

Sona College of Technology (Autonomous), Salem – 636 005

Department of Civil Engineering

Advanced Diploma in LAND SURVEYING

CURRICULUM & SYLLABI

Academic year – 2021-22

I Year / I Semester

S. No.	Course Code	Course Title	L	T	P	C
Theory						
1.	DDS1	Basics of Surveying	4	0	0	4
2.	DDS2	Basics in Levelling	4	0	0	4
Laboratory						
	DDS3	Surveying LAB 1	0	0	4	2
Total Credits						10

I Year / II Semester

S. No.	Course Code	Course Title	L	T	P	C
Theory						
1.	DDS4	Theodolite and Tachometric Surveying	4	0	0	4
2.	DDS5	Total Station Surveying	4	0	0	4
Laboratory						
3	DDS6	Surveying LAB 2	0	0	4	2
Total Credits						10

II Year / III Semester

S. No.	Course Code	Course Title	L	T	P	C
Theory						
1.	DDS7	Modern Surveying	4	0	0	4
2.	DDS8	Advanced levelling	4	0	0	4
Laboratory						
3.	DDS9	Drone Lab 1	0	0	4	2
Total Credits						10

II Year / IV Semester

S. No.	Course Code	Course Title	L	T	P	C
Theory						
1.	DDS10	Global Informative System	4	0	0	4
2.	DDS11	Drone Surveying	4	0	0	4
Laboratory						
3.	DDS12	Drone Lab 2	0	0	4	2
Total Credits						10

SURVEYING LAB 1

L T P C

0 0 4 2

- 1) Measurement of distance by ranging and chaining.
- 2) Locating various objects by chain & cross staff surveying.
- 3) Determination of area of polygon by chain and cross staff survey.
- 4) Measurement of bearings of sides of traverse with prismatic compass and computation of correct included angle.
- 5) Locating given building by chain and compass traversing, (One full size drawing sheet)
- 6) Determination of elevation of various points with dumpy level by collimation plane method and rise & fall method.
- 7) Fixing benchmark with respect to temporary benchmark with dumpy level by fly leveling and check levelling.
- 8) L-Section and cross section of road. (One full size drawing sheet for L-Section and cross section)

REFERENCE BOOKS

- 1) Surveying and levelling Vol-I by T. P. Kanetkar & S. V. Kulkarni
- 2) Surveying and Levelling Vol-I by Dr. B. C. Punmia
- 3) Surveying and Levelling Vol-I by Hussain & Nagrani
- 4) Surveying by Mimi Das Saikia
- 5) Fundamentals of Surveying by S. K. Roy

TACHOMETRIC AND MODERN SURVEYING

L T P C

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UNIT-I Introduction on Theodolite Surveying 12

Introduction & Application of theodolite, Temporary and permanent adjustment of a theodolite, Definitions and various technical terms, Techniques for measuring horizontal angles and vertical angles, Other Application of Theodolite, Errors in theodolite work, Traversing using theodolite Closing errors and balancing of traverse, Gale's Traverse Table

UNIT-II TRIGONOMETRICAL LEVELLING 12

Introduction on trigonometric levelling, Techniques of observations (Direct and Reciprocal), Techniques of determining the elevation of a particular point – Signals and Towers - Satellite Station.

UNIT-III TACHEOMETRY 12

Introduction on tachometry, Purpose and Principles of tachometric surveying, Instruments used in Tachometry, Theory of Stadia Tachometry, Anallatic Lens, Techniques of Determining Tacheometer constants, Examples on Tachometer constants, Techniques of Tacheometry (Stadia & Tangential), Advantages and disadvantages of Tangential method, Examples on Horizontal Distance and R.L.

UNIT-IV GEODETIC SURVEYING AND THEORY OF ERRORS 12

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.

UNIT-V ADVANCED SURVEY EQUIPMENT'S 12

Introduction on advance surveying equipment's, Basics of Digital Theodolite, Introduction and Principles of E.D.M., Introduction and Basics of Total station, Parts of Total station, Advantages, disadvantages and uses of Total Station, Types of Total Station, Advancement in Total Station Technology, Automatic Target Recognition ATR, Surveying using Total Station, Flow chart of data collection, Fundamental Parameters of Total Station, Precautions to be taken while using Total Station

TOTAL: 60 HOURS

Reference Books

- 1) Surveying and levelling Vol-I & Vol-II by T. P. Kanetkar & S. V. Kulkarni
- 2) Surveying and Levelling Vol-I & Vol-II by Dr. B. C. Punmia
- 3) Surveying and Levelling Vol-I & Vol-II by Hussain & Nagrani
- 4) Surveying and Levelling Vol-I & Vol-II by S. K. Duggal

TOTAL STATION SURVEYING

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UNIT I FUNDAMENTALS OF TOTAL STATION AND ELECTROMAGNETIC WAVES 12

Basic Principles of Total Station, Historical Development, Classifications, applications and comparison with conventional surveying. Classification - applications of Electromagnetic waves, Propagation properties, wave propagation at lower and higher frequencies- Refractive index (RI) - factors affecting RI-Computation of group for light and near infrared waves at standard and ambient conditions-Computation of RI for microwaves at ambient condition - Reference refractive index- Real time application of first velocity correction. Measurement of atmospheric parameters- Mean refractive index- Second velocity correction -Total atmospheric correction- Use of temperature - pressure transducers.

UNIT II ELECTRO-OPTICAL AND MICROWAVE SYSTEM 12

Electro-optical system: Measuring principle, Working principle, Sources of Error, Infrared and Laser Total Station instruments. Microwave system: Measuring principle, working principle, Sources of Error, Microwave Total Station instruments. Comparison between Electro-optical and Microwave system. Care and maintenance of Total Station instruments – Traversing and Trilateration-COGO functions, offsets and stake out-land survey applications.

UNIT III SATELLITE SYSTEM 12

Basic concepts of GPS - Historical perspective and development - applications - Geoid and Ellipsoid- satellite orbital motion - Keplerian motion – Kepler's Law - Perturbing forces - Geodetic satellite - Doppler effect - Positioning concept –GNSS, IRNSS and GAGAN - Different segments - space, control and user segments - satellite configuration – GPS signal structure - Orbit determination and representation - Anti Spoofing and Selective Availability - Task of control segment - GPS receivers.

UNIT IV GPS DATA PROCESSING 12

GPS observables - code and carrier phase observation - linear combination and derived observables - concept of parameter estimation – downloading the data RINEX Format – Differential data processing – software modules -solutions of cycle slips, ambiguities, Concepts of rapid, static methods with GPS - semi Kinematic and pure Kinematic methods - satellite geometry & accuracy measures - applications- long baseline processing- use of different softwares available in the market.

UNIT V Hydrographic, Mine and Cadastral Surveying 12

Reconnaissance – Route surveys for highways, railways and waterways – Hydrographic surveyTides – MSL – Sounding methods – Three point problem – River surveys – Measurement of current and discharge – Mine surveying Equipment – Weisbach triangle – Tunnel alignment and setting out – Transfer of azimuth – Gyro Theodolite – Shafts and audits – Cadastral survey- Legal – Real – Taxcadastre – Land record system – Settlement procedure – deformation studies.

TOTAL: 60 HOURS

REFERENCES:

1. R. Subramanian, Surveying and Levelling, Oxford University Press, Second Edition, 2012.
2. Laurila, S.H. Electronic Surveying in Practice, John Wiley and Sons Inc, 1993.
3. Guocheng Xu, GPS Theory, Algorithms and Applications, Springer - Verlag, Berlin, 2003.
4. Alfred Leick, GPS satellite surveying, John Wiley & Sons Inc., 3rd Edition, 2004.
5. Seeber G, Satellite Geodesy, Walter De Gruyter, Berlin, 1998

Surveying LAB 2

L T P C

0 0 4 2

List of Experiments

1. Study of Theodolite and its accessories.
2. Measurement of horizontal angles with theodolite by method of repetition.
3. Measurement of horizontal angles with theodolite by method of reiteration.
4. Determination of horizontal distance between two inaccessible points with theodolite.
5. To determine heights and distances by using stadia tachometric Principles.
6. To determine heights and distances by using tangential tachometric Principles.
7. To determine heights and distances by using triangulation – Single and Double Plane Method.
8. Setting Out a Simple Curve by Means of Offsets from Long Chord.
9. Field work by using Total Station.

Reference Books

1. Arora K. R, “Surveying Vol. I and II”, Standard Book House, 2015
2. Duggal S.K, “Surveying Vol. I and II”, Tata McGraw Hill, New Delhi, 2013.

MODERN SURVEYING

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UNIT 1 Curve Surveying **12**

Curves – Necessity – Types, Simple curves, Elements, Designation of curves, setting out simple curves by linear methods (numerical problems on offsets from long chord & chord produced method), Setting out curves by Rankine’s 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).

UNIT II Geodetic Surveying and Theory of Errors **12**

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.

UNIT III Introduction to Field Astronomy: **12**

Earth, celestial sphere, earth and celestial coordinate systems, spherical triangle, astronomical triangle, Napier’s rule

UNIT IV Aerial Photogrammetry **12**

Introduction, Uses, 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

UNIT V Modern Surveying Instruments **12**

Introduction, Electromagnetic spectrum, Electromagnetic distance measurement, Total station, Lidar scanners for topographical survey. Drone surveying. Remote Sensing: Introduction, Principles of energy interaction in atmosphere and earth surface features, Image interpretation techniques, visual interpretation. Digital image processing, Global Positioning system Geographical Information System: Definition of GIS, Key Components of GIS, Functions of GIS, Spatial data, spatial information system Geospatial analysis, Integration of Remote sensing and GIS and Applications in Civil Engineering(transportation, town planning).

TOTAL: 60 HOURS

Reference Books:

1. S.K. Duggal, “Surveying Vol.I & II”, Tata McGraw Hi ll Publishing Co. Ltd. New Delhi.
2. R Subramanian, Surveying and Leveling, Second edition, Oxford University Press, New Delhi.

3. David Clerk, Plane and Geodetic Surveying Vol1 and Vol2, CBS publishers
4. B Bhatia, Remote Sensing and GIS , Oxford University Press, New Delhi.

ADVANCED LEVELLING

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UNIT I INTRODUCTION

12

Levelling-Modern Methods - Advanced Instruments used in levelling - Automatic level- tilting level- Telescopic staff- Measurements and calculation of Height of collimation- Reduced level and Rise, Fall calculation by using Advanced Instruments

UNIT II CONTOURING

12

Contour Detection- Detecting Contours in an Image- Drawing the Detected Contours- Pre-processing images For Contour Detection- Contour Retrieval Modes- Contour Manipulation- Sorting Contours in terms of size- Contour Analysis- Image Moments- Contour Properties- Contour hierarchies & Approximation Methods- Contour Analysis- Detect Enclosed Screens in Objects - Applications and characteristics of contours.

UNIT III TRIGNOMETRICAL LEVELLING

12

Trigonometrical levelling- Heights and distances- Base of the object is Accessible and inaccessible- Determination of the elevation of objects by Single plane method-Determination of the elevation of Double plane method.

UNIT IV ASTRONOMICAL & TOPOGRAPHICAL LEVELLING

12

Astronomy in the era of Copernicus-Tycho,Kepler and Galileo;Keplers laws of planetary Motion- Review of Classical Mechanics-Circular Orbits-Introduction to electromagnetic waves-Reflection-Refraction-Optics-Optical Radio and electrical Telescopes-Distances and Magnitudes.

UNIT V CURVES

12

Curve Surveying-Curves – Necessity – Types, Simple curves, Elements, Designation of curves, setting out simple curves by linear methods, Transition curves Characteristics, Vertical curves – Types.

TOTAL: 60 HOURS

Reference Books:

1. Punmia B.C, “Surveying, Vol. I and II”, Laxmi Publications, 2016.
2. Basak N.N, “Surveying and Levelling”, Tata Mc Graw Hill Publishing Company Ltd.,
3. Arora K. R, “Surveying Vol. I and II”, Standard Book House, 2015
4. Duggal S.K, “Surveying Vol. I and II”, Tata McGraw Hill, New Delhi, 2013.

DDS9

Drone Lab 1

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COURSE OUTCOMES (On completion of the course, the students will be able to):

1. Use UAV to Calculate Flight Planning
2. Advanced softwares used in Boundary setting
3. Measurement of Aerial and Topography Mapping

COURSE CONTENT S

1. Study About UAV Flight Planning
2. Establish Ground Control Points.
3. Boundary setting and Data Collection by using Flight Mapping.
4. Measure UAV Data Processing Orthomosaic Maps using 3D Point Cloud
5. Calculate Aerial Mapping using Drones
6. Calculate Topography Mapping Using Drones

TOTAL: 60 PERIODS

GLOBAL INFORMATIVE SYSTEM

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UNIT I MODERN SURVEYING EQUIPMENT 12

E.D.M. Instruments – Geodimeter, Tellurometer, Distomat, Total Station, Applications of Lasers in distance and angular measurements, Introduction of Electronic navigation and Position Fixing – different systems and their Characteristics.

UNIT II GLOBAL POSITIONING SYSTEM 12

Global Positioning System – working principle and methods, Different Approaches to use GPS and their accuracies, Advantages of GPS in Navigation, Survey, Planning and Mapping.

UNIT 3 GEOGRAPHIC INFORMATION SYSTEM 12

Geographic Information System – data requirement and database creation; Use of field data, maps, aerial and satellite data; Advantages of GIS

UNIT 4 GIS ANALYSIS 12

Types of GIS analysis, map topology, map feature elements, queries, features in a topographic base map, base map accuracy standards.

UNIT 5 SURVEYING MAPPING THROUGH SOFTWARE 12

Introduction of ARC Info, ARC View, ARC Gms, Intergraph, MGE, Modular GIS Environment, Map Info and Geomedia web map, etc

TOTAL: 60 HOURS

Reference Books:

- 1) Surveying (Vol – I, II & III) – Arora, K.R. (Standard Book House, Delhi, 1993)
- 2) Elements of Photogrammetry – Wolf, P.R. (McGraw Hill Book Company, New Delhi.)
- 3) Solving Problems in Surveying – Bannister, A. and Baker, R. (Longman Scientific Technical, U.K., 1994)
- 4) Electronic Distance Measurement – Burnside, C.D. (Oxford, BSP Professional Books, London, 1991)
- 5) Engineering Surveying Technology – Kennie, T.J.M. and Petrie, G. (Blackie & Sons Ltd., London, 1990)

DRONE SURVEYING

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UNIT 1 INTRODUCTION TO DIGITAL CAMERA 12

Basic types of digital cameras used in UAV's, how a CCD and CMOS sensor work, Bayer Filter basics, Pixel size and signal to noise.

UNIT II TYPES OF SHUTTERS HOW THESE EFFECT REMOTELY SENSE 12

Electromagnetic spectrum, Atmosphere interactions / scattering, IFOV – Instantaneous Field of View, Types of resolution, Spatial (GSD), Spectral (multispectral, hyperspectral), Radiometric (bit depth / dynamic range), Temporal, Types of sensors used in unmanned aerial survey, Passive Vs Active

UNIT III GEOMETRIC DISTORTIONS FROM PLATFORM AND SENSOR 12

Errors caused by platform (UAV) movement , Pitch , Roll, Yaw, Altitude, Velocity, Types of UAV airframes and how they relate to platform errors, Geometric errors caused by sensor, Rolling shutter effects, Lens distortion effects

UNIT IV UAV SURVEY DESIGN AND BASICS PRINCIPLES 12

Flight line orientation block and linear features, Overlaps forward and side, Effects of terrain on overlaps, Airbase and run spacing calculations, Stereo imagery base / height ratio, Ground Sample Distance + how to calculate, Forward Image movement calculations, Sun angle calculations and effects, Ground control design and layout, GPS airstation basic

UNIT V DATA OUTPUT AND ERROR ANALYSIS 12

Data Input Output Devices - Raster and Vector Data Display Devices - Printers, Plotters. - Sources of Errors - Types of Errors - Elimination of Errors - Precision and Accuracy

TOTAL: 60 HOURS

REFERENCE BOOKS

- 1) MGarvit Pandya, Basics of Unmanned Aerial Vehicles: Time to start working on Drone Technology , Notion Press (6 March 2021)
- 2) Elangovan K., “GIS: Fundamentals, Applications and Implementations”, New India Publishing Agency, New Delhi, 2006

DDS12

Drone Lab 2

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0 0 4 2

COURSE OUTCOMES (On completion of the course, the students will be able to):

- 1 Application of Post Processing Softwares
- 2 Calculate 2d &3d Reality Modelling.

Course Contents

1. Study About Post Processing Softwares In Drone Surveying
2. 3d Reality Modelling with Bentley Context capture Using Unmanned Aerial Vehicle.
3. Identify 2d &3d Reality Modelling with Google Earth Pro and Drone deploy Software Using Unmanned Aerial Vehicle.
4. Analyze 2d &3d Reality Modelling With AGI SOFT Metashape Software Using Unmanned Aerial Vehicle.
5. Evaluate Contour Maps by using Unmanned Aerial Vehicle.

TOTAL: 60 PERIODS