SUBJECT CODE	SUBJECT NAME	PERIOD PER WEEK		CREDIT
		T	P	C
26462	ADVANCED SURVEYING	2	3	3

Rationale	Advanced surveying is the most important subject of the diploma in civil, architecture and surveying engineering student. It helps them to implement of projects and other stakeholders. It is a branch of surveying, the object of which is to establish or verify or measure the height, distance of specified points relative to a datum or reference points. It is widely used in cartography to measure geodetic height and in construction to measure height differences of construction artifacts. It is also used in different method, angle and bearing measurement with digital theodolite, traversing, topography by total station. It also deals with the GPS receiver to identify relative position of global format, GIS application in projects area, digital mapping by survey drone and Multibeam Eco-sounder.
Learning Outcome (Theoretical)	**After undergoing the subject, students will be able to** 1. Describe the Field Astronomy. 2. Interpret latitude and longitude of a place. 3. State the uses of digital theodolite. 4. Illustrate total station. 5. Explain Global Positioning System (GPS). 6. Explain Geographic Information Systems (GIS). 7. Describe Geodetic surveying. 8. Explain Real-Time Kinematic (RTK) Surveying. 9. Describe the operation of survey drone. 10. State operation procedure of Multibeam Echo Sounder.
Learning Outcome (Practical)	**After undergoing the subject, students will be able to** 1. Determine height and distance of Tower /Building using total station. 2. Conduct a Digital Topographic Survey with total station and plot maps including computation of areas. 3. Plot a Topographical survey map with the help of plotter/printer using different scale. 4. Perform layout plan of a high-rise Building 5. Measure the latitude and longitude of a place using GPS receiver. 6. Conduct a geodetic survey using GPS receiver and plot maps 7. Prepare a Base Map showing all features in standard GIS format. 8. Prepare a DEM map showing all existing /proposed infrastructure in GIS format. 9. Plot base/DEM map in different scale with plotter/ printer. 10. Transfer a SOB BM using leveling operation in a project area. 11. Perform GPS survey using RTK system. 12. Perform Drone survey using survey drone.

DETAILED SYLLABUS (THEORY)

Unit	Topics with Contents	Class (1 Period)	Final Marks
1	**FIELD ASTRONOMY** 1.1 Define Spherical trigonometry, small circle, Great circle, Celestial sphere, Zenith, Nadir, Celestial horizon, Visible horizon, Polar equator and Polar axis. 1.2 Define Celestial equator, Celestial poles, Prime vertical, Ecliptic, Nautical mile, Altitude and azimuth, Declination and Right ascension, Declination and Hour angle, 1.3 Define Culmination, Circumpolar star, Astronomical triangle, Spherical triangle, Spherical excess, Polaris, Meridian, Azimuth, latitude and longitude. 1.4 Determine the length of a great circle arc. 1.5 Determine the length of a small circle arc. 1.6 Mention the properties of a spherical triangle. 1.7 State spherical coordinate system with classification. 1.8 State altitude and azimuth system. 1.9 State declination and hour angle system. 1.10 State the declination and right ascension.	**3**	**4**
2	**TIME** 2.1 State Sidereal time, Apparent solar time, mean solar time, Local time, Local mean time, Greenwich mean time and Standard time. 2.2 Describe the equation of time. 2.3 Define standard time, local mean time and Greenwich Mean Time. 2.4 Convert standard time to local mean time and vice versa. 2.5 Convert local time to Greenwich Mean Time and vice versa. 2.6 Solve problem on Conversion of time.	**3**	**6**
3	**DIGITAL THEODOLITE** 3.1 Define digital theodolite. 3.2 Describe the components of digital theodolite with function. 3.3 Compare between digital theodolite and analog theodolite. 3.4 Describe the setting procedure of digital theodolite. 3.5 State the procedure to measure horizontal angle by digital theodolite. 3.6 Describe the procedure to measure vertical angle digital theodolite. 3.7 Explain the procedure of measuring magnetic bearing of a line.	**3**	**6**
4	**TOTAL STATION** 4.1 Define total station. 4.2 Explain the function of total station. 4.3 Mention the procedure of centering and leveling. 4.4 Describe the procedure of EDM setting in the total station. 4.5 State the procedure of measuring horizontal, vertical and slope distance with total station. 4.6 Explain 3-D co-ordinates. 4.7 State the procedure of entering instrument station data. 4.8 Mention the procedure of azimuth angle setting.	**3**	**6**

	4.9 Describe the procedure of 3-D co-ordinates measurement.		
5	**RESECTION AND SETTING OUT MEASUREMENT** 5.1 Explain co-ordinates resection measurement. 5.2 Describe height resection measurement. 5.3 Illustrate distance setting out measurement. 5.4 Explain co-ordinates setting out measurement. 5.5 Describe remote elevation measurement (REM) and setting out measurement.	**2**	**5**
6	**GEODETIC SURVEYING** 6.1 Define Geodetic surveying. 6.2 Explain the purposes of Geodetic surveying. 6.3 Define geodetic control point. 6.4 Explain horizontal and vertical control points. 6.5 Mention the Standard Geodetic datum in the World. 6.6 State Geographic Coordinate System (GCS). 6.7 Define Universal Transverse Mercator (UTM) System. 6.8 Convert GCS to UTM and vise-versa. 6.9 Mention the uses of Geographic Tools 6.10 Define Bangladesh Universal Transverse Mercator (BUTM) System.	**3**	**6**
7	**OPERATION AND USES OF GPS RECEIVER** 7.1 Explain Global Positioning System (GPS). 7.2 Describe the working principles of GPS receiver. 7.3 Mention different features of GPS receiver. 7.4 Describe operational process of the instruments related to GPS. 7.5 State the procedure of finding co-ordinates of a station using GPS receiver. 7.6 List the works performed by GPS receiver. 7.7 Mention different types of software used in GPS receiver. 7.8 Describe the preparation of a map using mapping software and data received with GPS receiver. 7.9 State the process to locate a geodetic position in a project area using GNNS Receiver.	**3**	**5**
8	**GEOGRAPHIC INFORMATION SYSTEM (GIS)** 8.1 Explain Geographic Information System (GIS). 8.2 Describe advantages of GIS. 8.3 Mention Major application of GIS. 8.4 Describe Basic functions of GIS. 8.5 Explain GIS data model. 8.6 Describe different source of geographic data. 8.7 Mention different Methods of data capture. 8.8 Define Spatial Database. 8.9 Describe Database management system.	**3**	**4**
9	**GIS MAP** 9.1 Mention different types of GIS software. 9.2 Describe required hardware and software for GIS. 9.3 State Installation process of Arc Map software. 9.4 Mention different working tools of Arc Map software.	**3**	**6**

	9.5 State the procedure to prepare a Base Map with all features in standard GIS format. 9.6 State the procedure to prepare a Contour map showing all existing /proposed Infrastructure in GIS Environment. 9.7 State the procedure to prepare a DEM Map showing all existing /proposed Infrastructure in GIS format. 9.8 Describe all views of Picture in existing features in different modes. 9.9 Describe the procedure of plotting map in the computer.		
10	**REAL-TIME KINEMATIC(RTK) SURVEYING.** 10.1 Define Real-Time Kinematic (RTK) Surveying. 10.2 Mention the objectives of RTK surveying. 10.3 Describe advantages of RTK surveying. 10.4 Mention the components of RTK system. 10.5 Describe the procedure of setting up a base station. 10.6 Describe the procedure of setting up a rover. 10.7 Illustrate the process to conduct the GPS survey using RTK system.	**3**	**6**
11	**SURVEY DRONE AND ECHO SOUNDER.** 11.1 State survey Drone with classification. 11.2 Mention the application of survey Drone. 11.3 Describe operation panel of the survey drone. 11.4 State field data process with suitable software and prepare map in a project area. 11.5 Plot the existing map. 11.6 Define Echo Sounder. 11.7 Define Multibeam Echo Sounder. 11.8 Mention the purposes of Multibeam Echo Sounder. 11.9 List the component of Multibeam Echo Sounder. 11.10 Describe the operation procedure of Multibeam Echo Sounder	**3**	**6**
	Total	**32**	**60**

DETAILED SYLLABUS (PRACTICAL)

Sl.	Experiment Name	Class (3 Period)	Marks (Continuous)
1	**DETERMINE HEIGHT AND DISTANCE OF TOWER /BUILDING USING TOTAL STATION.** 1.1 Setup the total station near the tower/ building. 1.2 Measure the distance of tower/ building. 1.3 Select REM and target vertex point. 1.4 Show the Result on display panel. 1.5 Maintain the record of performed task.	1	2
2	**CONDUCT A DIGITAL TOPOGRAPHIC SURVEY WITH TOTAL STATION AND PLOT MAPS INCLUDING COMPUTATION OF AREAS.** 2.1 Setup total station and complete the temporary adjustment. 2.2 Measure several points with 3-D format and save with code. 2.3 Transfer the measure data in AutoCAD and prepare topographic map. 2.4 Determine the area of topographic map.	1	2

	2.5 Maintain the record of performed task.		
3	**PLOT A TOPOGRAPHICAL SURVEY MAP WITH THE HELP OF PLOTTER/PRINTER USING DIFFERENT SCALE.** 3.1 Open a topographical survey map in AutoCAD format. 3.2 Select plot option and setup plot model. 3.3 Plot the topographic map and print in different scale. 3.4 Maintain the record of performed task.	1	2
4	**PERFORM LAYOUT PLAN OF A HIGH-RISE BUILDING INCLUDING PILE, PILE CAP, GRID LINE AND COLUMN.** 4.1 Open an existing topographical map and find out the coordinate several points of pile, pile cap, grid line, column etc. 4.2 Setup total station and complete the temporary adjustment. 4.3 Locate the points by the total station. 4.4 Maintain the record of performed task.	1	2
5	**MEASURE THE LATITUDE AND LONGITUDE OF A PLACE USING GPS RECEIVER.** 5.1 Setup the GPS in a proposed area. 5.2 Select several points in proposed area. 5.3 Mark the points and save with suitable code. 5.4 Observe the save data with suitable format. 4.5 Maintain the record of performed task.	1	2
6	**CONDUCT A GEODETIC SURVEY USING GPS RECEIVER** 6.1 Setup the GPS in a proposed area. 6.2 Select several points in proposed area. 6.3 Mark the point and save with suitable code. 6.4 Plot the map in AutoCAD / Google Earth. 6.5 Maintain the record of performed task.	1	2
7	**PREPARE A BASE MAP SHOWING ALL FEATURES IN STANDARD GIS FORMAT.** 7.1 Open an existing Topographic map. 7.2 Transfer the Topographical data in GIS format (ArcGIS). 7.3 Process the GIS data using GIS tool and prepare base map. 7.4 Maintain the record of performed task.	2	2
8	**PREPARE A DEM MAP SHOWING ALL EXISTING /PROPOSED INFRASTRUCTURE IN GIS FORMAT.** 8.1 Open a base map data model GIS format. 8.2 Prepare DEM model using base map data. 8.3 Showing all existing / proposed infrastructure in DEM model. 8.4 Maintain the record of performed task.	2	2
9	**PLOT BASE / DEM MAP IN DIFFERENT SCALE WITH PLOTTER/ PRINTER**. 9.1 Open Base / DEM model in GIS format. 9.2 Prepare page layout from page and print setup. 9.3 Create scale bar from GIS insert tool. 9.4 Print / Export map using different scale. 9.5 Maintain the record of performed task.	2	2
10	**TRANSFER A SOB BM USING LEVELING OPERATION IN A PROJECT AREA.** 10.1 Find out a SOB BM near the project area from SOB (Survey of Bangladesh) geodetic control point. 10.2 Transfer SOB RL to project area by leveling operation.	2	3

	10.3 Mark SOB RL on a pillar in project area. 10.4 Maintain the record of performed task.		
11	**PERFORM GPS SURVEY USING RTK SYSTEM.** 11.1 Setup a Base station in project area and connect with rover. 11.2 Collect several points in project area and save the data. 11.3 Process the data in suitable software and plot the map. 11.4 Maintain the record of performed task.	1	2
12	**PERFORM DRONE SURVEY USING SURVEY DRONE.** 12.1 Setup a survey drone for a proposed area in GIS format. 12.2 Connect with electronic speed controller. 12.3 Perform the survey work in photographic format. 12.4 Maintain the record of performed task.	1	2
	Total	**16**	**25**

NECESSARY RESOURCES (TOOLS, EQUIPMENT'S AND MACHINERY):

Sl	Item Name	Quantity
01	Digital Theodolite	5 nos.
02	Total Station	5 nos.
03	GPS Receiver	5 nos.
04	RTK (Real Time Kinematic)	2 nos.
05	Survey Drone	2 nos.
06	Echo Sounder	2 nos.
07	Level Machine	5 nos.
08	Tubular Compass	5 nos.
09	Prism	5 nos.
10	Leveling Staff	5 nos.
11	Tripod	5 nos.
12	Steel Tape (3m)	5 nos.

RECOMMENDED BOOKS:

Sl	Book Name	Writer Name	Publisher Name & Edition
1.	Surveying and Levelling	T. P. Kanatker	Delhi Standard Publisher
2.	Surveying	Norman Thomas	Delhi-jalandhar,s,.chand
3.	Plane & Geodetic Survey	D. Clark	
4.	Surveying (Vol-II)	Dr. B C Punmia	
5.	Text book of surveying	S.K.Husain, M.S Nagraj	
6	Surveying & leveling	S.S.Bhavikatti.	
7.	Introduction to Surveying	Md.Hamidul Islam (KUET)	
8.	Surveying (Volume I & II)	S.K.Duggal.	
9.	Advance Surveying	Natarajan	
10.	A Text Book of surveying (Vol-II)	P.B. Shahani	
11.	Advance Surveying	by Satheesh Gopi,	
12.	GIS work book	Sungi Murai, S. Koishigawa,	
13.	GPS for land surveyors	Jan Van Sickle	

WEBSITE REFERENCES:

Sl	Web Link	Remarks
01	www.youtube.com	Search here with topics
02	www.google.com	Search here with topics
03	https://www.youtube.com/watch?v=-1KSBqYHfOg	Search here with topics
04	https://www.jouav.com/industry/aerial-mapping-surveying	Search here with topics
05	https://theconstructor.org/surveying/real-time-kinematic-survey/560661	Search here with topics
06	https://en.wikipedia.org/wiki/Multibeam_echosounder	Search here with topics
07	https://www.geotechengbd.com/drone-aerial-survey-in-bd/	Search here with topics