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

Department of Civil Engineering

Advanced Diploma in DRONE TECHNOLOGY

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 remote surveying and GIS	4	0	0	4
2.	DDS2	Advanced Surveying	4	0	0	4
Laboratory						
3.	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	Post processing in drone surveying	4	0	0	4
2.	DDS5	Digital Marketing	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	Advanced photogrammetry	4	0	0	4
2.	DDS8	Advanced aerial systems and applications	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	Image processing	4	0	0	4
2.	DDS11	Graphics Designing	4	0	0	4
Laboratory						
3.	DDS12	Drone Lab 2	0	0	4	2
		Total Credits				10

BASICS OF REMOTE SENSING AND GIS

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UNIT-I REMOTE SENSING 12

Definition - Physics of Remote Sensing - Electromagnetic Radiation (EMR) - Blackbody Radiation - Planck's Law - StefanBoltzmann Law - Wien's Displacement Law - Components of Remote Sensing - Atmospheric Windows and Blinds - Interaction of EMR with atmosphere, and Earth's surface: soil, water and vegetation - Remote Sensing Platforms and Sensors – Image Interpretations

UNIT-II GEOGRAPHICAL INFORMATION SYSTEM 12

Maps - Classification of Maps - Map Scale - Map Projections - Grouping of Map Projections - Commonly used Map Projections and their Comparison- GIS - Historical Development of GIS - Components of GIS - Data - Types of Data - Spatial and Non-spatial - Vector Data - Point, Line, Polygon - Raster Data - Database Structures - Vector and Raster Data Structures - Files - File Formats

UNIT-III DATA ANALYSIS AND MODELLING 12

Data Retrieval - Query - Spatial Analysis - Overlay - Vector Data Analysis - Raster Data Analysis - Modelling in GIS – Digital Elevation Model - Cost and Path Analysis - Network Analysis - Expert Systems - Artificial Intelligence - Integration with GIS

UNIT-IV 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

UNIT-V SOFTWARES FOR GIS AND REMOTE SENSING 12

Data processing using RS and GIS software, Case study using software, Hands on training session to process the drone data

TOTAL: 60 HOURS

REFERENCE BOOKS

1. Kumar S., " Basics of Remote Sensing and GIS", Laxmi Publication (P) Ltd
2. Elangovan K., "GIS: Fundamentals, Applications and Implementations", New India Publishing Agency, New Delhi, 2006
3. 2. Kang- Tsung Chang ," Introduction to Geographical Information System", Tata McGraw Hill, 2002

ADVANCED SURVEYING

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UNIT I THEODOLITE 12

Introduction to theodolite - Uses of theodolite - Reading of main and vernier scale on horizontal and vertical plate - Temporary adjustment of a theodolite - Permanent adjustment of theodolite - Methods of measuring horizontal angles and vertical angles - Errors in theodolite work and Theodolite Traversing - Traverse computations - Closing errors, Balancing the traverse

UNIT II TRIGONOMETRICAL LEVELLING 12

Introduction - Methods of observations (Direct and Reciprocal) - Methods of determining the elevation of a particular point - when base of the object is accessible - when base of the object is inaccessible - Related examples using all methods

UNIT III TACHEOMETRY 12

Introduction -Purpose and Principles of tacheometric surveying - Instruments used in Tacheometry - Theory of Stadia Tacheometry - Methods of determining constants of a Tacheometer - Methods of Tacheometry - Method of Fixed Hair : - When line of sight is horizontal and staff held vertically - When line of sight is inclined and staff held vertically (Angle of Elevation & Depression) - Advantages and disadvantages of Tangential method

UNIT IV CURVES 12

Introduction - Types of circular curves - Definitions and notations - Designation of curve - Relation between Radius and degree of curve - Elements of simple circular curve - Setting out simple circular curve - Methods of setting out simple circular curves - Transition curves - Requirements and purpose of it. - Vertical curves

UNIT V ADVANCED SURVEY EQUIPMENTS 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. B.C. Punmia, “Surveying Vol.2”, Laxmi Publications pvt. Ltd., New Delhi, 2018
2. K.R. Arora, “Surveying Vol. 1” Standard Book House, New Delhi, 2019
3. T.M Lillesand,. R.W Kiefer,. and J.W Chipman, Remote sensing and Image interpretation , 5th edition, John Wiley and Sons India
4. S.K. Duggal, “Surveying Vol.I & II”, Tata McGraw Hi ll Publishing Co. Ltd. New Delhi,2019
5. R Subramanian, Surveying and Leveling, Second edition, Oxford University Press, New Delhi, 2012

SURVEYING LAB 1

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List of Experiments

1 Survey of an area by Chain Survey (Closed Traverse) & Plotting

2 Chaining across Obstacles

3 Determination of two inaccessible points with Compass

4 Survey of a given area by Prismatic Compass (Closed Traverse) and plotting after adjustment

5 Radiation, Intersection Methods of Plane Table Surveying

6 Two Point and Three Point Problem in Plane Table Survey

7 Traversing by Plane Table Surveying

8 Fly Leveling (Differential Leveling)

9 An exercise of L.S. and L. S. and Plotting

10 Two Exercises on Contouring

TOTAL: 60 HOURS

POST PROCESSING IN DRONE SURVEYING

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UNIT -1 AGISOFT METASHAPE PRO, PHOTOGRAMMETRY SOFTWARE 12

PhotoScan – application available in Standard and Pro versions- automatic generation- classifiable dense point clouds- textured polygon models (3D model)- geo-referenced orthomosaics-DSM-Digital Surface Models (DEM-Digital Elevation Model)- Digital Terrain Models (DTM)**.**

UNIT –II DATA GEO REFERENCING WITH RTK, PPK OR RPK METHOD 12

position and orientation system (POS) data-Ground control points (GCPS)- Google Earth coordinates-metric accuracy-automatic mode based on the positioning metadata-PPK (Post Processed Kinematics)- RPK (Re-processed Kinematics)- GeotagZ software from Septentrio-GNSS reception base-Septentrio Altus-NR3-RINEX data-fixed base in real time (via NTRIP) or in PPK.

UNIT-III GLOBAL MAPPER, GIS SOFTWARE 12

Stand-alone spatial data management software-Topographs-points clouds, orthophotos or DSM/DTM-Blue Marble Geographics-Global Mapper, LIDAR module and GeoCalc-accurate map creation-optimized spatial data management-powerful analytics tools-Terrain Analysis and 3D Data Processing-Raster and vector creation and editing features-intuitive drawing to image correction and vectorization-Advanced Attribute Editing and Real-Time Hill Shade Rendering.

UNIT IV PYTHAGORAS CAD AND GIS 12

Mapping solution for all your geodata- 360° compatible-Land Surveying- drawing and calculation tools- Agriculture- Soils analysis, crop monitoring, irrigation and growth management, damage detection and creating machine control- GPS data and UAV images allows to create 3D models-Mining- 3D models, excavation reports, contour lines, profiles and cross sections.

UNIT- V UAV DATA PROCESSING 12

Orthomosaic Maps- 3D Point Cloud- Digital Surface Models (DSM)- Digital Terrain Models (DTM)- Contour Maps-3D textured mesh

TOTAL : 60 HOURS

REFERENCE BOOKS

1) Garvit Pandya, Basics of Unmanned Aerial Vehicles: Time to start working on Drone Technology , Notion Press (6 March 2021)

2) PK Garg, Introduction To Unmanned Aerial Vehicles, New Age International Publishers New Age International Private Limited; First edition (1 October 2020); NEW AGE International Pvt Ltd

3) Kike Calvo, So You Want to Create Maps Using Drones?

DIGITAL MARKETING

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UNIT-I INTRODUCTION TO DIGITAL MARKETING 12

Marketing- Understanding Digital Marketing Process - Types of visibility - Bringing Targeted Traffic - Inbound and outbound marketing

UNIT-II DIGITAL MARKETING VS. TRADITIONAL MARKETING 12

Benefits of Traditional Marketing - Benefits of Digital Marketing - Tools of Digital Marketing –The Downside to Traditional Marketing – Use of Both Digital & Traditional Marketing

UNIT-III SEARCH ENGINE OPTIMIZATION 12

Introduction to SERP - search engines - Major functions of a search engine - Different types of keywords - Keywords research process - On-Page SEO - Off-Page SEO - Meta Tags, Description

UNIT-IV SOCIAL MEDIA MARKETING 12

Understanding the existing Social Media – Forms of Internet marketing - Types of advertising - Targeting in ad campaign - Setting up conversion tracking - Video Marketing - Benefits of video marketing - Targeting Options - Understanding Bid Strategy

UNIT-V GOOGLE ANALYTICS & ADWORDS 12

Google analytics - google adwords & online display advertising - email marketing - lead generation for business - content marketing - affiliate marketing

Reference Books

1. eMarketing – The Essential Guide to Online Marketing author Saylor Academy | Source: Saylor Academy

2. Internet Marketing author Alex Trengove Jones, Anna Malczyk, Justin Beneke | Source: University of Cape Town UCT

3. Digital Marketing For Dummies Book by Russ Henneberry and Ryan Deiss

SURVEYING LAB 2

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0 0 4 2

List of Experiments

1. Identify linear measurement instruments: Chain, tape, EDM
2. Demonstration of components of chain (tally, link etc) folding & unfolding of chain, tape etc
3. Demonstration of ranging and chaining operations
4. Plan, map and various scales, draw plan of any building with different scales
5. Demonstrate offsets and its utility for locating point: Perpendicular off and Oblique offset. Methods of obtaining perpendicular offset
6. Angular measurement devices: Prismatic & Surveyor compasses, EDM
7. Demonstration of taking reading on compass & explanation of Bearing & meridian
8. Numericals based on WCB & RB
9. Determine bearings of different survey lines by using Compass
10. Determine included angles from measured bearings.
11. Demonstration of height (Elevation) measuring devices: dumply level, theodolite, Total station
12. Concept of Benchmark, RL, MSL, line of colimation
13. Height of instrument method to calculate RL
14. Rise and fall method to estimate RL

TOTAL: 60 HOURS

ADVANCED PHOTOGRAMMETRY

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Unit- I Introduction **12**

Photogrammetry- metric photogrammetry- interpretative photogrammetry- Types of Photographs- Terrestrial photographs- Aerial photography- Taking Vertical Aerial Photographs- Existing Aerial Photography- Application of Photogrammetry- Photogrammetry and Geographic Information Systems

Unit- II Principles of Photogrammetry **12**

Theory of Photogrammetric Orientation- Photographic Resolution- Ground Coverage- 3D Rotation- Photogrammetric Techniques- photographic devices- Instruments for Traditional and Digital Photogrammetry- 3D Visualization

Unit III Digital Photogrammetry **12**

Ground sampling distance-Photogrammetric Measurements- Using stereoscopic aerial photographs-Digital photogrammetric techniques-Relating Focal length to altitude-Scale of vertical aerial photo over variable terrain-Height measurement from single aerial photos-Relief Displacement –Digital Photogrammetric station.

Unit IV Photogrammetric Triangulation and Digital Image Processing **12**

Triangulation-Methods of Photogrammetric Triangulation-Aerial Triangulation- Inputs for Aerial Triangulation-Semi Analytical Of Blocks-Self Calibrating Bundle Adjusment-Vanishing point-Analog steroploters-Components of Analog Steroploters

Unit V Generation of Digital Terrain Models and Ortho Models **12**

Digital Terrain Model- Sources of DTM-Field survey-LIDAR-Photogrammetry survey-Digitalised Contour- Radar and satellite images- Different approaches for acquisition of DTM- Process of DTM Photogrammetry-TIN (Triangulated Irregular Network)- DEM Production- DTM Evaluation / Accuracy- Systematic Errors in DTM

TOTAL : 60 HOURS

REFERENCE BOOKS

1) Krauss, K., [1997]. Photogrammetry, Volume 2: Advanced Methods and Applications, 4th Edition, Dummler/Bonn. ISBN 3-427-78694-3 Provides an overview of the photogrammetric principles and their application for object space reconstruction from imagery.

2) Mikhail, E., Bethel, J. and McGlone, J., [2001]. Introduction to Modern Photogrammetry, John Wiley & Sons, Inc. ISBN 0-471-30924-9 Provides an overview of the impact of modern photogrammetric and remote sensing systems on photogrammetric mapping.

3) Schenk, T., [1999]. Digital Photogrammetry (Volume I): Background, Fundamentals, Automatic Orientation Procedures, TerraSience. ISBN 0-9677653-1-5

ADVANCED AERIAL SYSTEMS AND APPLICATIONS

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UNIT I ASTRONOMICAL SURVEYING 12

Astronomical terms and definition – Motion of sun and stars – Celestial co-ordinate System - Time system - Nautical Alamance – Apparent attitude and corrections – Field observations and determinations of time, longitude, latitude and azimuth by attitude and Hour angle method.

UNIT II AERIAL SURVEYING 12

Terrestrial Photogrammetry – Terrestrial stereo photogrammetry – Aerial photogrammetry – overlaps – scale of photographs – Vertical and titled photographs distortion in aerial photographs – stereostopic vision - photo interpretation – Applications.

UNIT III TOTAL STATION SURVEYING 12

Classification – basic measuring and working principles of an Electro – optical and Microwave total station- sources of errors in Electro – optical and Microwave total station – Care and Maintenance of total station – trilateration – Applications.

UNIT IV GPS SURVEYING 12

Basic concepts – Space, Control and User segments – Satellite configuration – Signal structure – Orbit determination and representation – Antispoofing and selective availability – hand held and geodetic receivers – Field work procedure – Data processing Applications.

UNIT V MISCELLANEOUS 12

Reconnaissance – Rout surveys for highways, railways and waterways – simple, compound, reverse, transition and vertical curve – setting out methods - hydrographic surveying – tides – MSL – Sounding methods – measurement of current and discharge – Tunnel alignment and setting out – Settlement and Deformation studies.

TOTAL : 60 HOURS

REFERENCE BOOKS

1. B.C. Punmia, “Surveying Vol.2”, Laxmi Publications pvt. Ltd., New Delhi, 2018
2. K.R. Arora, “Surveying Vol. 1” Standard Book House, New Delhi, 2019
3. T.M Lillesand,. R.W Kiefer,. and J.W Chipman, Remote sensing and Image interpretation , 5th edition, John Wiley and Sons India
4. S.K. Duggal, “Surveying Vol.I & II”, Tata McGraw Hi ll Publishing Co. Ltd. New Delhi,2019
5. R Subramanian, Surveying and Leveling, Second edition, Oxford University Press, New Delhi, 2012

DRONE LAB 1

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List of Experiments

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

1. Use UAV to Calculate Flight Planning
2. Advanced software's 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 HOURS

IMAGE PROCESSING

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UNIT I INTRODUCTION 12

Definition of digital image, pixels, representation of digital image in spatial domain as well as in matrix form, Block diagram of fundamentals steps in digital image processing, application of digital image processing system, Elements of Digital Image, Processing systems, Basic Concepts in Sampling and Quantization, Representing Digital Images

UNIT IIIMAGE SEGMENTATION 12

Definition, Similarity and Discontinuity based techniques, Point Detection, Line Detection, Edge Detection using Gradient and Laplacian Filters, Mexican Hat Filters, Edge Linking and Boundary Detection, Hough Transform, Mat lab applications in image segmentation.

UNIT III INTRODUCTION TO MORPHOLOGICAL IMAGE PROCESSING 12

Logic Operations involving binary images, Introduction to Morphological Image Processing, Definition of Fit and Hit, Dilation and Erosion, Opening and Closing

UNIT IV REGISTRATION AND IMAGE FUSION 12

Registration - Preprocessing, Feature selection - points, lines, regions and templates Feature correspondence - Point pattern matching, Line matching, Region matching, and Template matching. Image Fusion - Overview of image fusion, pixel fusion, and wavelet based fusion -region based fusion.

UNIT V 3D IMAGE VISUALIZATION 12

Sources of 3D Data sets, Slicing the Data set, Arbitrary section planes, The use of color, Volumetric display, Stereo Viewing, Ray tracing, Reflection, Surfaces, Multiple connected surfaces, Image processing in 3D, Measurements on 3D images, Advanced software for image visualization

TOTAL: 60 HOURS

REFERENCE BOOKS

1) Gonzalez & Woods, ―Digital Image Processing, 3rd ed., Pearson education, 2008

2) ain Anil K., ―Fundamentals Digital Image Processing, Prentice Hall India, 2010

GRAPHICS DESIGNING

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UNIT I CONCEPT OF GRAPHIC DESIGN 12

Graphic Design: A branch of visual art which concerns itself usually with visual communication (information to be read). In other words, it is a form of communication that uses visual images to convey messages. These visual images may include letters, photographs, symbols, drawings and colour.

UNIT II SIGNS AND SYMBOLS 12

Developing ideas from the environment, Characteristics of signs and symbols

Types and uses, Traditional and Symbols, Environmental graphics

UNIT III THE ROLE OF GRAPHIC DESIGNER IN THE SOCIETY 12

Analysing the role of Graphic Design in the Society:Graphic designers educate, warn, inform, notify, entertain, etc. social, cultural, economic, religious, health, political, educational roles, various job titles and practitioners in graphic design in terms of business advertising, marketing, publishing, transportation, electronic and print media,

UNIT IV PRINTING TECHNOLOGY 12

Printing - Offset Printing - Lithography - explain the principle involved in lithography- Gravure - explain the principle involved in gravure.electronic printing devices.

UNIT V STAGES IN DESIGN PROCESS 12

Problem identification and specification, Preliminary studies (Research), Suggestion of possible solution through pre-imaging/visualization, Idea development through thumbnail sketches, Rough sketches/layouts, Comprehensive sketches/layouts, finished sketches/layout

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REFERENCE BOOKS

1. Designing Effective Communications (2001): Creating Contexts for Clarity and Meaning .by Jorge Frascara (Editor) Publisher: Allworth Press.U.S.A. First edition

2. Golden trends in Printing Technology (1996);by V S Krishnamurthy. Sage publications. New delhi. First edition.

3. Graphic Communication (1999) by Aruthur Turnbull. Sage publications. New Delhi, INDIA. First edition.

DRONE LAB 2

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List of Experiments

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 HOURS