Ref No:

SRI KRISHNA INSTITUTE OF TECHNOLOGY

COURSE PLAN

Academic Year 2019 - 2020

Program:	B E – Civil Engineering
Semester :	4
Course Code:	18cv45
Course Title:	Advanced Surveying
Credit / L-T-P:	3 / 3-0-0
Total Contact Hours:	50
Course Plan Author:	SHIVAPRASAD D G

Academic Evaluation and Monitoring Cell

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Table of Contents

Note : Remove "Table of Content" before including in CP Book
Each Course Plan shall be printed and made into a book with cover page
Blooms Level in all sections match with A.2, only if you plan to teach / learn at higher levels

A. COURSE INFORMATION

1. Course Overview

Degree:	BE	Program:	CV
Year / Semester :	2019/IV	Academic Year:	2019-20
Course Title:	Advanced Surveying	Course Code:	18CV45
Credit / L-T-P:	3/3-0-0	SEE Duration:	180 Minutes
Total Contact Hours:	50	SEE Marks:	60 Marks
CIA Marks:	40	Assignment	1 / Module
Course Plan Author:	SHIVAPRASAD D G	Sign	Dt:
Checked By:		Sign	Dt:
CO Targets	78%	SEE Target:	70%

Note: Define CIA and SEE % targets based on previous performance.

2. Course Content

Content / Syllabus of the course as prescribed by University or designed by institute. Identify 2 concepts per module as in G.

Module	Content	Teaching Hours	Identified Module Concepts	Blooms Learning Levels
1	**Curves** – Necessity – Types, Simple curves, Element Designation of curves, Setting out simple curves by linear methods (numerical problems on offsets from long chord & chord produced method), Setting out curves by Rankines deflection angle method (numerical problems). Compound curves, Elements, Design of compound curves, Setting out of compound curves (numerical problems). Reverse curve between two parallel straights (numerical problems on Equal radius and unequal radius). Transition curves Characteristics , numerical problems on Length of Transition curve, Vertical curves –Types – (theory).	10	Rankines deflection	L5
2	**Geodetic Surveying**: Principle and Classification of triangulation system, Selection of base line and stations, Orders of triangulation, Triangulation figures, Reduction to Centre, Selection and marking of stations Theory of Errors: Introduction, types of errors, definitions, laws of accidental errors, laws of weights, theory of least squares, rules for giving weights and distribution of errors to the field observations, determination of the most probable values of quantities.	10	Triangulation system	L3
3	**Earth,** celestial sphere, earth and celestial Coordinate systems, spherical triangle, astronomical triangle, Napier's rule Introduction, Uses,	10	Celestial coordinate system	L5
4	**Aerial photographs**, Definitions, Scale of vertical and tilted photograph (simple problems), Ground Co&ordinates (simple problems),Relief Displacements(Derivation),Ground control, Procedure of aerial survey, overlaps and mosaics, Stereoscopes, Derivation Parallax.	10	Aerial survey	L5
5	**Introduction**, Electromagnetic spectrum, Electromagnetic distance measurement, Total station, Lidar scanners for topographical survey. Remote Sensing: Introduction, Principles of energy interaction in atmosphere and earth surface features, Image interpretation techniques, visual interpretation. Digital	10	Electromagnetic spectrum	L5

	image processing, Global Positioning system Geographical Information System: Definition of GIS, Key Components of GIS, Functions of GIS, Spatial data, spatial information system Geo-spatial analysis, Integration of Remote sensing and GIS and Applications in Civil Engineering(transportation, town planning).			
-	**Total**	**50**	-	-

3. Course Material

Books & other material as recommended by university (A, B) and additional resources used by course teacher (C).
1. Understanding: Concept simulation / video ; one per concept ; to understand the concepts ; 15 – 30 minutes
2. Design: Simulation and design tools used – software tools used ; Free / open source
3. Research: Recent developments on the concepts – publications in journals; conferences etc.

Modules	Details	Chapters in book	Availability
A	**Text books (Title, Authors, Edition, Publisher, Year.)**	-	-
1, 2, 3, 4, 5	B.C. Punmia, "Surveying Vol.2", Laxmi Publications pvt. Ltd., New Delhi.	1, 2, 3, 4	In Dept
1, 2, 3, 4, 5	Kanetkar T P and S V Kulkarni , Surveying and Levelling Part 2, Pune Vidyarthi Griha Prakashan	1,2, 3, 4	In dept
1, 2, 3, 4, 5	K.R. Arora, "Surveying Vol. 1" Standard Book House, New Delhi.	1, 2, 3, 4	In Dept
B	**Reference books (Title, Authors, Edition, Publisher, Year.)**	-	-
1, 2	S.K. Duggal, "Surveying Vol.I & II", Tata McGraw Hi ll Publishing Co. Ltd. New Delhi.	1, 2, 3, 4	In Lib
1, 2	R Subramanian, Surveying and Leveling, Second edition, Oxford University Press, New Delhi.	1,2, 3, 4	Not Available
3, 4, 5	David Clerk, Plane and Geodetic Surveying Vol1 and Vol2, CBS publishers	1, 2, 3, 4	In lib
3, 4, 5	B Bhatia, Remote Sensing and GIS , Oxford University Press, New Delhi.	1, 2, 3, 4	In lib
C	**Concept Videos or Simulation for Understanding**	-	-
C1	https://youtu.be/GkFgysZC4Vc		
C2			
C3			
C4			
C5			
C6			
C7			
C8			
C9			
C10			
D	**Software Tools for Design**	-	-
E	**Recent Developments for Research**	-	-

F	**Others (Web, Video, Simulation, Notes etc.)**	**-**	**-**
?			

4. Course Prerequisites

Refer to GL01. If prerequisites are not taught earlier, GAP in curriculum needs to be addressed. Include in Remarks and implement in B.5.
Students must have learnt the following Courses / Topics with described Content . . .

Modules	Course Code	Course Name	Topic / Description	Sem	Remarks	Blooms Level
1	17CV36	Basic Surveying	1. Knowledge on Surveying appications	3		L3

5. Content for Placement, Profession, HE and GATE

The content is not included in this course, but required to meet industry & profession requirements and help students for Placement, GATE, Higher Education, Entrepreneurship, etc. Identifying Area / Content requires experts consultation in the area.
Topics included are like, a. Advanced Topics, b. Recent Developments, c. Certificate Courses, d. Course Projects, e. New Software Tools, f. GATE Topics, g. NPTEL Videos, h. Swayam videos etc.

Modules	Topic / Description	Area	Remarks	Blooms Level
-	-	-	-	-

B. OBE PARAMETERS

1. Course Outcomes

Expected learning outcomes of the course, which will be mapped to POs. Identify a max of 2 Concepts per Module. Write 1 CO per Concept.

Modules	Course Code.#	Course Outcome **At the end of the course, student should be able to . . .**	Teach. Hours	Concept	Instr Method	Assessment Method	Blooms' Level
1	18CV45.1	Set out simple curves by linear methods	5	Simple Circular Curve	Lecture	CIA and Assignment	L5 Design
1	18CV45.2	Reverse curve between two parallel straights	5	Reverse curve	Lecture/ Tutorial	CIA and Assignment	L5 Design
2	18CV45.3	Understand the Triangulation figures	5	Triangulations	Lecture	CIA and Assignment	L5 Design
2	18CV45.4	Understand the Theory of errors	5	Theory of errors	Lecture	CIA and Assignment	L5 Design
3	18CV45.5	Understand the celestial sphere of earth	5	Celestial Sphere	Lecture	CIA and Assignment	L5 Design
3	18CV45.6	Understand the astonomical triangle	5	astonomical triangle	Lecture/ Tutorial	CIA and Assignment	L5 Design
4	18CV45.7	Understand the Scale of vertical and tilted photograph	5	tilted photograph	Lecture/ Tutorial	CIA and Assignment	L5 Design
4	18CV45.8	Understand the aerial survey	5	aerial survey	Lecture/ Tutorial	CIA and Assignment	L5 Design
5	18CV45.9	Understand the Electromagnetic spectrum	5	Electromagnetic spectrum	Lecture	CIA and Assignment	L5 Design

5	18CV45.10	Understand the Functions of GIS	5	GIS	Lecture	CIA and Assignment	L5 Design
-	-	**Total**	**50**	-	-	-	**L3-L4**

2. Course Applications

Write 1 or 2 applications per CO.
Students should be able to employ / apply the course learnings to . . .

Modules	Application Area Compiled from Module Applications.	CO	Level
1	Understanding the surveying applications	CO1	L3
1	Students are able to Design curves	CO2	L5
2	Understanding the surveying applications	CO3	L5
2	Understanding the surveying applications	CO4	L5
3	Measure and calculations of earth and celestial coordinates	CO5	L5
3	Measure and calculations of earth and celestial coordinates	CO6	L5
4	To conduct aerial survey	CO7	L5
4	To conduct aerial survey	CO8	L5
5	Usage of modern surveying instruments	CO9	L5
5	Usage of modern surveying instruments	CO10	L5

3. Mapping And Justification

CO – PO Mapping with mapping Level along with justification for each CO-PO pair.
To attain competency required (as defined in POs) in a specified area and the knowledge & ability required to accomplish it.

Modules	Mapping		Mapping Level	Justification for each CO-PO pair	Level
-	**CO**	**PO**	-	**'Area': 'Competency' and 'Knowledge' for specified 'Accomplishment'**	-
1	CO1	PO1	1	Engineering knowledge on setting of curves	L3
1	CO1	PO2	1	Analyses of problems on setting on curves	L4
1	CO2	PO1	1	Engineering knowledge on design and implement the different types of curves for deviating type of alignments.	L5
2	CO2	PO2	1	Analyses of problems on design and implement the different types of curves for deviating type of alignments.	L5
2	CO3	PO1	1	Engineering knowledge on geometric- principles to arrive at surveying problems.	L5
2	CO3	PO2	1	Analyses of problems on geometric- principles to arrive at surveying problems.	L5
2	CO4	PO1	1	Engineering knowledge on geometric- principles to arrive at surveying problems.	L5
2	CO4	PO2	1	Analyses of problems on geometric- principles to arrive at surveying problems.	L5
3	CO5	PO1	1	Engineering knowledge on capture geodetic data to process and perform analyses for survey problems with the use of electronic instruments.	L5
3	CO5	PO2	1	Analyses of problems on capture geodetic data to process and perform analyses for survey problems with the use of electronic instruments.	L5
3	CO6	PO1	1	Engineering knowledge on capture geodetic data to process and perform analyses for survey problems with the use of electronic instruments.	L5
3	CO6	PO2	1	Analyses of problems on capture geodetic data to process and perform analyses for survey problems with the use of electronic instruments.	L5
4	CO7	PO1	1	Engineering knowledge on use modern instruments to obtain geo- spatial data and analyze the same to appropriate engineering problems.	L5
4	CO7	PO2	1	Analyses of problems on use modern instruments to obtain geo-	L5

				spatial data and analyze the same to appropriate engineering problems.	
4	CO8	PO1	1	Engineering knowledge on use modern instruments to obtain geo- spatial data and analyze the same to appropriate engineering problems.	L5
4	CO8	PO2	1	Analyses of problems on use modern instruments to obtain geo-spatial data and analyze the same to appropriate engineering problems.	L5
4	CO9	PO1	1	Engineering knowledge on use modern instruments to obtain geo- spatial data and analyze the same to appropriate engineering problems.	L5
4	CO9	PO2	1	Analyses of problems on use modern instruments to obtain geo-spatial data and analyze the same to appropriate engineering problems.	L5
5	CO10	PO1	1	Engineering knowledge on use modern instruments to obtain geo- spatial data and analyze the same to appropriate engineering problems.	L5
5	CO10	PO2	1	Analyses of problems on use modern instruments to obtain geo-spatial data and analyze the same to appropriate engineering problems.	L5

4. Articulation Matrix

CO – PO Mapping with mapping level for each CO-PO pair, with course average attainment.

-	-	Course Outcomes	Program Outcomes														-
Modules	CO.#	**At the end of the course student should be able to . . .**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	Level
1	18CV45.1																	
1	18CV45.2	Reverse curve between two parallel straights	2	3	-	-	-	-	-	-	-	-	-	-				L4
2	18CV45.3	Understand the Triangulation figures	2	3	-	-	-	-	-	-	-	-	-	-				L2
2	18CV45.4	Understand the Theory of errors	2	3	-	-	-	-	-	-	-	-	-	-				L4
3	18CV45.5	Understand the celestial sphere of earth	2	3	-	-	-	-	-	-	-	-	-	-				L2
3	18CV45.6	Understand the astronomical triangle	2	3	-	-	-	-	-	-	-	-	-	-				L4
4	18CV45.7	Understand the Scale of vertical and tilted photograph	2	3	-	-	-	-	-	-	-	-	-	-				L2
4	18CV45.8	Understand the aerial survey	2	3	-	-	-	-	-	-	-	-	-	-				L4
5	18CV45.9	Understand the Electromagnetic spectrum	2	3	-	-	-	-	-	-	-	-	-	-				L2
5	18CV45.10	Understand the Functions of GIS	2	3	-	-	-	-	-	-	-	-	-	-				L4
-	**18CV45PC**	**Average attainment (1, 2, or 3)**	**2**	**3**														**-**
-	*PO, PSO*	*1.Engineering Knowledge; 2.Problem Analysis; 3.Design / Development of Solutions; 4.Conduct Investigations of Complex Problems; 5.Modern Tool Usage; 6.The Engineer and Society; 7.Environment and Sustainability; 8.Ethics; 9.Individual and Teamwork; 10.Communication; 11.Project Management and Finance; 12.Life-long Learning; S1.Software Engineering; S2.Data Base Management; S3.Web Design*																

5. Curricular Gap and Content

Topics & contents not covered (from A.4), but essential for the course to address POs and PSOs.

Modules	Gap Topic	Actions Planned	Schedule Planned	Resources Person	PO Mapping
1					
2					
3					
4					
5					

6. Content Beyond Syllabus

Topics & contents required (from A.5) not addressed, but help students for Placement, GATE, Higher Education, Entrepreneurship, etc.

Modules	Gap Topic	Area	Actions Planned	Schedule Planned	Resources Person	PO Mapping
1						
1						
2						
2						
3						
3						
4						
4						
5						
5						

C. COURSE ASSESSMENT

1. Course Coverage

Assessment of learning outcomes for Internal and end semester evaluation. Distinct assignment for each student. 1 Assignment per chapter per student. 1 seminar per test per student.

Module #	Title	Teaching Hours	No. of question in Exam						CO	Levels
			CIA-1	CIA-2	CIA-3	Asg	Extra Asg	SEE		
1	Curve Surveying	10	4	-	-	1	1	2	CO1, CO2	L2,L4,L5
2	Geodetic Surveying and Theory of Errors	10	4	-	-	1	1	2	CO3,CO4	L2,L4,L5
3	Introduction to Field Astronomy	10	-	4	-	1	1	2	CO5, CO6	L2,L4,L5
4	Aerial Photogrammetry	10	-	4	-	1	1	2	CO7, CO8	L2,L4,L5
5	Modern Surveying Instruments	10	-	-	8	1	1	2	CO9, CO10	L2,L4,L5
-	**TOTAL**	**50**	**8**	**8**	**8**	**5**	**5**	**10**	**-**	**-**

2. Continuous Internal Assessment (CIA)

Assessment of learning outcomes for Internal exams. Blooms Level in last column shall match with A.2.

Modules	Evaluation	Weightage in Marks	CO	Levels
1,2	CIA Exam – 1	30	CO1, CO2, CO3, CO4	L2, L3, L2, L4
3,4	CIA Exam – 2	30	CO5, CO6, CO7, CO8	L2, L4, L2, L4
5	CIA Exam – 3	30	CO9, CO10	L2, L4
1,2	Assignment - 1	10	CO1, CO2, CO3, CO4	L2, L3, L2, L4

3,4	Assignment - 2	10	CO5, CO6, CO7, CO8	L2, L4, L2, L4
5	Assignment - 3	10	CO9, CO10	L2, L4
	Final CIA Marks	**40**	**-**	**-**

D1. TEACHING PLAN - 1

Module - 1

Title:	Curve Surveying	Appr Time:	16 Hrs
a	***Course Outcomes***	-	**Blooms**
-	The student should be able to:	-	**Level**
1	Set out simple curves by linear methods	CO1	L5
2	Reverse curve between two parallel straights	CO2	L5
b	***Course Schedule***	-	-
Class No	**Module Content Covered**	**CO**	**Level**
1	Curves – Necessity – Types, Simple curves, Element Designation of curves,	C01	L3
2	Setting out simple curves by linear methods (numerical problems on offsets from long chord & chord produced method)	C01	L3
3	Setting out curves by Rankines deflection angle method (numerical problems). Compound curves,	C01	L3
4	Elements, Design of compound curves, Setting out of compound	C01	L3
5	numerical problems	C01	L5
6	Reverse curve between two parallel straights	C01	L3
7	numerical problems on Equal radius and unequal radius	C01	L5
8	Transition curves Characteristics	C01	L3
9	numerical problems on Length of Transition curve	C01	L5
10	Vertical curves –Types – (theory).	C01	L3
c	**Application Areas**	**CO**	**Level**
1	Understanding the surveying applications	CO1	L3
d	**Review Questions**	-	-
1	Explain the following along with a neat sketch : i) Forward tangent ii) Point of curve iii) Deflection angle iv) Apex distance.	CO1	L2
2	Two tangents intersect at a chainage of 1 l 90m, the deflection angle 36˚. Compute all the data necessary to set out a curve of radius 300m by deflection angle method. The peg interval is 30m. Tabulate the results.	CO1	L3
3	A reverse curve is to be set out to connect two parallel railway line 30m apart. The distance between the tangent points is l 50m. Both the arcs have the same radius. The curve is set out by method of ordinates from long chord	CO2	L4

	taking a peg interval of 10m. Calculate the necessary data for setting the curve		
4	List the requirements of a transition curve (any four).	CO2	L3
5	With a neat sketch, list any four vertical curves.	CO2	L3
6	Define curve ? Establish the relationship between degree of a curve and its radius	CO2	L3
7	Two tangents intersect each other at a chainage of 50+60, deflection angle being 50°30'. its required to connect two tangents by a simple curve of 15 chain radius. Taking peg inetrval of 100 links, calculate the necessary data for setting out the curve by Rankines method of deflection angle. Take length of the chain as 20m= 100 links. Also write brief procedure for setting out the curve.	CO2	L5
8	Distinguish between a compound curve and reverse curve with neat sketches.	CO2	L3
9	A compound curve consists of two simple circular radii 350m and 500m respectively and is to be laid out between two tangents T1I and IT2. PQ is common tangent and D is the point of compound curvature. The angles <IpQ and <IQP are 55° and 25° respectively. Given chainage of point of intersection as 1800.00m, calculate the chainage of T1,T2 and D.	CO2	L5

Module – 2

Title:	Geodetic Surveying and Theory of Errors	Appr Time:	10 Hrs
A	***Course Outcomes***	-	**Blooms**
-	The student should be able to:	-	**Level**
1	Understand the Triangulation figures	CO3	L3
2	Understand the Theory of errors	CO4	L4
b	***Course Schedule***	-	-
Class No	**Module Content Covered**	**CO**	**Level**
11	Geodetic Surveying: Principle and Classification of triangulation system	CO2	L3
12	Selection of base line and stations	CO2	L3
13	Orders of triangulation, Triangulation figures	CO2	L3
14	Reduction to Center, Selection and marking of stations	CO2	L3
15	Theory of Errors: Introduction, types of errors	CO2	L3
16	definitions, laws of accidental errors	CO2	L3
17	laws of weights, theory of least squares	CO2	L3
18	rules for giving weights and distribution of errors to the field observations	CO2	L3
19	determination of the most probable values of quantities.	CO2	L3
20	determination of the most probable values of quantities.	CO2	L3
c	**Application Areas**	**CO**	**Level**
1	Understanding the surveying applications	CO1	L3
2	Students are able to Design curves	CO2	L4
d	**Review Questions**	-	-
10	Mention the points to be considered in the selection of triangular station	CO3	L1
11	Triangulation station B was used in measuring angies and the instrument as necessary to shift to a satellite station S due south of main station B at a distance of 12.2111 from it. The line BS bisects the exterior angle A, B, C and the angles ASB and BSC were observed to be 30° 20' 30" and 29° 45' 6". When the station B was observed angles CAB and ACB were observed to be 59° 18' 26" and 60° 26' 12". The side AC computed to be 4248.5m from the adjacent triangle. Determine the correct value of the angle ABC.	CO3	L3
12	Explain the three kinds of errors.	CO3	L3
13	The observed values of P, Q and Rat a station the angles being subjected to the condition that P +Q = R. P = 30° 12' 28.2" Q = 35° 48° 12.6" R = 66° O' 44.4"	CO318'	L4

	Find the most probable value of P, Q and R.		
14	Explain the probability curve.	CO3	L2
15	What are important factors considered to be in selection of site for a base line ?	CO4	L3
16	From a triangulation sat elite stations Q 5.80m away from the main station A , the following observations were observed ; A = 0°0'0", B=132°18'30", 232°24'6",D=296°6'11", the inter connected base line AB. AC & AD were measured as 3265.50m,4022.20m and 3086.40m respectively. Determine the directions of AB, AC, AD	CO4	L5
17	Define the terms: a) true error b) residual error c) conditioned equation d) indirect observation.	CO4	L2
18	The observed angles α,β and γ from a station P with probable errors of measurement are given below; α= 78°12'12"±12", β= 136°48'34"±4", γ+ 144°59'8"±5" determine their corrected values.	CO4	L5
e	**Experiences**	-	-
1			
2			

E1. CIA EXAM – 1

a. Model Question Paper - 1

Crs Code:	18CV45	Sem:	4	Marks:	30	Time:	75 minutes
Course:	Advanced surveying						

-	-	**Note: Answer any 2 questions, each carry equal marks.**	**Marks**	**CO**	**Level**
1	a	Explain the following along with a neat sketch : i) Forward tangent ii) Point of curve iii) Deflection angle iv) Apex distance.	8	CO1	L2
	b	A reverse curve is to be set out to connect two parallel railway line 30m apart. The distance between the tangent points is l 50m. Both the arcs have the same radius. The curve is set out by method of ordinates from long chord taking a peg interval of 10m. Calculate the necessary data for setting the curve	7	CO2	L4
2	a	With a neat sketch, list any four vertical curves.	7	CO1	L3
	b	Two tangents intersect each other at a chainage of 50+60, deflection angle being 50°30'. its required to connect two tangents by a simple curve of 15 chain radius. Taking peg inetrval of 100 links, calculate the necessary data for setting out the curve by Rankines method of deflection angle. Take length of the chain as 20m= 100 links. Also write brief procedure for setting out the curve.	8	CO2	L4
3	a	Mention the points to be considered in the selection of triangular station	7	CO3	L2
	b	Triangulation station B was used in measuring angies and the instrument as necessary to shift to a satellite station S due south of main station B at a distance of 12.2111 from it. The line BS bisects the exterior angle A, B, C and the angles ASB and BSC were observed to be 30° 20' 30" and 29° 45' 6". When the station B was observed angles CAB and ACB were observed to be 59° 18' 26" and 60° 26' 12". The side AC computed to be 4248.5m from the adjacent triangle. Determine the correct value of the angle ABC.	8	CO4	L4
4	a	What are important factors considered to be in selection of site for a base line ?	7	CO3	L2
	b	The observed angles α,β and γ from a station P with probable errors of measurement are given below; α= 78°12'12"±12", β= 136°48'34"±4", γ+ 144°59'8"±5" determine their corrected values.	8	CO4	L4

b. Assignment -1

Note: A distinct assignment to be assigned to each student.

Model Assignment Questions							
Crs Code:	18CV45	Sem:	4	Marks:	10 / 10	Time:	90 – 120 minutes
Course:	Advanced surveying						
Note: Each student to answer 2-3 assignments. Each assignment carries equal mark.							

SNo	USN	Assignment Description	Marks	CO	Level
1		Explain the following along with a neat sketch : i) Forward tangent ii) Point of curve iii) Deflection angle iv) Apex distance.	10	CO2	L2
2		Two tangents intersect at a chainage of 1 l 90m, the deflection angle 36°. Compute all the data necessary to set out a curve of radius 300m by deflection angle method. The peg interval is 30m. Tabulate the results.	10	CO1	L3
3		A reverse curve is to be set out to connect two parallel railway line 30m apart. The distance between the tangent points is I 50m. Both the arcs have the same radius. The curve is set out by method of ordinates from long chord taking a peg interval of 10m. Calculate the necessary data for setting the curve	10	CO2	L3
4		List the requirements of a transition curve (any four).	10	CO2	L2
5		With a neat sketch, list any four vertical curves.	10	CO2	L3
6		Define curve ? Establish the relationship between degree of a curve and its radius	10	CO2	L2
7		Two tangents intersect each other at a chainage of 50+60, deflection angle being 50°30'. its required to connect two tangents by a simple curve of 15 chain radius. Taking peg inetrval of 100 links, calculate the necessary data for setting out the curve by Rankines method of deflection angle. Take length of the chain as 20m= 100 links. Also write brief procedure for setting out the curve.	10	CO2	L3
8		Distinguish between a compound curve and reverse curve with neat sketches.	10	CO2	L2
9		A compound curve consists of two simple circular radii 350m and 500m respectively and is to be laid out between two tangents T1I and IT2. PQ is common tangent and D is the point of compound curvature. The angles <IpQ and <IQP are 55° and 25° respectively. Given chainage of point of intersection as 1800.00m, calculate the chainage of T1,T2 and D.	10	CO2	L3
10		Mention the points to be considered in the selection of triangular station	10	CO1	L3
11		Triangulation station B was used in measuring angies and the instrument as necessary to shift to a satellite station S due south of main station B at a distance of 12.2111 from it. The line BS bisects the exterior angle A, B, C and the angles ASB and BSC were observed to be 30° 20' 30" and 29° 45' 6". When the station B was observed angles CAB and ACB were observed to be 59° 18' 26" and 60° 26' 12". The side AC computed to be 4248.5m from the adjacent triangle. Determine the correct value of the angle ABC.	10	CO1	L3
12		Explain the three kinds of errors.	10	CO2	L3
13		The observed values of P, Q and Rat a station the angles being subjected to the condition that P +Q = R. P = 30° 12' 28.2" Q = 35° 48° 12.6" R = 66° O' 44.4" Find the most probable value of P, Q and R.	10	CO2	L3

9		Explain the probability curve.	10	CO2	L3
10		What are important factors considered to be in selection of site for a base line ?	10	CO2	L3
11		From a triangulation sat elite stations Q 5.80m away from the main station A , the following observations were observed ; A = 0°0'0", B=132°18'30", 232°24'6",D=296°6'11", the inter connected base line AB. AC & AD were measured as 3265.50m,4022.20m and 3086.40m respectively. Determine the directions of AB, AC, AD	10	CO2	L3
12		Define the terms: a) true error b) residual error c) conditioned equation d) indirect observation.	10	CO2	L3
13		The observed angles α,β and γ from a station P with probable errors of measurement are given below; α= 78°12'12"±12", β= 136°48'34"±4", γ+ 144°59'8"±5" determine their corrected values.	10	CO1	L3

D2. TEACHING PLAN - 2

Module – 3

Title:	**Introduction to Field Astronomy**	Appr Time:	16 Hrs
a	***Course Outcomes***	-	**Blooms**
-	The student should be able to:	-	**Level**
1	Understand the celestial sphere of earth	CO5	L5
2	Understand the astonomical triangle	CO6	L5
b	***Course Schedule***		
Class No	**Module Content Covered**	**CO**	**Level**
1	Introduction about Earth	CO5	L5
2	celestial sphere	CO5	L5
3	earth and celestial coordinate systems	CO5	L5
4	celestial coordinate systems	CO5	L5
5	celestial coordinate systems	CO6	L5
6	spherical triangle	CO6	L5
7	astronomical triangle	CO6	L5
8	Napier's rule	CO6	L5
9	Numerical problems	CO6	L5
10	Numerical problems	CO6	L5
c	**Application Areas**	**CO**	**Level**
1	Measure and calculations of earth and celestial coordinates	CO3	L4
d	**Review Questions**	-	-
1	Define the following terms : i) Zenith and Nadir ii) Prime vertical iii) Hour angle.	CO3	L3
2	Mention the properties of a spherical triangle.	CO3	L3
3	Find the shortest distance between two points A & B, given A latitude - 18° 24' N longitude 36° 18 E B latitude - 68° 32' N longitude 126° 34 E.	CO3	L3
4	Define the following : i) Vertical circle ii) Azimuth iii) Altitude.	CO3	L3
5	Explain Ecliptic and Solstices	CO3	L3
6	Find the shortest distance between two places A & B given that the longitudes of A and B are 15° O' N and 12°· 6' N and longitudes are 50° 12' E and 54° O' E respectively.	CO3	L5
7	Define the terms: I) celestial sphere ii) hour angle iii) prime vertical iv) latitude of a place	CO3	L3

8	Find the shortest distance between two places A and B given that their latitudes are 12°N and 13°04'N with respective longitudes 72°32'E and 80°12'E	CO3	L4
9	Briefly explain the solution of spherical triangle by napiers rule of circular parts	CO3	L3
10	The standard time meridian in India is 80°30'E . if the standard time of place is $20^{H}\ 24^{M}\ 06^{S}$, find the local mean time of two places having the longitudes as 20°E and 20°W respectively.	CO3	L5
e	**Experiences**	-	-
1			
2			

Module – 4

Title:	**Aerial Photogrammetry**	Appr Time:	16 Hrs
a	***Course Outcomes***	-	**Blooms**
-	The student should be able to:	-	**Level**
1	capture geodetic data to process and perform analyses for survey problems with the use of electronic instruments.	CO7	L4
2		CO8	L5
b	***Course Schedule***		
Class No	**Module Content Covered**	**CO**	**Level**
1	Introduction, Uses,, Definitions,	CO4	L2
2	Aerial photographs	CO4	L2
3	Scale of vertical photograph	CO4	L4
4	Scale of tilted photograph	CO4	L4
5	simple problems	CO4	L3
6	Ground Co-ordinates (simple problems)	CO4	L3
7	Relief Displacements (Derivation)	CO4	L3
8	Ground control, Procedure of aerial survey, overlaps	CO4	L3
9	mosaics, Stereoscopes	CO4	L2
10	Derivation Parallax	CO4	L3
c	**Application Areas**	**CO**	**Level**
1	To conduct aerial survey	CO4	L3
d	**Review Questions**	-	-
1	Define the following terminologies i) Exposure station ii) Picture plane iii) Perspective centre.	CO7	L3
2	Mention the general features of Photographic images.	CO7	L3
3	Find the number of photographLrs (size 250 x 250mm) required to cover over a area of 20km x I 6km of the longitudinal overlap is 60% and the side overlap is 30% scale the photograph is lcm= 150m.	CO7	L3
4	Derive an expression for relief displac~ment on a vertical photograph.	CO7	L3
5	Explain the procedure for aerial survey.	CO7	L3
6	A vertical photograph was taken at a altitude of 1200 meters above mean sea level. Determine the scale of the photograph for a terrain lying at elevations of 80 meters and 300 meters if the focal length oft he camera is 15cm.	CO7	L3
7	With a neat sketch, derive the expression for the scale of a vertical photograph.	CO7	L3
8	A line AB 2.00 KM long, laying at an elevation of 500m measure 8.65cm	CO7	L3

	on a vertical photograph of focal length of 20cm. Determine the scale of the photograph at an average elevation of 800m.		
9	Define the terms: I) Tilt ii) Exposure stations iii) Principal point iv) ISO centre.	CO7	L3
10	Mention the reasons for photograph over lap. Justify the same.	CO7	L3
e	**Experiences**	-	-
1			L2
2			
3			

E2. CIA EXAM – 2

a. Model Question Paper - 2

Crs Code:	18CV45	Sem:	4	Marks:	30	Time:	75 minutes
Course:	Advanced Surveying						

-	-	**Note: Answer any 2 questions, each carry equal marks.**	**Marks**	**CO**	**Level**
1	a	Mention the properties of a spherical triangle.	8	CO3	L2
	b	Find the shortest distance between two points A & B, given A latitude - 18° 24' N longitude 36° 18 E B latitude - 68° 32' N longitude 126° 34 E.	7	CO3	L4
2	a	Find the shortest distance between two places A & B given that the longitudes of A and B are 15° O' N and 12°· 6' N and longitudes are 50° 12' E and 54° O' E respectively.	8	CO3	L5
	b	Define the terms: I) celestial sphere ii) hour angle iii) prime vertical iv) latitude of a place	7	CO3	L2
3	a	Mention the general features of Photographic images.	8	CO4	L3
	b	Find the number of photography (size 250 x 250mm) required to cover over a area of 20km x I 6km of the longitudinal overlap is 60% and the side overlap is 30% scale the photograph is lcm= 150m.	7	CO4	L4
4	a	A line AB 2.00 KM long, laying at an elevation of 500m measure 8.65cm on a vertical photograph of focal length of 20cm. Determine the scale of the photograph at an average elevation of 800m.	8	CO4	L5
	b	Define the terms: I) Tilt ii) Exposure stations iii) Principal point iv) ISO center.	7	CO4	L2

b. Assignment – 2

Note: A distinct assignment to be assigned to each student.

Model Assignment Questions

Crs Code:	18CV45	Sem:	III	Marks:	10 / 10	Time:	90 – 120 minutes
Course:	Advanced Surveying						

Note: Each student to answer 2-3 assignments. Each assignment carries equal mark.

SNo	USN	Assignment Description	Marks	CO	Level
1		Define the following terms : i) Zenith and Nadir ii) Prime vertical iii) Hour angle.	10	CO3	L3
2		Mention the properties of a spherical triangle.	10	CO3	L3
3		Find the shortest distance between two points A & B, given A latitude - 18° 24' N longitude 36° 18 E B latitude - 68° 32' N longitude 126° 34 E.	10	CO3	L3
4		Define the following : i) Vertical circle ii) Azimuth iii) Altitude.	10	CO3	L3
5		Explain Ecliptic and Solstices	10	CO3	L3
6		Find the shortest distance between two places A & B given that the longitudes of A and B are 15° O' N and 12°· 6' N and longitudes are 50° 12' E and 54° O' E respectively.	10	CO3	L3
7		Define the terms: I) celestial sphere ii) hour angle iii) prime vertical iv) latitude of a place	10	CO3	L3
8		Find the shortest distance between two places A and B given	10	CO4	L3

		that their latitudes are 12°N and 13°04'N with respective longitudes 72°32'E and 80°12'E			
9		Briefly explain the solution of spherical triangle by napiers rule of circular parts	10	CO4	L3
10		The standard time meridian in India is 80°30'E . if the standard time of place is $20^H\ 24^M\ 06^S$, find the local mean time of two places having the longitudes as 20°E and 20°W respectively.	10	CO4	L3
11		Define the following terminologies i) Exposure station ii) Picture plane iii) Perspective centre.	10	CO4	L2
12		Mention the general features of Photographic images.	10	CO4	L2
13		Find the number of photographLrs (size 250 x 250mm) required to cover over a area of 20km x I 6km of the longitudinal overlap is 60% and the side overlap is 30% scale the photograph is lcm= 150m.	10	CO4	L5
9		Derive an expression for relief displac~ment on a vertical photograph.	10	CO4	L3
10		Explain the procedure for aerial survey.	10	CO4	L3
11		A vertical photograph was taken at a altitude of 1200 meters above mean sea level. Determine the scale of the photograph for a terrain lying at elevations of 80 meters and 300 meters if the focal length oft he camera is 15cm.	10	CO4	L5
12		With a neat sketch, derive the expression for the scale of a vertical photograph.	10	CO4	L3
13		A line AB 2.00 KM long, laying at an elevation of 500m measure 8.65cm on a vertical photograph of focal length of 20cm. Determine the scale of the photograph at an average elevation of 800m.	10	CO4	L4
14		Define the terms: I) Tilt ii) Exposure stations iii) Principal point iv) ISO centre.	10	CO4	L2
15		Mention the reasons for photograph over lap. Justify the same.	10	CO4	L3

D3. TEACHING PLAN - 3

Module – 5

Title:	Modern surveying instruments	Appr Time:	16 Hrs
a	***Course Outcomes***	-	**Blooms**
-	The student should be able to:	-	**Level**
1	use modern instruments to obtain geo- spatial data and analyze the same to appropriate engineering problems.	CO5	L4
b	***Course Schedule***		
Class No	**Module Content Covered**	**CO**	**Level**
1	Introduction, Electromagnetic spectrum, Electromagnetic distance measurement, Total station,	CO5	L2
2	Lidar scanners for topographical survey. Remote Sensing: Introduction,	CO5	L3
3	Principles of energy interaction in atmosphere and earth surface features	CO5	L3
4	Image interpretation techniques, visual interpretation.	CO5	L4
5	Digital image processing	CO5	L2
6	Global Positioning system Geographical Information System	CO5	L4
7	Definition of GIS, Key Components of GIS, Functions of GIS, Spatial data,	CO5	L4
8	spatial information system Geo-spatial analysis	CO5	L4

9	Integration of Remote sensing and GIS and Applications in Civil Engineering(transportation, town planning)	CO5	L4
10	Integration of Remote sensing and GIS and Applications in Civil Engineering(transportation, town planning)	CO5	L4
c	**Application Areas**	**CO**	**Level**
1	Usage of modern surveying instruments	CO5	L3
d	**Review Questions**	-	-
1	Mention the advantages of total station and also discuss the working principles of the same.	CO5	L1
2	Define Remote sensing. Explain the stages of idealized remote sensing system.	CO5	L3
3	What is GIS? Enumerate on GIS applications in civil engineering.	CO5	L2
4	Explain the basic principles of GPS and its application in surveying.	CO5	L4
5	Define and explain EDM?	CO5	L2
6	Explain the working of remote sensing equipment.	CO5	L5
7	What are the advantages of LIDAR technology.	CO5	L2
8	Explain the working of total station.	CO5	L3
9	Explain the civil engineering applications in GIS and remote sensing.	CO5	L4
e	**Experiences**	-	-
1		-	-
2			
3			

E3. CIA EXAM – 3

a. Model Question Paper - 3

Crs Code:	18CV45	Sem:	4	Marks:	30	Time:	75 minutes		
Course:	Advanced surveying								
-	**-**	**Note: Answer any 2 questions, each carry equal marks.**					**Marks**	**CO**	**Level**
1	a	Mention the advantages of total station and also discuss the working principles of the same.					8	CO5	L3
	b	Define Remote sensing. Explain the stages of idealized remote sensing system.					7	CO5	L2
2	a	What is GIS? Enumerate on GIS applications in civil engineering.					8	CO5	L2
	b	Explain the basic principles of GPS and its application in surveying.					7	CO5	L3
3	a	Explain the working of remote sensing equipment.					8	CO5	L3
	b	What are the advantages of LIDAR technology.					7	CO5	L4
4	a	Define and explain EDM?					7	CO5	L3
	b	Explain the working of total station.					8	CO5	L3

b. Assignment – 3

Note: A distinct assignment to be assigned to each student.

Model Assignment Questions							
Crs Code:	18CV45	Sem:	4	Marks:	10 / 10	Time:	90 – 120 minutes
Course:	Advanced surveying						
Note: Each student to answer 2-3 assignments. Each assignment carries equal mark.							

SNo	USN	Assignment Description	Marks	CO	Level
1		Mention the advantages of total station and also discuss the working principles of the same.	10	CO5	L3
2		Define Remote sensing. Explain the stages of idealized remote sensing system.	10	CO5	L2
3		What is GIS? Enumerate on GIS applications in civil	10	CO5	L2

		engineering.			
4		Explain the basic principles of GPS and its application in surveying.	10	CO5	L3
5		Define and explain EDM?	10	CO5	L3
6		Explain the working of remote sensing equipment.	10	CO5	L3
7		What are the advantages of LIDAR technology.	10	CO5	L4
8		Explain the working of total station.	10	CO5	L3

F. EXAM PREPARATION

1. University Model Question Paper

Course:	Advanced surveying					Month / Year	May /2018	
Crs Code:	18CV45	Sem:	4	Marks:	100	Time:	180 minutes	
-	**Note**	Answer all FIVE full questions. All questions carry equal marks.				**Marks**	**CO**	**Level**
1	a	Explain the following along with a neat sketch : i) Forward tangent ii) Point of curve iii) Deflection angle iv) Apex distance.				8	CO1	L1
	b	A reverse curve is to be set out to connect two parallel railway line 30m apart. The distance between the tangent points is I 50m. Both the arcs have the same radius. The curve is set out by method of ordinates from long chord taking a peg interval of 10m. Calculate the necessary data for setting the curve				8	CO2	L5
		OR						
2	a	With a neat sketch, list any four vertical curves.				8	CO1	L3
	b	Two tangents intersect each other at a chainage of 50+60, deflection angle being 50˚30'. its required to connect two tangents by a simple curve of 15 chain radius. Taking peg inetrval of 100 links, calculate the necessary data for setting out the curve by Rankines method of deflection angle. Take length of the chain as 20m= 100 links. Also write brief procedure for setting out the curve.				8	CO2	L5
3	a	Mention the points to be considered in the selection of triangular station				8	CO3	L1
	b	Triangulation station B was used in measuring angies and the instrument as necessary to shift to a satellite station S due south of main station B at a distance of 12.2111 from it. The line BS bisects the exterior angle A, B, C and the angles ASB and BSC were observed to be 30˚ 20' 30" and 29˚ 45' 6". When the station B was observed angles CAB and ACB were observed to be 59˚ 18' 26" and 60˚ 26' 12". The side AC computed to be 4248.5m from the adjacent triangle. Determine the correct value of the angle ABC.				8	CO4	L3
		OR						
4	a	What are important factors considered to be in selection of site for a base line ?				8	CO3	L2
	b	The observed angles α,β and γ from a station P with probable errors of measurement are given below; α= 78°12'12"±12", β= 136˚48'34"±4", γ+ 144˚59'8"±5" determine their corrected values.				8	CO4	L3
		OR						
5	a	Mention the properties of a spherical triangle.				8	CO5	L3
	b	Find the shortest distance between two points A & B, given A latitude - 18˚ 24' N longitude 36˚ 18 E B latitude - 68˚ 32' N longitude 126˚ 34 E.				8	CO6	L3
		OR						
6	a	Mention the general features of Photographic images.				8	CO5	L4
	b	Find the number of photography (size 250 x 250mm) required to cover over a area of 20km x I 6km of the longitudinal overlap is 60% and the side overlap is 30% scale the photograph is lcm= 150m.				8	CO6	L5
7	a	Find the number of photographLrs (size 250 x 250mm) required to cover over a area of 20km x I 6km of the longitudinal overlap is 60% and the side overlap is 30% scale the photograph is lcm= 150m.				8	CO7	L4
	b	Derive an expression for relief displac~ment on a vertical photograph.				8	CO8	L3

		OR			
8	a	A line AB 2.00 KM long, laying at an elevation of 500m measure 8.65cm on a vertical photograph of focal length of 20cm. Determine the scale of the photograph at an average elevation of 800m.	8	CO7	L4
	b	Define the terms: I) Tilt ii) Exposure stations iii) Principal point iv) ISO centre.	8	CO8	L2
9	a	Mention the advantages of total station and also discuss the working principles of the same.	8	CO9	L3
	b	Define Remote sensing. Explain the stages of idealized remote sensing system.	8	CO10	L2
		OR			
10	a	Explain the working of remote sensing equipment.	8	CO9	L4
	b	What are the advantages of LIDAR technology.	8	CO10	L3

2. SEE Important Questions

Course:	Advanced surveying					Month / Year	May /2018	
Crs Code:	18CV45	Sem:	4	Marks:	100	Time:	180 minutes	
	Note	Answer all FIVE full questions. All questions carry equal marks.				-	-	
Module	Qno.	Important Question				**Marks**	**CO**	**Year**
1	1	Explain the following along with a neat sketch : i) Forward tangent ii) Point of curve iii) Deflection angle iv) Apex distance.				16 / 20	CO1	2016
	2	Two tangents intersect at a chainage of 1 l 90m, the deflection angle 36˚. Compute all the data necessary to set out a curve of radius 300m by deflection angle method. The peg interval is 30m. Tabulate the results.					CO1	2016
	3	A reverse curve is to be set out to connect two parallel railway line 30m apart. The distance between the tangent points is I 50m. Both the arcs have the same radius. The curve is set out by method of ordinates from long chord taking a peg interval of 10m. Calculate the necessary data for setting the curve					CO2	207
	4	List the requirements of a transition curve (any four).					CO2	2017
	5	With a neat sketch, list any four vertical curves.					CO2	2016
2	1	Triangulation station B was used in measuring angies and the instrument as necessary to shift to a satellite station S due south of main station B at a distance of 12.2111 from it. The line BS bisects the exterior angle A, B, C and the angles ASB and BSC were observed to be 30˚ 20' 30" and 29˚ 45' 6". When the station B was observed angles CAB and ACB were observed to be 59˚ 18' 26" and 60˚ 26' 12". The side AC computed to be 4248.5m from the adjacent triangle. Determine the correct value of the angle ABC.				16 / 20	CO3	2016
	2	Explain the three kinds of errors.					CO3	2016
	3	The observed values of P, Q and Rat a station the angles being subjected to the condition that P +Q = R. P = 30˚ 12' 28.2" Q = 35˚ 48˚ 12.6" R = 66˚ O' 44.4" Find the most probable value of P, Q and R.					CO3	2017
	4	Explain the probability curve.					CO4	2017
	5	Triangulation station B was used in measuring angies and the instrument as necessary to shift to a satellite station S due south of main station B at a distance of 12.2111 from it. The line BS bisects the exterior angle A, B, C and the angles ASB and BSC were observed to be 30˚ 20' 30" and 29˚ 45' 6". When the station B was observed angles CAB and ACB were observed to be 59˚ 18' 26" and 60˚ 26' 12". The side AC computed to be 4248.5m from the adjacent triangle. Determine the correct value of the angle ABC.					CO4	2017

3	1	Find the shortest distance between two points A & B, given A latitude - 18˚ 24' N longitude 36˚ 18 E B latitude - 68˚ 32' N longitude 126˚ 34 E.	16 / 20	CO5	2016
	2	Define the following : i) Vertical circle ii) Azimuth iii) Altitude.		CO5	2016
	3	Explain Ecliptic and Solstices		CO5	2015
	4	Find the shortest distance between two places A & B given that the longitudes of A and B are 15˚ O' N and 12˚· 6' N and longitudes are 50˚ 12' E and 54˚ O' E respectively.		CO6	2015
	5	Define the terms: I) celestial sphere ii) hour angle iii) prime vertical iv) latitude of a place		CO6	2015
4	1	Find the number of photographLrs (size 250 x 250mm) required to cover over a area of 20km x I 6km of the longitudinal overlap is 60% and the side overlap is 30% scale the photograph is lcm= 150m.	16 / 20	CO7	2017
	2	Derive an expression for relief displac~ment on a vertical photograph.		CO7	2015
	3	Explain the procedure for aerial survey.		CO8	2016
	4	A vertical photograph was taken at a altitude of 1200 meters above mean sea level. Determine the scale of the photograph for a terrain lying at elevations of 80 meters and 300 meters if the focal length oft he camera is 15cm.		CO8	2015
	5	With a neat sketch, derive the expression for the scale of a vertical photograph.		CO8	2016
5	1	Define Remote sensing. Explain the stages of idealized remote sensing system.	16 / 20	CO9	2015
	2	What is GIS? Enumerate on GIS applications in civil engineering.		CO9	2016
	3	Explain the basic principles of GPS and its application in surveying.		CO9	2017
	4	Define and explain EDM?		CO10	2016
	5	Explain the working of remote sensing equipment.		CO10	2017
	6	What are the advantages of LIDAR technology.		CO10	2016

Course Outcome Computation

Academic Year:

Odd / Even semester

INTERNAL TEST	T1						T2						T3			
Course Outcome	CO1		CO2		CO3		CO4		CO5		CO6		CO7		CO8	
QUESTION NO	Q1	LV	Q2	LV	Q3	LV	Q1	LV	Q2	LV	Q3	LV	Q1	LV	Q2	LV
MAX MARKS																
USN-1																
USN-2																
USN-3																
USN-4																
USN-5																
USN-6																
Average CO Attainment																

LV Threshold : 3:>60%, 2:>=50% and <=60%, 1: <=49%
CO1 Computation :(2+2+2+3)/4 = 10/4=2.5

PO Computation

Program Outcome Weight of CO - PO	PO1		PO3		PO3		PO1		PO12		PO12		PO6		PO1	
Course Outcome	CO1		CO2		CO3		CO4		CO5		CO6		CO7		CO8	
Test/Quiz/Lab	T1						T2						T3			
QUESTION NO	Q1	LV	Q2	LV	Q3	LV	Q1	LV	Q2	LV	Q3	LV	Q1	LV	Q2	LV
MAX MARKS																
USN-1																
USN-2																
USN-3																
USN-4																
USN-5																
USN-6																
Average CO Attainment																