AND TRAVERSE SURVEYING

Theodolite, description of transit theodolite, definitions and terms, temporary and permanent adjustments, measurement of horizontal and vertical angles. Trigonometric leveling height and distance problems, traverse survey and methods of traversing, closing errors in traversing

UNIT-V	TACHEOMETRIC AND ADVANCED SURVEYING

Tachometry: Stadia and tangential methods of tachometry. Distance elevation and depression formulae for staff held in vertical and inclined position. Curves: Definition, types of curves, design and setting out, simple andcompound curves. Advanced Surveying: Basic principles of total station, global positioning system and geographic information system

Text Books:

1. Dr. K. R. Arora, "Surveying Volume-1", Standard book house, New Delhi, 13th Edition, 2012.
2. S. K. Duggal, "SurveyingVolume-2", Tata McGraw-Hill Education Private Limited, India,New Delhi, 3rd Edition, 2009.

Reference Books:

1. R. Subramanian, "Surveying and Leveling", Oxford University Press, New Delhi. 2nd Edition, 2012.
2. M. James, Anderson Edward Mikhail, "Surveying Theory and Practice", Tata McGraw Hill, NewDelhi, 7th Edition, 2000.
3. Arthur R Benton, Philip J Taety, "Elements of Plane Surveying", McGraw-Hill Education, New Delhi.8th Edition, 2000.

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	Understand the objective of survey and primary division.	CLO 1	T1:1.3
2	Remember Principles of survey and classification of survey.	CLO 2	T1:1.4
3	Understand the concept of chain survey and terminology instruments used in it.	CLO 3	T1:1.6
4-5	Recall types of chains, errors while using it.	CLO 2	T1.3.4
6-7	Identify the problems on error due to chain.	CLO 6	T1.3.5
8-9	Remember the concept of Ranging, traversing using chain..	CLO 7	T1.3.8
10	Understand types in compass, principle and objective.	CLO 9	T1.3.10
11	Remember the terminology and adjustments in compass surveying	CLO 10	T1.3.15
12-13	Recall types of bearings in compass survey.	CLO 11	T1.3.16
14	Understand errors in closed traverse	CLO 12	T1.3.18
15-16	Identify the purpose of chain and cross staff survey	CLO 13	T1.3.19
17	Recall different types of scales used in surveying	CLO 11	T1.3.21
18	Remember different methods for distance measurement	CLO 10	T1.3.22
19	Recall difference between a plan and a map	CLO 14	T1.2.2.1
20	Remember chaining on un even ground and errors in chain	CLO 14	T1.2.2.2
21	Understand errors in tape and obstacles in chaining	CLO 12	T1.2.24
22-23	Understand azimuth and bearings and measurement of angles using compass	CLO 14	T1.2.8.6
24-25	Remember magnetic dip and declination and different types of bearing systems	CLO 14	T1.2.8.8
26	Remember leveling, terminology and their definitions and different instruments used in leveling	CLO 17	T1.9.1
27	Understand temporary adjustments in leveling	CLO 17	T1.9.3
28-30	Understand permanent adjustments and focusing	CLO 19	T1.9.4
31-32	Recall different methods of leveling	CLO 19	T1.9.10
33-34	Recall steps in leveling and problems	CLO 20	T1.9.22
35-36	Remember contour	CLO 20	T1.9.25
37-38	Recall characteristics of contour	CLO 21	T1.10.1
39	Recall methods of locating contour	CLO 22	T1.10.4
40-41	Understand contour gradient	CLO 23	T1.1.5
42	Recall use of contours	CLO 23	T1.10.10
43	Recall computation of areas and volumes.	CLO 23	T1.16.2
44	Remember computation of area using different methods of regular and irregular areas	CLO 23	T1.16.4
45	Understand the calculation of volume of different type pits	CLO 23	T1.16.6
46	Recall a level section, two level section and respective problems	CLO 23	T1.16.8
47-48	Remember to calculate volume of a reservoir	CLO 23	T1.17.1
49	Understand theodolite and traverse surveying description	CLO 18	T1.14.1
50	Remember the terminology in theodolite and traverse surveying	CLO 23	T1.14.4
51	temporary adjustments in theodolite	CLO 18	T1.14.6
52	permanent adjustments in theodolite, measuring horizontal angles in theodolite	CLO 23	T1.14.8
53-54	Trigonometric leveling height and distance problems, traverse survey and methods of traversing, closing errors in traversing	CLO 20	T2.1.1-1.5
55	Uses of theodolites in theodolite and errors in theodolites.	CLO 23	T1.14.18
56	Remember the trigonometric leveling in theodolite	CLO 20	T1.14.19
57	Distance elevation and depression formulae for staff held in vertical and inclined position in tacheometric survey	CLO 23	T1.5.2
58	Remember definition, types of curves, design and setting out, simple and compound curves	CLO 23	T2.8.3

Lecture No	Topics to be covered	Course Learning Outcomes (CLOs)	Reference
59-60	Recall Advanced Surveying Basic principles of total station, global positioning system and geographic information system.	CLO 19	T2.8.5; R1.9.2

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

S No	Description	Proposed actions	Relevance with POs	Relevance with PSOs
1	Compute irregular area and volume of a field by the method of chain triangulation, closed traverse to identify the basic errors.	Seminars	PO 1	PSO 1
2	Sketch the profile of land using the levelling instruments and justification of result through algebraic checks	Seminars / NPTEL	PO 5	PSO 1
3	To perform smart work with the application of total station in real life experience to reduce the manual errors involved in reading and recording of measured data	NPTEL	PO 2	PSO 1

Prepared by:
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