



BANGLADESH TECHNICAL EDUCATION BOARD

Agargaon, Sher-E-Bangla Nagar

Dhaka-1207.

04-YEAR DIPLOMA IN ENGINEERING CURRICULUM COURSE STRUCTURE & SYLLABUS (PROBIDHAN-2022)

CIVIL TECHNOLOGY

TECHNOLOGY CODE: 64

6TH SEMESTER

(Effective from 2022-2023 Academic Sessions)

DIPLOMA IN ENGINEERING CURRICULUM

COURSE STRUCTURE

(PROBIDHAN-2022)

TECHNOLOGY NAME: CIVIL TECHNOLOGY (64)

(6th SEMESTER)

Sl. No.	Subject		Period Per Week		Credit	Marks Distribution						
						Theory Assessment			Practical Assessment			Grand Total
	Code	Name	Theory	Practical		Continuous	Final	Total	Continuous	Final	Total	
1	26461	Water Resources Engineering	2	3	3	40	60	100	25	25	50	150
2	26462	Advance Surveying	2	3	3	40	60	100	25	25	50	150
3	26463	Transportation Engineering-I	2	3	3	40	60	100	25	25	50	150
4	26464	Design of Structure-I	2	3	3	40	60	100	25	25	50	150
5	28863	Steel Structures	2	3	3	40	60	100	25	25	50	150
6	28861	Advanced Construction	2	3	3	40	60	100	25	25	50	150
7	29041	Environmental Studies	2	3	3	40	60	100	25	25	50	150
Total			14	21	21	280	420	700	175	175	350	1050

SUBJECT CODE	SUBJECT NAME	PERIOD PER WEEK		CREDIT
26461	WATER RESOURCE ENGINEERING	T	P	C
		2	3	3

Rationale	Water is very important resource for the life of humans and plants and their full need to be optimally used and conserved. The demand of water is growing divided resulting in scarcity of water. Moreover in Bangladesh there is uncertain and inadequate rainfall. Therefore every drop of water is required to be harnessed appropriately using the relevant technological tools and principles. Accordingly Irrigation Structures (dams, canals and allied structures etc.), which basically are the backbone structures in the system use to preserve and conserve the water source. In the planning, design, construction and maintenance of the structures, civil engineers have a significant role to play. Thus the course will enable the students to apply and use the basic principles and practices related to irrigation engineer at site. It will also help the students to mitigate the Challenges of Water Resources Engineering in the 21st Century such as Climate Change, Population Growth, Water Pollution, Desalination, clean water, Smart Irrigation etc. So this course for our student will be very effective to serve the mentioned purposes.
Learning Outcome (Theoretical)	After undergoing the subject, students will be able to : 1. Illustrate water resources in Bangladesh. 2. Explain well and recharging of ground water. 3. Describe the Significance of irrigation. 4. Interpret Dam, dyke and irrigation canal. 5. Illustrate Storage reservoir. 6. Explain Silt deposition & scouring. 7. Interpret Head works. 8. Illustrate the principles of drainage. 9. Explain River training works. 10. Analyze Flood and flood control. 11. State Irrigation projects in Bangladesh. 12. Explain Coastal water resources in Bangladesh
Learning Outcome (Practical)	After undergoing the subject, students will be able to: 1. Calculate yield of demarcated catchment area. 2. Sketch section of dam reservoir with different components. 3. Sketch section of earthen/masonry dam. 4. Sketch head works with efferent component. 5. Sketch distribution system of irrigation. 6. Sketch guide bank, groyne, spur, afflux, marginal bund and stone Apron. 7. Prepare a model for a typical irrigation project. 8. Observe an irrigation and flood control project in Bangladesh. 9. Prepare a presentation on technical details of a multipurpose project in Bangladesh. 10. Sketch coastal area with different components. 11. Prepare a presentation on technical details of a multipurpose project in Bangladesh.

DETAILED SYLLABUS (THEORY)

Unit	Topics with Contents	Class (1 Period)	Final Marks
1.	WATER RESOURCES IN BANGLADESH 1.1 Describe Inland water resources in Bangladesh. 1.2 State the importance of water Resource management. 1.3 Explain Challenges of water resources in Bangladesh. 1.4 Illustrate water resources management. 1.5 Mention the characteristics of rainfall and run-off in Bangladesh. 1.6 List the factors affecting the run-off an area. 1.7 Determine average annual run-off a catchment area from given data.	2	4
2.	WELL AND RECHARGING OF GROUND WATER 2.1 Define Cone of depression, Circle of influence and Draw down curve. 2.2 Describe the process to determine the yield of a well. 2.3 Solve the problems regarding lifting water from well. 2.4 Define storing and recharging of ground water/rain water. 2.5 Mention the condition of recharging of ground water. 2.6 List the methods of recharging ground water. 2.7 Mention the advantages and disadvantages of recharging ground water. 2.8 State the necessity to recharge water in Bangladesh.	3	5
3	SIGNIFICANCE OF IRRIGATION 3.1 Explain the necessity of irrigation in Bangladesh. 3.2 Mention the benefits of irrigation. 3.3 Describe evaluation of irrigation in Bangladesh. 3.4 Name different types of irrigation with sub-divisions. 3.5 Describe flow irrigation through flexible pipe. 3.6 Differentiate between canal or direct irrigation and reservoir (tank) or indirect irrigation. 3.7 Describe different methods of lifting water for irrigation by manually and power. 3.8 Mention the advantages and disadvantages of well irrigation. 3.9 Explain the necessity of tube-well irrigation in Bangladesh. 3.10 Mention the advantages and disadvantages of tube-well irrigation.	3	5
4	STORAGE RESERVOIRS 4.1 Define storage reservoir. 4.2 Explain the necessity of irrigation storage reservoir 4.3 Mention the requirements of an ideal reservoir. 4.4 Explain the meaning of commendable area and irrigable area. 4.5 Calculate the capacity of a storage reservoir by using appropriate methods. 4.6 Mention the factors to determine the height of the dam of a reservoir. 4.7 Mention the section of a dam of reservoir with different components.	3	6
5	DAM, DYKE AND IRRIGATION CANAL. 5.1 Define dam, core wall, dyke and irrigation canal. 5.2 Mention the considerations to select a site of an Earthen Dam and Masonry Dam. 5.3 Mention the advantages and limitations of an earthen dam and masonry dam. 5.4 Describe the construction procedure of an earthen dam and dyke. 5.5 Mention the prevention and remedies of an earthen dam and dyke failure.	3	6

	5.6 Differentiate between dam and dyke. 5.7 Define main, branch, distributor, field canal and canal lining. 5.8 Mention the considering factors in fixing the alignment of an irrigation canal. 5.9 Describe the distributor system of irrigation canals with sketch. 5.10 Describe the steps for excavating a new canal and old canal.		
6	SILT DEPOSITION & SCOURING 6.1 Describe river morphology, silt, siltation and scouring. 6.2 Mention the causes of siltation. 6.3 Mention the merits and demerits of siltation. 6.4 State the methods to prevent the silt deposition into river and canal. 6.5 Describe the removal methods of silt from the river and canal. 6.6 Differentiate between silt excluder and silt ejector. 6.7 Discuss the effect of scouring. 6.8 Describe the methods of preventing scouring.	3	5
7	DIVERSION HEAD WORKS 7.1 State the meaning of diversion head works. 7.2 Explain the importance of diversion head works. 7.3 Describe the different types of diversion head works 7.4 Illustrate the function of different types of diversion head works 7.5 Name the different components of a diversion head works with sketch. 7.6 State the functions of each of the component of a diversion head works. 7.7 Explain diversion head works in irrigation.	2	5
8	DRAINAGE 8.1 State the meaning of drainage. 8.2 Mention the different methods of drainage. 8.3 Describe importance of drainage. 8.4 Explain the qualities of good drainage system. 8.5 State the meaning of cross drainage works. 8.6 Mention the functions of cross drainage works. 8.7 Differentiate between aqueduct and super passage. 8.8 Mention the need for drainage in Bangladesh.	3	5
9	RIVER TRAINING WORKS 9.1 State the meaning of river training works. 9.2 Outline the objectives of river training works. 9.3 Mention the different methods of river training works. 9.4 List the functions of guide bank, groyne, spur, afflux, marginal bund and stone apron. 9.5 State the necessity of river training works in Bangladesh. 9.6 Explain the river training works for Padma multipurpose bridge in Bangladesh	2	5
10	FLOOD AND FLOOD CONTROL 10.1 State the meaning of flood. 10.2 Mention the causes of flood. 10.3 Outline the different method of controlling flood. 10.4 List the causes of flood in Bangladesh. 10.5 Describe suitable method for flood control in Bangladesh. 10.6 State coastal embankment project and inland river embankment project. 10.7 Describe the flood forecasting procedure in Bangladesh.	3	5
11	IRRIGATION PROJECTS IN BANGLADESH 11.1 Describe history of irrigation in Bangladesh. 11.2 State Ganga-Kapatakhha (G-K) Project.	3	5

	11.3 Describe Teesta Barrage Project. 11.4 State Chalan Beel Development Project. 11.5 Describe Chandpur Irrigation Project. 11.6 State Barisal Irrigation Project. 11.7 State North Bengal Deep Tube Well Project. 11.8 Describe Pabna Irrigation and Flood Control Project. 11.9 Discuss Muhuri Irrigation Project. 11.10 Describe Dhaka Integrated Flood Protection Project.		
12	COSTAL AREA WATER RESOURCES IN BANGLADESH 12.1 Describe basic Concepts of coastal area water resources. 12.2 State the importance of coastal area water resources. 12.3 Explain water resources management in coastal area. 12.4 Illustrate water resources scenarios and climate change impact in Bangladesh 12.5 Describe different component of coastal area. 12.6 Explain Dunes, Back shore, Off shore and Fore shore. 12.7 Describe Tide, low tide with causes. 12.8 Define spring tide, neap tide and equilibrium tide.	2	4
	Total	32	60

DETAILED SYLLABUS (PRACTICAL)

Sl.	Experiment name with procedure	Class (3 Period)	Continuous Marks
1	COMPUTE THE YIELD OF DEMARCATED CATCMENT AREA FROM GIVEN DATA. 1.1 Collect a drawing demarcated catchment area. 1.2 Calculate catchment area. 1.3 Take height of run-off from given data. 1.4 Compute the yield of run-off using formula. 1.5 Maintain the record of performed job.	1	3
2	SKETCH CONE OF DEPRESSION WITH DRAW DOWN AND CIRCLE OF INFLUENCE. 2.1 Collect a drawing 2.2 Collect the required tools and raw materials. 2.3 Sketch according to given drawing. 2.4 Maintain the record of performed job.	1	3
3	SKETCH A SECTION OF DAM RESERVOIR WITH DIFFERENT COMPONENTS 3.1 Collect a drawing 3.2 Collect the required tools and raw materials. 3.3 Sketch according to given drawing. 3.4 Maintain the record of performed job.	1	2
4	SKETCH SECTION OF EARTHEN & MASSONRY DAM 4.1 Collect a drawing 4.2 Collect the required tools and raw materials. 4.3 Sketch according to given drawing. 4.4 Maintain the record of performed job.	1	3
5	DRAW HEAD WORKS WITH DEFFERENT COMPONENT 5.1 Collect a drawing	2	2

	5.2 Collect the required tools and raw materials. 5.3 Sketch according to given drawing. 5.4 Maintain the record of performed job.		
6	SKETCH DISTRIBUTION SYSTEM OF IRRIGATION 6.1 Collect a drawing 6.2 Collect the required tools and raw materials. 6.3 Sketch according to given drawing. 6.4 Maintain the record of performed job.	2	2
7	DRAW GUIDE BANK, GROUYNE, SPUR, AFFLUX, MARGINAL BUND AND STONE APROAN 7.1 Collect a drawing 7.2 Collect the required tools and raw materials. 7.3 Sketch according to given drawing. 7.4 Maintain the record of performed job.	1	2
8	PREPARE A MODEL FOR A TYPICAL IRRIGATION PROJECT 8.1 Collect a drawing 8.2 Collect the required tools and raw materials. 8.3 Sketch according to given drawing. 8.4 Maintain the record of performed job.	2	2
9	OBSERVE AN IRRIGATION AND FLOOD CONTROL PROJECT IN BANGLADESH 9.1 Select an irrigation and flood control project. 9.2 Observe an irrigation and flood control project. 9.3 Collect and note different information of project. 9.4 Prepare a presentation according to observation. 9.5 Present the Report. 9.6 Maintain the record of performed job.	2	2
10	PREPARE A PRESENTATION ON TECHNICAL DETAILS OF A MULTIPERPOSE PROJECT IN BANGLADESH 10.1 Observe an irrigation and flood control project. 10.2 Collect and note different information of project. 10.3 Prepare a report according to observation. 10.4 Present the Report. 10.5 Maintain the record of performed job.	2	2
11	SKETCH COASTAL AREA WITH DIFFERENT COMPONENTS 11.1 Collect a drawing 11.2 Collect the required tools and raw materials. 11.3 Sketch according to given drawing. 11.4 Maintain the record of performed job.	1	2
Total		16	25

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

SI	Item Name	Quantity
01	Multimedia Projector	1 set
02	Laptop	1 Nos
03	Pen drive	Required Amount
04	Cork sheet	Required Amount
05	Gum/Glue	Required Amount
06	Gum/Glue Gan	Required Amount

07	Neil	Required Amount
08	Pencil	Required Amount
09	Eraser	Required Amount
10	Drawing Sheet	Required Amount

RECOMMENDED BOOKS:

SI	Book Name	Writer Name	Publisher Name & Edition
01	Water Resources Engineering Voll – 2 Irrigation Engineering and Hydraulic Structure.	Santosh Kumar Garg	Khanna Pudlishers. 34 th Revised Edition, 2017
02	Water Resources Engineering.	Ralph A. Wurbs. Wesley p. Jemes	1 st edition, 2001.
03	Water Resources Engineering.	John Wiley	3 rd edition
04	Introduction to Coastal Engineering and Management.	J. William Kamphuis.	3 rd edition
06	Basic Coastal Engineering.	Robert M.Sorensen	3 rd edition
07	Hydrology, Ground Water & Water Resources Engineering.	Santosh Kumar Garg	27 th edition

WEBSITE REFERENCES:

SI	Web Link	Remarks
01	https://www.youtube.com/watch?v=m7VAPMAae70	Job no.-1
02	https://www.youtube.com/watch?v=QjnUO0qglu8	Job no.-2
03	https://www.youtube.com/watch?v=olsDr3GA3-Y	Job no.-3
04	https://www.youtube.com/watch?v=ZGFKI_fMllo	Job no.-4
05	https://www.youtube.com/watch?v=zTH194KMlnU	Job no.-5
06	https://www.youtube.com/watch?v=RTR2RgMbJ-g	Job no.-6
07	https://www.youtube.com/watch?v=B6imUQ-36BI	Job no.-7
08	https://www.youtube.com/watch?v=yJBbRLr1bF0	Job no.-8
09	https://www.youtube.com/watch?v=l20uyMJ6EYc	Job no.-09
10	https://www.youtube.com/watch?v=IP_6p58jhZ0	Job no.-10
11	https://www.youtube.com/watch?v=IP_6p58jhZ0	Job no.-11

SUBJECT CODE	SUBJECT NAME	PERIOD PER WEEK		CREDIT
26462	ADVANCED SURVEYING	T	P	C
		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 GNSS 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):

SI	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:

SI	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_echo_sounder	Search here with topics
07	https://www.geotechengbd.com/drone-aerial-survey-in-bd/	Search here with topics

SUBJECT CODE	SUBJECT NAME	PERIOD PER WEEK		CREDIT
26463	Transportation Engineering -I	T	P	C
		2	3	3

Rationale	Transportation engineering is a branch of civil engineering that involves the planning, design, operation, and maintenance of transportation. Construction of roads is one of the major areas in which diploma holders in Civil Engineering may get very good opportunities for employment. Its primary objective is to provide efficient, safe, cost-effective and environmentally sustainable mobility services. Diploma holders are responsible for construction and maintenance of highways and airports. Basic concepts of road geo-metrics, surveys and plans, elements of traffic engineering, road materials, construction of rigid and flexible pavements, special features of hill roads, road drainage system and various aspects of maintenance find place in above course. In addition, this subject will cater the needs of those technicians who would like to find employment in the construction of railway tracks, bridges. The subject aims at providing broad based knowledge regarding various components and construction of railway track, bridges.
Learning Outcome (Theoretical)	After undergoing the subject, students will be able to 1. Interpret modes of transportation, highway planning and alignment of road and survey. 2. Illustrate principles of highway geometric, highway cross-section and intersections. 3. Explain sight distance. 4. Explain characteristics of sub-grade soil and materials for highway construction. 5. Describe formation of a road and classification of road. 6. Interpret hill road and highway drainage. 7. Evaluate traffic signs. 8. Explain machineries used for construction of roads & highways. 9. Describe causes of failures and maintenance of roads & highways. 10. Analyze highway bridges & culverts. 11. Illustrate airport building & warehouse, planning of airport and geometrics used in airport.
Learning Outcome (Practical)	After undergoing the subject, students will be able to 1. Set an alignment of a new road. 2. Prepare the model of a typical clover leaf pattern of grade separation. 3. Calculate crushing strength test of coarse aggregate used in road construction. 4. Perform abrasion test of coarse aggregate used in road construction. 5. Conduct water absorption, specific gravity and density test of coarse aggregate used in road construction. 6. Calculate the California Bearing Ratio (CBR) test. 7. Demonstrate aggregate impact value test. 8. Perform the test of grading of coarse aggregate. 9. Perform the bitumen test for loss of ignition. 10. Perform the bitumen test for fire point, flash point. 11. Perform the bitumen test for softening. 12. Perform the bitumen test for marshal test.

DETAILED SYLLABUS (THEORY)

Unit	Topics with Contents	Class (1 Period)	Final Marks
1.	MODES OF TRANSPORTATION, HIGHWAY PLANNING AND ALIGNMENT OF ROAD AND SURVEY 1.1 Define transportation. 1.2 Classify transportation. 1.2 Explain the importance of transportation and highway planning. 1.3 Mention the benefits of standard road system. 1.4 Describe the characteristics of important early roads. 1.5 Classify the road according to location & functions. 1.6 Mention the objectives of road planning and survey. 1.7 State fundamental principles of alignment of road. 1.8 Describe the reconnaissance, preliminary, final location and soil survey for a road construction. 1.9 Mention the considering factors to fix the location of a new urban road.	2	3
2	HIGHWAY GEOMETRIC, HIGHWAY CROSS-SECTION AND INTERSECTIONS 2.1 Classify highway geometric and the level intersection of roads 2.2 Define camber, super elevation, Curve, Right of way and Gradient, Visibility, Horizontal curves, Vertical curves and Road intersections. 2.3 Define right of way, formation width, side slope, berm, embankment, cutting, shoulder, carriage way width, footpath, cycle track, parking lanes, median strip, kerb, skid, slip and Friction of a Road. 2.4 Mention the affecting factors of frictional coefficient and the highway geometrics. 2.5 Explain the necessity of camber, gradient, super elevation and curve in road. 2.6 Describe the procedure of providing camber, gradient, super elevation and curve in road. 2.7 Mention the depending factors of the curves and gradient of a road. 2.8 Define underpass and overpass. 2.9 Mention the purposes of intersection of roads. 2.10 Mention the advantages and disadvantages of different types of intersections and grade separations.	4	8
3	SIGHT DISTANCE 3.1 Classify sight distances. 3.2 State the reaction time, reaction distance, braking time and braking distance. 3.3 Describe different types of sight distances. 3.4 Compute the time of different types of sight distances.	2	3
4	SUB-GRADE SOIL AND MATERIALS FOR HIGHWAY CONSTRUCTION. 4.1 Define sub-grade in highway. 4.2 Describe the characteristics of different sub-grade soil.	3	6

	4.3 Mention the suitable sub-grade for various types of highway construction. 4.4 State the procedure of improving sub-grade soil for road construction. 4.5 Describe construction of road in water logged area. 4.6 Mention the advantages and limitations of aggregates for highway construction. 4.7 List the test for aggregates used in highway construction. 4.8 Describe different types of bituminous materials for road construction. 4.9 State the properties of bituminous materials. 4.10 Describe standard tests on bituminous materials.		
5	FORMATION AND CLASSIFICATION OF A ROAD 5.1 State the procedure of earth work in cutting, filling and compaction of soil and turfing used in road embankment. 5.2 List the field tests to find out the quality of compaction of soil for road construction. 5.3 Classify road on the basis of materials, volume of traffic, type of traffic, number of lanes, direction of movement of traffic, area they traverse, cost of roads and rigidity of roads. 5.4 Describe various types of low cost roads with classification. 5.5 State the construction procedure of WBM, bituminous, CC and RCC road. 5.6 Mention the advantages and disadvantages of WBM. 5.7 Define seal coat, tack coat and prime coat, bituminous carpet, bituminous concrete, sheet asphalt and mastic asphalt. 5.8 Mention the advantages and disadvantages of bituminous, CC and RCC road. 5.9 Explain the joints for CC and RCC road with sketches, specification and function. 5.10 Distinguish between flexible and rigid pavement.	4	8
6	HILL ROAD AND HIGHWAY DRAINAGE 6.1 Mention the considering points for alignment of hill road. 6.2 Define village path or track, bridle path, motor road, hill road, salient curves, re-entrant curve, hair pin bend, corner bend and trace cut. 6.3 State the meaning of retaining wall and breast wall. 6.4 Mention the causes and prevention of land slide of hill area. 6.5 Describe highway drainage system. 6.6 Mention the controlling factors for design of highway drainage system. 6.7 Indicate the effects of improper drainage. 6.8 Define cross-drainage works. 6.9 Classify cross-drainage works.	3	6
7	TRAFFIC SIGNS 7.1 List different type of traffic signs. 7.2 Classify traffic signs. 7.3 Explain the importance of traffic signs to maintain the road safety. 7.4 Describe the utility of traffic regulations.	2	4

8	ROADS & HIGHWAYS MACHINERIES 8.1 List the machineries of cleaning the site, earth cutting, earth removing, consolidating and grading in highway construction. 8.2 State the machineries of crushing road metals. 8.3 Discuss the machineries for construction of bituminous road. 8.4 State the machineries for construction of CC & RCC road.	3	6
9	HIGHWAY BRIDGES, FLYOVERS & CULVERTS 9.1 Define bridge, Flyovers, controlled access highways and culvert. 9.2 Mention the ideal site for construction of a bridge, Flyovers and culverts. 9.3 Classify bridges, Flyovers, controlled access highways and culverts. 9.4 Distinguish between bridge and culvert. 9.5 Mention affecting factors to select type of bridge, Flyovers, controlled access highways or culvert. 9.6 Define flood discharge, waterway, scouring depth, free board in the construction of bridges & culverts. 9.7 Mention the causes and remedies for corrugations and wavy Surfaces of road.	3	6
10	ROADS & HIGHWAYS MAINTENANCE 10.1 Define road and highway maintenance. 10.2 State the significance of routine maintenance of highways. controlled access highways or culvert in roads & highways. 10.3 Classify maintenance work of road. 10.4 Describe the maintenance of earthen road, water bound macadam road, bituminous road, CC & RCC road. 10.5 Describe the failures of sub-grade, base and wearing course. 10.6 Mention the typical failures of flexible & rigid pavement and RCC road. 10.7 Explain the necessity of maintenance of bridges, Flyovers, controlled access highways & culverts. 10.8 List the possible maintenance of Highway Bridges, Flyovers and Culverts.	3	6
11	AIRPORT 11.1 Classify airport and mention the functions and facilities of an airport. 11.2 State the importance of warehouse of an Airport. 11.3 Mention the information required for planning of an airport. 11.4 List the considering factors to select the site of an airport. 11.5 Describe landing strip, approach zone, running lengths & hanger, runway, taxiway, aprons, runway orientation, pattern & grade. 11.7 Distinguish between runway and taxiway. 11.8 Mention the functions of terminal. 11.9 Define helipad. 11.10 Distinguish between helipad and airport.	3	4
	Total	32	60

DETAILED SYLLABUS (PRACTICAL)

Sl.	Experiment Name with procedure	Class (3 Period)	Marks (Continuous)
1	SET UP ALIGNMENT OF A NEW ROAD. 1.1 Identify tools and equipment for setting up an alignment of road. 1.2 Collect tools and equipment. 1.2 Select a new road location. 1.3 Set alignment of the new road. 1.4 Maintain the record of performed job.	1	1
2	PREPARE THE MODEL OF A TYPICAL CLOVER LEAF PATTERN OF GRADE SEPARATION. 2.1 Prepare Plan, layout and base. 2.2 Create the Road Surfaces. 2.3 Build Elevation Changes. 2.4 Create model the Grade Separation Structures. 2.5 Add Detail to Roads and painting. 2.6 Maintain the record of performed job.	1	1
3	PERFORM CRUSHING STRENGTH TEST OF COARSE AGGREGATE USED IN ROAD CONSTRUCTION. 3.1 Perform Sample Preparation. 3.2 Calculate moisture Content Check. 3.3 Perform Sieve Analysis. 3.4 Prepare of Test Specimen. 3.5 Setup testing Apparatus. 3.6 Perform Loading and calculation. 3.7 Maintain the record of performed job.	1	1
4	PERFORM ABRASION TEST OF COARSE AGGREGATE USED IN ROAD CONSTRUCTION. 4.1 Perform Sample Preparation. 4.2 Calculate moisture Content Check. 4.3 Perform Sieve Analysis. 4.4 Setup Los Angeles Abrasion Testing Machine. 4.5 Prepare of Test Specimen. 4.6 Perform testing and Sieve Analysis after Abrasion. 4.7 Determinate mass. 4.8 Calculate Abrasion in Percentage. 4.9 Perform interpretation. 4.10 Maintain the record of performed job.	2	3
5	PERFORM WATER ABSORPTION, SPECIFIC GRAVITY AND DENSITY TEST OF COARSE AGGREGATE USED IN ROAD CONSTRUCTION. 5.1 Perform Sample Preparation. 5.2 Calculate moisture Content Check. 5.3 Perform Sieve Analysis. 5.4 Perform Water Absorption Test 5.5 Conduct Specific Gravity and Density Test	1	3

	5.6 Repeat the tests with additional samples if necessary, and calculate the average values. 5.7 Maintain the record of performed job.		
6	PERFORM THE CALIFORNIA BEARING RATIO (CBR) TEST. 6.1 Collect Sample. 6.2 Determine Moisture Content. 6.3 Perform sample Preparation. 6.4 Assemble CBR Mould. 6.5 Perform Swell Plate Saturation. 6.6 Assemble CBR Surcharge Weight. 6.7 Perform CBR Penetration Piston. 6.8 Perform loading and Calculate CBR value. 6.9 Maintain the record of performed job.	1	3
7	PERFORM THE AGGREGATE IMPACT VALUE TEST. 7.1 Collect and prepare Sample. 7.2 Calculate moisture Content Check. 7.3 Perform Sieve Analysis. 7.4 Prepare test Specimen. 7.5 Perform Oven Drying. 7.6 Setup Testing Machine. 7.7 Perform Impact Test. 7.8 Calculate and Compare the obtained Aggregate Impact Value with the specified limits in the relevant standard. 7.9 Maintain the record of performed job.	2	4
8	PERFORM GRADING OF COARSE AGGREGATE. 8.1 Collect Sample and sample Preparation. 8.2 Weight an appropriate amount of the aggregate sample (as per the testing standards) using a balance. 8.3 Perform Sieve Analysis. 8.4 Weight the material retained on each sieve individually. 8.5 Calculate the percentage of the total sample retained on each sieve and passing through each sieve by subtracting the percentage retained from 100. 8.6 Perform graphical representation and interpretation. 8.7 Maintain the record of performed job.	2	4
9	PERFORM THE BITUMEN TEST FOR LOSS OF IGNITION 9.1 Weight the crucible and cover accurately using the analytical balance. 9.2 Place a known weight of the bitumen sample into the crucible. 9.3 Cover the crucible and re-weight it with the bitumen. 9.4 Place the crucible in a muffle furnace and heat it to a temperature for a specified period. 9.5 Perform After heating, cool the crucible in a desiccator and re-weight it. 9.6 Calculate the loss in weight as a percentage of the original weight to determine the loss of ignition. 9.7 Maintain the record of performed job.	2	4
10	PERFORM THE BITUMEN TEST FOR FIRE POINT AND FLASH POINT 10.1 Prepare Apparatus.	1	3

	10.2 Perform Heating and Continuous Observation. 10.3 Record the Flash Point. 10.4 Maintain the record of performed job.		
11	PERFORM THE BITUMEN TEST FOR SOFTENING POINT 11.1 Prepare of apparatus and bitumen Sample. 11.2 Perform testing temperature Calibration, filling the ring, placement of steel balls. 11.3 Assemble the Apparatus, heating, observation, recording the softening Point. 11.4 Maintain the record of performed job.	1	2
12	PERFORM THE BITUMEN TEST FOR MARSHAL. 12.1 Perform sample preparation and Heating. 12.2 Perform mixing, molding specimens, compaction and removing specimens. 12.3 Test Stability and calculations. 12.4 Maintain the record of performed job.	1	2
	Total	16	25

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

SI	Item Name	Quantity
01	Total Station	4 No
02	Theodolite	4 No
03	Leveling Instrument:	4 No
04	Excavators	2 No
05	Backhoes	2 No
06	Bulldozers	1 No
07	Graders	1 No
08	Asphalt Pavers	1 No
09	Concrete Pavers	1 No
10	Rollers	1 No
11	Vibratory Rollers	1 No
12	Concrete Mixers	1 No
13	Road Sweepers	1 No
14	Asphalt Testing Equipment	4 No
15	Penetration Test Apparatus:	4 No
16	Softening Point Test Apparatus	4 No
17	Flash Point and Fire Point Test Apparatus	4 No
18	Marshall Stability Test Apparatus	4 No
19	Specific Gravity Test Apparatus	4 No

RECOMMENDED BOOKS:

SI	Book Name	Writer Name	Publisher Name & Edition
01.	Highway Engineering	Khanna S.K,Justo,CEG and Veeraraavan	New Chand and Brothers,Roorkee,2010,ISBN 978-8185240800
02.	Road ,Railway Bridge and	Birdi,Ahuja	Standard book house,New Delhi,march

	Tunnel Engineering		2010,ISBN 978-8189401337
03.	Traffic Engineering and Transport planning	Kadiyali,L.R.	Khanna Publishers, New Delhi 2008,ISBN 978-8174092205
04	Principal, Practice and design of Highway Engineering	Sharma,S.K.	S.Chand publication, New Delhi,march 2012,ISBN 9788121901314
05	Laboratory manual in highway Engineering	Duggal,Ajay K. and Puri,V.P.	New Age international(P) limited,Newdelhi 2010 ISBN 9788122403107

WEBSITE REFERENCES:

Sl	Web Link	Remarks
01	https://www.youtube.com/watch?v=juWc-DpFoLY	Search here with topics
02	https://www.youtube.com/watch?v=Xf89KDib1FE	Search here with topics
03	https://www.youtube.com/watch?v=IORIZ1shRIM	Search here with topics
04	https://rahabitumen.com/bitumen-tests/	Search here with topics
05	https://www.youtube.com/watch?v=Z49m5jusJt0	Search here with topics

SUBJECT CODE	SUBJECT NAME	PERIOD PER WEEK		CREDIT
26464	Design of Structure 1	T	P	C
		2	3	3

Rationale	Among all the engineering, Civil engineering is the ancient one. Its demand is very high in socio-economic development of any country. It serves fundamental requirement of human being, that is, residence. It has many branches. Among all branches of Civil Engineering, Design of Structure is the most vital branch. This course have been to serve the all purposes for the construction of respective structure. To achieve those purposes, Design of Structure-1 course deals with the strength, serviceability, durability of any RCC structure. In this course it is also discussed elaborately about the design procedure, safety issues and strength of various types Beams and Lintels which are the main parts of any building structures like human skeleton. Now a days, Frame Structure is very popular, effective and durable against earthquake. After completing this course Diploma in Civil Engineering students will be skill with sufficient knowledge and adequate manner regarding field.
Learning Outcome (Theoretical)	After undergoing the subject, students will be able to 1. Illustrate different type of cement concrete and structural safety. 2. Analyze the properties of reinforcing steel used in RCC. 3. State transformed section of beam. 4. Explain the shear stress developed with functions of web reinforcement in RCC beam. 5. Discuss the functions of web reinforcement in RCC beam. 6. Explain the flexure formula and design of RCC rectangular beam in WSD and USD method . 7. Explain the design of RCC cantilever & overhanging rectangular beam, RCC T-beam and RCC beam with compression reinforcement and RCC lintel.
Learning Outcome (Practical)	After undergoing the subject, students will be able to 1. Perform compression test of concrete cylinder and cube for particular proportion with different water-cement ratio. 2. Determine tensile strength test of mild steel for plain bar and deformed bar of different diameters. 3. Prepare a model for simply supported RCC rectangular beam, continuous RCC rectangular beam, semi-continuous RCC rectangular beam, double reinforced simply supported rectangular beam and RCC lintel with sunshade as per drawing.

DETAILED SYLLABUS (THEORY)

Unit	Topics with Contents	Class (1 Period)	Final Marks
1.	CEMENT CONCRETE AND STRUCTURAL SAFETY 1.1 State plain concrete, reinforced concrete and pre-stressed concrete. 1.2 Describe uses of the plain concrete, reinforced concrete and pre-stressed concrete. 1.3 Calculate young modulus of elasticity of concrete. 1.4 Describe test procedure of crushing Cubes and Cylinders for compression test. 1.5 Define Earthquake, Richter scale, Tectonic plate and Epicenter. 1.6 Illustrate the necessity of considering the seismic load and wind load in designing reinforced concrete work. 1.7 List different types of thrust. 1.8 Mention the significant of the thrust to be consider in designing reinforced concrete structure in coastal zone. 1.9 Explain the need for structural safety and safety provision.	2	3
2.	REINFORCING STEEL IN RCC 2.1. List the different types & grades of steel used in RCC and Pre-stressed concrete. 2.2. State the different types & grades of steel used in RCC and Pre-stressed concrete. 2.3. Mention the advantages of using mild steel in RCC. 2.4. Describe the scope of using welded wire fabric in RCC. 2.5. Illustrate the characteristics of Plain bar, Deformed bar, Twisted bar and Tendon. 2.6. Mention the advantages of using Deformed and Twisted bar in RCC. 2.7. State the minimum reinforcement used in RCC beam and slab.	2	3
3.	TRANSFORMED SECTION OF BEAM 3.1. Define Transformed section. 3.2. Explain the theory of Transformed section with sketch. 3.3. Derive the equation for investigating the stresses developed in Concrete and Steel by Transformed section method. 3.4. State WSD and USD Method. 3.5. Differentiate between WSD and USD method. 3.6. Calculate the stresses developed in rectangular beam and T-beam in WSD method. 3.7. Illustrate balanced reinforced beam, under reinforced beam and over reinforced beam. 3.8. Mention the effect of under reinforced and over reinforced in RCC	3	6

	beam.		
4.	SHEAR STRESS DEVELOPED IN RCC BEAM 4.1. Define Shear Stress. 4.2. Explain the effect of shear force and stress in RCC beam. 4.3. State the meaning of diagonal tension. 4.4. Illustrate the causes of diagonal tension in RCC beam. 4.5. Derive the formula to determine shear stress developed in RCC beam. 4.6. Solve the problems on shear stress developed in WSD method. 4.7. Solve the problems on shear stress developed in USD method. 4.8. Mention the allowable shear stress for RCC beam (v) and shear stress for concrete (v_c).	2	6
5.	WEB REINFORCEMENT IN RCC BEAM 5.1. Define web reinforcement. 5.2. Classify web reinforcement with sketch. 5.3. Mention the functions of web reinforcement in RCC beam. 5.4. Determine the spacing of vertical web reinforcement in WSD method. 5.5. Determine the spacing of web reinforcement in USD method. 5.6. Calculate the portion of the RCC beam requiring web reinforcement.	2	4
6.	BOND STRESS DEVELOPED IN RCC BEAM 6.1. State the meaning of bond stress. 6.2. Derive the formula to determine bond stress developed in RCC beam. 6.3. Illustrate the allowable bond stress for plain bar and deformed bar in WSD and USD method. 6.4. Determine the anchorage length of reinforcement in RCC beam. 6.5. Explain the necessity of standard hooks of reinforcement in RCC beam.	3	8
7.	FLEXURE FORMULA AND DESIGN OF RCC RECTANGULAR BEAM IN WSD METHOD 7.1. State the assumptions used in developing the flexure formula. 7.2. Explain the stress diagram of a loaded RCC beam. 7.3. Mention the notations used in flexure formula in WSD method. 7.4. Derive the flexure formula for RCC beam in WSD method. 7.5. Outline the design steps of RCC rectangular beam in WSD method. 7.6. Determine the minimum spacing of reinforcing bars in RCC beam. 7.7. Design a simply supported RCC rectangular beam in WSD method. 7.8. Design a semi-continuous RCC rectangular beam in WSD method. 7.9. Design a continuous RCC rectangular beam in WSD method.	5	7

8.	DESIGN OF RCC RECTANGULAR BEAM IN USD METHOD 8.1.Explain the stress diagram of loaded beam with showing the actual & equivalent rectangular stress distribution of ultimate load. 8.2.State load and load factors used in USD method. 8.3.Mention the notations used in flexure formula in USD method. 8.4.Express the derivation of the flexure formula in USD method. 8.5.Outline the design steps of RCC rectangular beam in USD method. 8.6.Design a simply supported RCC rectangular beam in USD method. 8.7.Design a semi-continuous RCC rectangular beam in USD method. 8.8.Design a continuous RCC rectangular beam in USD method.	5	7
9.	DESIGN OF RCC CANTILEVER & OVERHANGING RECTANGULAR BEAMS IN WSD METHOD 9.1.Determine the design load, shear force and bending moment of RCC cantilever & overhanging beam. 9.2.Design a cantilever RCC rectangular beam. 9.3.Design an overhanging RCC rectangular beam. 9.4. Describe curtailment technique of reinforcement in cantilever RCC beam.	2	4
10.	T-BEAM AND DESIGN OF RCC T-BEAMS 10.1 Define T-beam and rectangular beam. 10.2 List the different parts of a typical T-beam. 10.3 Determine the width of flange of T-beam considering span length and slab thickness. 10.4 State the ratio of width of web to the depth of web for T-beams. 10.5 Distinguish between RCC rectangular beam and T-beam. 10.6 Determine the depth and width of a simply supported T-beam in respect to shear force. 10.7 Outline the design steps of RCC T-beam in WSD method. 10.8 Design a simply supported RCC T-beam in WSD method. 10.9 Design a semi-continuous RCC T-beam in WSD method. 10.10 Design a continuous RCC T-beam in WSD method.	3	6
11.	DESIGN OF RCC BEAM WITH COMPRESSION REINFORCEMENT AND RCC LINTEL OVER DOORS & WINDOWS. 11.1. State the meaning of double reinforced beam. 11.2. Differentiate between RCC single and double reinforced beam. 11.3. Outline the design steps of double reinforced beam. 11.4. Design a simply supported double reinforced beam. 11.5. Design a semi-continuous double reinforced beam. 11.6. Design a continuous double reinforced beam. 11.7. Determine the area of wall to be considered the design load for RCC lintels.	3	6

	11.8. Outline the design steps of RCC lintel. 11.9. Design a RCC lintel over doors and windows.		
	Total	32	60

DETAILED SYLLABUS (PRACTICAL)

Sl.	Experiment name with procedure	Class (3 Period)	Continuous Marks
1.	PERFORM COMPRESSION TEST OF CONCRETE CYLINDER FOR PARTICULAR PROPORTION. 1.1 Select tools and raw materials. 1.2 Mix cement, sand and stone chips as per ratio with proper Water-cement ratio. 1.3 Prepare the concrete cylinder with concrete according to standard procedure. 1.4 Perform curing. 1.5 Perform compression test using UTM / compression test Machine. 1.6 Calculate compressive strength. 1.7 Maintain the record of performed job.	1	2
2.	PERFORM COMPRESSION TEST OF CONCRETE CUBE FOR PARTICULAR PROPORTION 2.1. Select tools and raw materials. 2.2. Mix cement, sand and stone chips as per ratio with proper water-cement ratio. 2.3. Prepare the concrete cube with concrete according to standard procedure. 2.4. Perform curing. 2.5. Perform compression test using UTM / compression test machine. 2.6. Calculate compressive strength. 2.7. Maintain the record of performed job.	2	3
3.	DETERMINE TENSILE STRENGTH OF MILD STEEL FOR PLAIN BAR IN DIFFERENT DIAMETERS 3.1 Select tools and raw materials. 3.2 Prepare mild steel for plain bar of different diameters according to standard procedure. 3.3 Perform tensile strength test according to standard Procedure using Universal Testing Machine (UTM). 3.4 Calculate tensile strength. 3.5 Maintain the record of performed job.	2	3

4.	DETERMINE TENSILE STRENGTH OF MILD STEEL FOR DEFORMED BAR OF DIFFERENT DIAMETERS 4.1 Select tools and raw materials. 4.2 Prepare mild steel for deformed bar of different diameters according to standard procedure. 4.3 Perform tensile strength test according to standard procedure using Universal Testing Machine (UTM). 4.4 Calculate tensile strength. 4.5 Maintain the record of performed job.	1	2
5.	PREPARE A MODEL OF SIMPLY SUPPORTED RCC RECTANGULAR BEAM AS PER DRAWING 5.1 Collect tools and raw materials. 5.2 Prepare a model of simply supported RCC rectangular beam as per drawing. 5.3 Check the accuracy of the work. 5.4 Maintain the model for demonstration.	2	3
6.	MAKE A MODEL OF SEMI-CONTINUOUS RCC RECTANGULAR BEAM AS PER DRAWING 6.1 Collect tools and raw materials. 6.2 Prepare a model of semi-continuous RCC rectangular beam as per drawing. 6.3 Check the accuracy of the work. 6.4 Maintain the model for demonstration.	2	3
7.	PREPARE A MODEL OF CONTINUOUS RCC RECTANGULAR BEAM AS PER DRAWING 7.1 Collect tools and raw materials. 7.2 Prepare a model of continuous RCC rectangular beam as per drawing. 7.3 Check the accuracy of the work. 7.4 Maintain the model for demonstration.	2	3
8.	CREATE A MODEL OF DOUBLE REINFORCED SIMPLY SUPPORTED RECTANGULAR BEAM AS PER DRAWING 8.1 Collect tools and raw materials. 8.2 Prepare a model of double reinforced simply supported rectangular beam as per drawing. 8.3 Check the accuracy of the work. 8.4 Maintain the model for demonstration.	2	3
9.	PREPARE A MODEL OF RCC LINTEL WITH SUNSHADE AS PER DRAWING 9.1 Collect tools and raw materials. 9.2 Prepare a model of RCC lintel with sunshade as per drawing. 9.3 Check the accuracy of the work. 9.4 Maintain the model for demonstration.	2	3
	Total	16	25

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

SI	Item Name	Quantity
1.	LIST OF HAND TOOLS AND RAW MATERIALS: HAND TOOLS Hammer, Trowel, Shovel, Temping Rod, Bucket, Hand Gloves, Iron pan, Measuring box, Measuring tape, Rubber Boots, Safety glasses, Safety Helmet, Spade, Hack Saw, Slide Calipers, and Hand Rod Bender. RAW MATERIALS Plain & Deformed Bar, Cement, Sand, Stone Chips, Water, Galvanized Iron (G I) wire.	25
2.	LIST OF EQUIPMENT AND MACHINERY: Rod Shear Machine/Grinding Machine, Rod Bending Machine, GI wire binding machine. Universal Testing Machine(UTM), Compression Testing Machine	1

RECOMMENDED BOOKS:

SI	Book Name	Writer Name	Publisher Name & Edition
01.	Simplified Design of Reinforced Concrete	-by H Parker	
02.	R C C Design	by Abul Faraz Khan	
03.	Design of Concrete Structures	-by G Winter, L C Urquhart, C E O'Rourke, A H Nilson	
04.	Treasure of R C C Designs	-by Sushil Kumar	

WEBSITE REFERENCES:

SI	Web Link	Remarks
01.	https://www.youtube.com/watch?v=Nk6qq357ZSQ&t=2802s	Use this URL
02.	https://www.google.com/search?q=beam+design+calculation+youtube+video	Use this URL
03.	https://www.google.com/search?q=beam+design+calculation&oq	Use this URL
04	https://www.google.com/search?q=beam+design+calculation&oq=&gs_lcrp=EgZjaHJvbWUqCQgCECMYJxjqAjlJCAAQlxgnGOoCMgkIARAJGCcY6glyCQgCECMYJxjqAjlJCAMQlxgnGOoCMgkIBBAJGCcY6glyCQgFECMYJxjqAjlJCAYQlxgnGOoCMgkIBxBFGDsYwgPSAQwxODM1MjgzMmowajeoAgiwAgE&sourceid=chrome&ie=UTF-8#vhid=D3a966VWEccG7M&vssid=l	Use this URL

SUBJECT CODE	SUBJECT NAME	PERIOD PER WEEK		CREDIT
28863	STEEL STRUCTURES	T	P	C
		2	3	3

Rationale	Construction of steel structure is one of the major areas in which diploma holders in construction and civil Engineering may get very good opportunities for employment. Diploma holders have to use of steel section in various types of steel structure construction project. This subject will contain the topics on Basic concept of steel structure design, tension and compression in steel structure, steel beam and column, flexible and rigid connection, trusses and tower, steel bridge, composite structure.
Learning Outcome (Theoretical)	After undergoing the subject, students will be able to 1. Describe various types of steel structure. 2. Illustrate effect of load on various steel structures. 3. State various type of steel structure design. 4. Describe effect of tension and compression in steel structure. 5. Explain uses of beam and column on steel structure. 6. Explain necessity of various types of connection. 7. Interpret the uses of trusses, tower and steel bridge. 8. Describe steel-concrete composite structure.
Learning Outcome (Practical)	After undergoing the subject, students will be able to 1. Identify various types of steel section. 2. Compute physical properties (shape, size and weight per unit length) of steel section. 3. Perform tensile strength test on steel section. 4. Perform compressive strength test on steel-concrete composite section. 5. Identify various types of failure mood of steel section. 6. Perform rivet, bolt and welded joint. 7. Perform tensile strength test of joint. 8. Prepare a report on a steel or composite structures project. 9. Perform the correct procedure of handle tools and materials.

DETAILED SYLLABUS (THEORY)

Unit	Topics with Contents	Class (1 Period)	Final Marks
1.	INTRODUCTION TO STEEL STRUCTURE 1.1 Discuss steel structure 1.2 Describe various types of load 1.3 Define building code and specification 1.4 List various types building code for steel element design 1.5 Describe properties of steel 1.6 Draw the standard cross-sectional shape of steel	03	03
2.	STEEL STRUCTURE DESIGN 2.1 Describe design method of steel structure 2.2 State center of gravity and moment of inertia 2.3 Discuss LRFD and ASD method 2.4 Explain safety factor and load combination for LRFD and ASD method 2.5 Mention the probabilistic load and resistance factor 2.6 List the step of steel design	03	08
3.	TENSION MEMBER IN STEEL STRUCTURE 3.1 Discuss design criteria of tension member 3.2 Describe ASD and LRFD method of tension member 3.3 Compute effective area of riveted bolted tension member 3.4 Compute effective area for staggered hole of tension member 3.5 State the effect of length in member for stiffness and slenderness ratio 3.6 Discuss block shear	03	06
4.	COMPRESSION IN STEEL STRUCTURE 4.1 Derive the Euler's formula 4.2 Solve the problem related to Euler's formula 4.3 State effective length and slenderness ratio for compression member 4.4 Discuss torsional and flexural- torsional buckling 4.5 Define built-up member	03	06
5.	BEAM AND COLUMN 5.1 Discuss the simple bending of steel beam 5.2 Mention the design of beam and others flexural member using ASD allowable Bending stress 5.3 Describe deflections of beam 5.4 Mention the design of a beam others flexural member using LRFD method 5.5 State axial force and eccentric force in column 5.6 Design criteria for compression member under concentric load for LRFD and ASD method	04	08
6.	FLEXIBLE CONNECTIONS 6.1 Define flexible connection 6.2 List different kinds of flexible connection 6.3 Describe failure modes of joint	04	07

	6.4 Design a Joint subjected to axial load 6.5 Discuss end connection of beam 6.5 State semi-rigid joint		
7.	RIGID CONNECTION 7.1 Define rigid connection 7.2 Define leg, throat, and fillet of weld connection 7.3 Mention different types of weld with notation 7.4 Describe strength of weld and allowable stresses 7.5 Design a butt-weld and fillet weld 7.6 Describe end connection beam 7.7 Distinguish between flexible and rigid connection	03	07
8.	TRUSSES AND TOWER 8.1 Mention types of trusses and towers 8.2 Describe characteristic of perfect trusses 8.3 Mention type of trusses. 8.4 Mention the uses of trusses 8.5 Discuss design load for trusses 8.6 List types of tower 8.7 Describe the configuration factor for transmission tower 8.8 Discuss different types of load consider for tower design	03	07
9.	STEEL BRIDGE 9.1 Discuss types of steel bridge 9.2 List various materials used for steel bridge 9.3 Describe design load for road and rail way bridge 9.4 Define plate girder bridge and composite plate bridge 9.5 Define box girder and truss bridge	03	03
10.	COMPOSITE STRUCTURE 10.1 Define composite structure 10.2 Discuss design conceptualization and assumption 10.3 Mention elastic stress in composite structures 10.4 Discuss development of section properties 10.5 Define shear connection 10.6 List the design assumptions of LFRD method	03	05
	Total	32	60

DETAILED SYLLABUS (PRACTICAL)

SL.	Experiment Name with procedure	Class (3 Period)	Marks (Continuous)
1.	IDENTIFY VARIOUS TYPES OF STEEL SECTION 1.1 Collect the necessary tools and materials 1.2 Identify different steel section shape 1.3 Maintain the record of performed task.	2	2.5
2.	DETERMINE SHAPE, SIZE AND WEIGHT PER UNIT LENGTH OF STEEL SECTION 2.1 Wear PPE 2.2 Identify steel section shape 2.3 Calculate all measurement of steel section 2.4 Measure weight of section per linear unit length. 2.5 Maintain the record of performed task.	1	2.5
3.	PERFORM TENSILE STRENGTH TEST ON STEEL SECTION	2	2.5

	3.1 Wear PPE 3.2 Select job specimen 3.3 Perform tensile strength test on steel section 3.4 Identify types of failure at tensile strength test on steel section 3.5 Maintain the record of performed task.		
4.	PERFORM COMPRESSIVE STRENGTH TEST ON STEEL SECTION 4.1 Wear PPE 4.2 Select job specimen 4.3 Perform compressive strength test on steel section 4.4 Identify types of failure at compression strength test on steel section 4.5 Maintain the record of performed task.	1	2.5
5.	PERFORM COMPRESSIVE STRENGTH TEST ON STEEL-CONCRETE COMPOSITE SECTION 5.1 Wear PPE 5.2 Select job specimen 5.3 Perform compressive strength test on steel-concrete composite section 5.4 Identify types of failure at compression strength test on steel-concrete composite section 5.5 Maintain the record of performed task.	1	2.5
6.	PERFORM A RIVET JOINT 6.1 Wear PPE 6.2 Select job specimen 6.3 Prepare the section for joint 6.4 Perform the procedure of rivet joint 6.5 Maintain the record of performed task.	2	2.5
7.	PERFORM A BOLT JOINT 7.1 Wear PPE 7.2 Select job specimen 7.3 Prepare the section for joint 7.4 Perform the procedure of bolt joint 7.5 Maintain the record of performed task.	1	2.5
8.	PERFORM A WELDED JOINT 8.1 Wear PPE 8.2 Select job specimen 8.3 Prepare the section for joint 8.4 Perform the procedure of welded joint 8.5 Maintain the record of performed task.	2	2.5
9.	PERFORM TENSILE STRENGTH TEST OF JOINT 9.1 Wear PPE 9.2 Select job specimen 9.3 Perform the procedure of tensile strength test 9.4 Calculate joint efficiency due to actual tensile strength of section 9.5 Maintain the record of performed task.	2	2.5
10.	OBSERVE A STEEL OR COMPOSITE STRUCTURES PROJECT	2	2.5

	10.1 Visit steel structure project 10.2 Prepare a report regarding visit 10.3 Present the report		
	Total	16	25

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

S.L.	Item Name	Quantity
01	PPE	50 Sets
02	First Aid Box	5 Sets
03	Universal Testing Machine	1 Sets
04	Welding Machine	5 Sets
05	Tools set for Measuring and cutting	5 Sets

RECOMMENDED BOOKS:

S.L.	Book Name	Writer Name	Publisher Name & Edition
01.	STEEL DESIGN	William T. Segui	5th Edition
02.	DESIGN OF STEEL STRUCTURES	Elias G. Abu-Saba	SPINGER SCIUENCE+BUSINESS MEDIA
03.	COMPANION TO THE <i>AISC STEEL CONSTRUCTION MANUAL</i>	AMERICAN INSTITUTE OF STEEL CONSTRUCTION	Version 15.1

WEBSITE REFERENCES:

S.L.	Web Link	Remarks
01	https://www.youtube.com	
02	https://www.google.com	

SUBJECT CODE	SUBJECT NAME	PERIOD PER WEEK		CREDIT
28861	ADVANCED CONSTRUCTION	T	P	C
		2	3	3

Rationale	Advanced construction techniques are innovative methods and technologies have to use in the construction that are more efficient, sustainable and safer than traditional construction methods. Diploma in Construction and Civil Engineering holders have to use of advanced construction materials, advanced concreting methods, advanced construction methods, site developments, necessity and use of precast building components, industrial roof and flooring, techniques for repair and demolition, necessity of equipment in construction work, operation and maintenance of construction equipment, 3D printing, building information modeling, drones and prefabrication.
Learning Outcome (Theoretical)	After undergoing the subject, students will be able to 1. Describe the uses of fibers and plastics as construction materials 2. Explain production and equipment for ready mix concrete 3. State equipment and machinery required for construction of multistoried building 4. Interpret detection procedure of the construction defects in site development 5. Describe industrial roof and flooring 6. Explain all advanced plants and equipment's used in construction with sketch 7. Describe the necessity of different equipment in construction work 8. Describe strengthening and stiffening of beam and column.
Learning Outcome (Practical)	After undergoing the subject, students will be able to 1. Observe a construction site 2. Perform concrete placement techniques for repair work and submit a report 3. Identify different construction equipment used in particular purpose and demonstrate each equipment 4. Prepare equipment required for different construction work 5. Prepare a routine maintenance schedule of different construction equipment 6. Perform strengthening and stiffening of beam and slab 7. Perform strengthening and stiffening column and footing 8. Select proper materials during construction in domain of advanced materials including fibers, artificial timbers 9. Perform formwork for column.

DETAILED SYLLABUS (THEORY)

Unit	Topics with Contents	Class (1 Period)	Final Marks
1.	ADVANCED CONSTRUCTION MATERIAL 1.1 Define fiber and plastic 1.2 Explain different types of fiber and plastic 1.3 Describe the uses of fibers and plastics as construction material 1.4 Define artificial timber 1.5 Mention types of artificial timber 1.6 Interpret uses of artificial timber 1.7 State properties of artificial timber 1.8 Describe the properties and uses of acoustics materials, plastic board, micro-silica, artificial sand and bonding agent.	2	4
2.	ADVANCED CONCRETING METHOD 2.1 Define Pre-stressed concrete 2.2 Describe grades of concrete and pre-stressing cables for pre-stressed concrete 2.3 Explain method of pre-tensioning and post tensioning 2.4 Explain underwater concreting for bridge piers and bored pile construction 2.5 Describe tremie method of underwater concreting 2.6 Describe necessity and uses of ready-mix concrete 2.7 Explain production procedure and equipment for ready mix concrete 2.8 Explain the procedure of roller compacted concrete 2.9 Describe properties and uses of high impact resisting concrete.	3	6
3.	ADVANCED CONSTRUCTION METHOD 3.1 Define wooden and steel formwork 3.2 Describe various types of formworks 3.3 Mention uses of lifts, belt conveyors, pumped concrete 3.4 Describe precautions and safety measures required during the construction work 3.5 Explain necessity of soil reinforcing 3.6 Mention the uses of wire mesh and geo-synthetic.	3	6
4.	SITE DEVELOPMENT 4.1 State site development 4.2 Mention the purposes of site development 4.3 Describe the site development by manual 4.4 Mention the site development by mechanical equipment 4.5 Describe the construction procedure in both of manual and mechanical system 4.6 Mention the construction defects in site development.	2	6

5.	PRECAST BUILDING COMPONENT 5.1 State pre-cast building component 5.2 Mention the various type of pre-cast building component 5.3 Mention the necessity of pre-cast building component 5.4 Mention the advantage and limitations of pre-cast building component 5.5 Describe the construction procedure of pre-cast building component.	3	5
6.	INDUSTRIAL ROOF AND FLOORING 6.1 Discuss types of flooring and footing for industrial building 6.2 State the vacuum dewatered concrete flooring (VDF) 6.3 Mention typical application areas of VDF flooring 6.4 Describe the procedure of VDF flooring 6.5 Describe necessity of waterproofing 6.6 Describe application procedure of cementations waterproofing, liquid waterproofing membrane, bituminous membrane, bituminous coating and polyurethane liquid membrane 6.7 Describe types of epoxy coating flooring 6.8 State purposes and advantages epoxy coating flooring 6.9 Explain the procedure of epoxy coating flooring.	3	7
7.	REPAIR AND DEMOLITION OF CONCRETE STRUCTURE 7.1 State the prevention of corrosion in reinforcement 7.2 Describe steps of preparing RCC for repair 7.3 State the repair works of corroded RCC element 7.4 Describe the repair works of surface defect 7.5 Explain exterior coating for protection and decoration 7.6 Describe water-based coating, oil-based coating and cement-based coating 7.7 Describe demolish concrete and demolition of building 7.8 Describe the safety measures for necessary demolition work 7.9 Explain modern demolition technique 7.10 Describe safety precaution in demolition and dismantling.	5	7
8.	ADVANCE CONSTRUCTION EQUIPMENT 8.1 Describe the necessity of different equipment in construction work 8.2 List advance construction equipment used in different construction work 8.3 State the operation and maintenance of advance machinery and equipment used in construction work 8.4 Describe preventive and break down maintenance of equipment 8.5 Mention the purpose of pumping and dewatering 8.6 Describe the method of dewatering.	5	7

9.	REHABILITATION AND STRENGTHENING TECHNIQUES 9.1 Describe repair, strengthening and stiffening of member 9.2 Mention the available strengthening method 9.3 Describe strengthening and stiffening of beam, column and slab 9.4 Discuss the criteria and properties of various bonding agent 9.5 Describe the criteria, properties and uses of micro concrete 9.6 Discuss the procedure of member replacement 9.7 Classify retrofitting technique.	3	6
10.	3D PRINTING, BUILDING INFORMATION MODELING, DRONE AND PREFABRICATION. 10.1 Define 3D printing and Drone 10.2 State the uses and future of 3D printing in construction 10.3 Define building information modeling (BIM) 10.4 Differentiate between BIM and CAD 10.5 Describe necessity and scope of prefabrication of building 10.6 Mention classification of fabrication 10.7 State advantage and disadvantages of fabrication 10.8 Describe process and design principle of prefabricated systems 10.9 State the application of drone for construction 10.10 Explain the advantage and disadvantage of drone in construction.	3	6
	Total	32	60

DETAILED SYLLABUS (PRACTICAL)

SL.	Experiment Name with procedure	Class (3 Period)	Marks (Continuous)
1.	IDENTIFY MATERIALS OF ADVANCED CONSTRUCTION 1.1 Collect the necessary tools and materials 1.2 Identify different advanced construction materials 1.3 Maintain the record of performed task.	2	2.5
2.	OBSERVE CONSTRUCTION SITE 2.1 Select a project 2.2 Observe the construction site 2.3 Prepare a report on tremie method of concreting for pile/bridge pier regarding visit 2.4 Present the report.	1	2.5
3.	OBSERVE A NEAR BY CONSTRUCTION SITE AND WRITE A REPORT ON METHOD OF PREPARATION AND CONVEYANCE OF READY-MIX CONCRETE. 3.1 Select a project 3.2 Prepare a report regarding visit	2	2.5

	3.3 Present the report.		
4.	OBSERVE A DEMOLITION PROJECT 4.1 Select a project 4.2 Prepare a report regarding visit 4.3 Present the report.	1	2.5
5.	PERFORM FORMWORK FOR COLUMN 5.1 Wear PPE 5.2 Select job specimen 5.3 Maintain the record of performed task.	1	2.5
6.	PERFORM COMPRESSIVE STRENGTH TEST ON STEEL-CONCRETE COMPOSITE SECTION 6.1 Wear PPE 6.2 Select job specimen 6.3 Perform compressive strength test on steel-concrete composite section 6.4 Identify types of failure at compression strength test on steel-concrete composite section 6.5 Maintain the record of performed task.	2	2.5
7.	PERFORM STRENGTHENING AND STIFFENING OF BEAM AND SLAB 7.1 Wear PPE 7.2 Select job specimen 7.3 Perform strengthening and stiffening of beam and slab.	1	2.5
8.	PERFORM STRENGTHENING AND STIFFENING OF COLUMN AND FOOTING 8.1 Wear PPE 8.2 Select job specimen 8.3 Perform strengthening and stiffening column and footing.	2	2.5
9.	PREPARE A SITE VISIT REPORT REGARDING YOUR VISIT IN WHICH CONSTRUCTION WORK IS GOING ON WITH ADVANCED EQUIPMENT STARTING LIST OF EQUIPMENT INCLUDING ITS SELECTION CRITERIA AND ITS ADVANTAGE 9.1 Wear PPE 9.2 Prepare a report regarding visit. 9.3 Present the report.	2	2.5
10.	PREPARE A ROUTINE MAINTENANCE SCHEDULE OF DIFFERENT CONSTRUCTION EQUIPMENT 10.1 Wear PPE 10.2 Select job specimen 10.3 Perform schedule maintenance of different construction equipment.	2	2.5
	Total	16	25

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

S.L.	Item Name	Quantity
01	PPE	50 Sets
02	First Aid Box	5 Sets
03	Concrete mixer machine	1 Sets
04	Vibrator	1 Sets
05	Brick cutter	1 Sets
06	Concrete mixture truck and pump	1 Sets
07	Welding Machine	5 Sets
08	Tools set for Measuring and cutting	5 Sets
09	Demolition hammer	5 Sets

RECOMMENDED BOOKS:

S.L.	Book Name	Writer Name	Publisher Name & Edition
01.	ADVANCE CONSTRUCTION AND EQUIPMENT	M.R. SAMAL	PLATINUM PUBLISHER, KOLKATA
02.	CONSTRUCTION EQUIPMENT AND ITS MANAGEMENT	S. C.SHARMA	
03.	CONSTRUCTION MANAGEMENT & MACHINERY LIMIT	B.L. GUPTA & AMIT GUPTA	STANDARD PUBLISHER
04.	CONSTRUCTION, PLANNINGEQUIPMENT & METHODS	ROBERT L. PEURIFOY	MC GRAW HILL INDIA

WEBSITE REFERENCES:

S.L.	Web Link	Remarks
01	https://www.youtube.com	
02	https://www.google.com	

Subject Code	Subject Name	Period per Week		Credit
29061	Environmental Studies	T	P	C
		2	3	3

Rationale	The need for sustainable environmental development is critical for the future of the world and mankind. The excess demand of natural resources is creating obstacles to sustain life on earth. The continuing problems of pollution have made everyone aware of environmental issues. Different industrial sectors have direct impact on the environment and are responsible for air, water, soil, noise, marine, nuclear, and biological pollution. The knowledge of environmental studies is the prerequisite for the control of these pollutions. In this present scenario, fundamental knowledge of environmental studies is necessary for a Diploma in Engineering Course to understand the root causes of pollution and enable them to control industrial pollution through maintaining the raw materials, processes, and technology. The subject covers the basic knowledge about key environmental issues, different types of pollution, their effects, control measures, and remedies in their respective fields. This will enable them to be responsible professionals and contribute to sustainable development for the benefit of all. This module is designed with hands on practical approach which includes practical activity to identify common pollutants and data collection for resource consumption.
Learning Outcome (Theoretical)	After undergoing the subject, students will be able to: 1. Describe the environment and environmental pollution. 2. Explain ecology and ecosystems. 3. Identify major environmental risks and challenges. related to industrial operation, production, and agriculture. 4. Identify ways to mitigate negative effects on the environment. 5. State Legislative measures and requirements to protect the environment.
Learning Outcome (Practical)	After undergoing the subject, students will be able to: 1. Analyze the water and wastewater quality parameters. 2. Demonstrate the air quality measures. 3. Estimate the noise level and acoustic zone mapping. 4. Collect data for resource consumption and waste generation. 5. Observe operations of an Effluent water treatment plant (ETP).

Detailed Syllabus (Theory)

Unit	Topics with Contents	Class (1 Period)	Final Marks
1	INTRODUCTION TO ENVIRONMENTAL STUDIES 1.1 Define nature, environment & environmental studies. 1.2 Mention the components of the environment. 1.3 Define pollution, pollutant & contaminant. 1.4 Classify different types of pollution. 1.5 Differentiate between natural and man-made environments. 1.6 Define climate change. 1.7 Mention the impact of climate change.	2	4
2	ECOLOGY & ECOSYSTEM 2.1 Define ecology & eco-system. 2.2 Illustrate the water cycle. 2.3 Illustrate the carbon cycle. 2.4 Illustrate the nitrogen cycle. 2.5 Illustrate the oxygen cycle. 2.6 Define food chains and food webs. 2.7 Define Biodiversity, biomass, bioconcentration and bio magnification. 2.8 Describe Terrestrial and Aquatic ecosystem. 2.9 Define ecologically critical area (ECA), threatened species, endanger species, extinct species, and exotic species. 2.10 List the ecologically critical areas of Bangladesh.	2	4
3	GLOBAL AND NATIONAL ENVIRONMENTAL ISSUES 3.1. Define Greenhouse effect, global warming & Ozone depleting substances (ODS). 3.2. Mention the causes of global warming. 3.3. List the greenhouse gases. 3.4. State the contribution of greenhouse gases to the greenhouse effect. 3.5. Discuss the effects of global warming on the environment and human life. 3.6. Define acid rain and impact on the environment. 3.7. Describe the importance of the ozone layer and the effects of ozone depletion. 3.8. Mention different types of natural disaster. 3.9. Discuss the Flood, Cyclone & Earthquake disaster management system of Bangladesh.	3	6
4	WATER AND WASTEWATER MANAGEMENT 4.1 Define water pollution, water pollutants and pollution sources. 4.2 Mention the sources of water pollution. 4.3 Mention the quality standards of drinking water and wastewater. 4.4 Define wastewater management. 4.5 Explain effluents, influent and methods of effluent treatment. 4.6 Draw different schematic diagrams of effluent treatment methods. 4.7 Explain the effects of water pollution on human health and the	5	10

	environment. 4.8 Discuss the importance of water conservation.		
5	AIR POLLUTION, ENERGY AND CARBON FOOTPRINT 5.1 Describe the sources, production, and consumption of energy. 5.2 Describe air pollution and sources of air pollution. 5.3 Define Carbon Footprint. 5.4 Define GHG emission and contribution to the greenhouse effect. 5.5 Discuss the effects of energy consumption on Climate Change. 5.6 Explain the concept of energy efficiency. 5.7 Discuss Carbon Footprint calculation methods. 5.8 Discuss the importance of reducing Carbon Footprint. 5.9 Discuss the effect of air pollution on human health, vegetation, and animals.	5	8
6	NOISE POLLUTION 6.1 Define sound & sound wave. 6.2 Mention the scale of measuring sound intensity. 6.3 Define sound pressure & sound power. 6.4 Describe the sound intensity and loudness. 6.5 Define noise pollution. 6.6 Mention the sources of noise pollution. 6.7 Mention the effect of noise pollution on human health. 6.8 Explain the methods for noise prevention in the industry.	2	4
7	SOIL POLLUTION 7.1. Define soil pollution and soil degradation. 7.2. Classify different types of soil pollution. 7.3. Mention the sources of soil pollution. 7.4. List the main pollutants in soil. 7.5. Describe the impacts of soil pollution on the food chain and ecosystem. 7.6. Describe the methods of soil pollution controlling. 7.7. List the agro-ecological zones of Bangladesh.	2	4
8	SOLID WASTE MANAGEMENT 8.1 Define solid waste. 8.2 Identify the sources of solid waste. 8.3 Categorize different types of solid waste. 8.4 Discuss the solid waste collection methods. 8.5 Describe 3R and 4R methods of solid waste management. 8.6 Describe the potential method of disposal of solid waste. 8.7 Mention the waste management strategies in Bangladesh. 8.8 Discuss the impact of solid waste on environment and human health.	3	6
9	CHEMICAL MANAGEMENT 9.1 Define Chemical hazard. 9.2. Discuss different types of chemical hazard and toxicity. 9.3 State the benefits of chemical management. 9.4 Describe basic concepts of chemical segregation and storage. 9.5. Describe chemical label and safety data sheet (SDS) 9.6. Discuss different hazard pictogram and safety signs. 9.7 Describe chemical pesticides.	4	7

	9.8. Describe the mitigation and control measures of chemical exposure.		
10	REGULATORY ISSUES OF ENVIRONMENT 10.1 Mention environmental act & legislations prescribed for air, noise, water, soil & wildlife protection in Bangladesh. 10.2 Discuss International protocols and agreements related to environmental issues. 10.3 Define environmental impact assessment (EIA). 10.4 Describe the environmental framework in Bangladesh. 10.5 Describe environmental conservation act 1995 in Bangladesh. 10.6 Describe the environment conservation rule 1997 in Bangladesh. 10.7 Discuss the steps required to obtain Environmental Clearance certificate in Bangladesh.	4	7
	Total	32	60

Detailed Syllabus (Practical)

Sl.	Experiment name with procedure	Class (3 Period)	Total Marks
1	Determine physical water quality of water sample. 1.1 Measure temperature, color, odor & taste. 1.2 Measure turbidity of water. 1.3 Measure total suspended solids (TSS) present in water sample. 1.4 Maintain the record of performed job.	1	5
2	Determine chemical water quality of water sample. 2.1 Measure pH level in water sample. 2.2 Measure Hardness in water sample. 2.3 Maintain the record of performed job.	1	5
3	Measure total dissolved solids (TDS) present in water sample. 3.2 Prepare TDS meter & necessary accessories. 3.2 Read the value of TDS meter. 3.3 Maintain the record of performed job.	1	5
4	Determine Iron (Fe) & Arsenic (As) level in water sample. 4.1 Prepare Iron & Arsenic test kit bottles. 4.2 Measure Iron (Fe) level in water sample. 4.3 Measure Arsenic level in water sample. 4.4 Maintain the record of performed job.	1	5
5	Determine dissolved oxygen (DO), Chemical oxygen demand (COD), biochemical oxygen demand (BOD) in wastewater sample. 5.1 Prepare DO meter and necessary accessories. 5.2 Measure dissolved oxygen (DO) level present in water. 5.3 Measure biochemical oxygen demand (BOD) in water. 5.4 Prepare required apparatus for Chemical oxygen demand (COD) test. 5.5 Prepare reagents for COD test. 5.6 Observe COD test readings and calculate result.	1	5

	5.7 Maintain the record of performed job.		
6	Measure Air Quality 6.1 Prepare air quality meter and necessary accessories. 6.2 Measure air quality, CO ₂ level in the air. 6.3 Maintain the record of performed job.	1	5
7	Control of air dust by cyclone separator 7.1 Prepare cyclone separator. 7.2 Observe the reading of cyclone separator. 7.3 Remove the dust from cyclone separator. 7.4 Maintain the record of performed job.	1	5
8	Measurement of noise level in different places 8.1 Prepare noise meter. 8.2 Observe the reading of noise level meter. 8.3 Measure the noise level in different working area. 8.4 Maintain the record of performed job.	1	5
9	Calculate Energy consumption. 9.1 Collect the data. 9.2 Compute energy consumption in KWH. 9.3 Maintain the record of performed job.	1	5
10	Perform a field visit on Effluent treatment plant (ETP) 10.1 Observe the ETP plant. 10.2 Collect the relative data. 10.3 Prepare the diagram of observed ETP plant. 10.4 Maintain the record of performed job.	1	5
	Total	10	50

Necessary Resources (Tools, equipment's, and Machinery):

SI	Item Name	Quantity
01	Turbidity meter	5 set
02	P ^H meter	5 set
03	TDS meter	5 set
04	Noise Level Meter	5 set
05	DO meter	5 set
06	Cyclone Separator(high sampler)	5 set
07	Iron & Arsenic test kit box	5 set
08	Incubator	1 set
09	Water Bath	1 set
10	Glassware	5 set
11	Thermometer	5 set
12	Ultraviolet–visible Spectrophotometer	1 set
13	Energy meter	1 set
14	Bill or data for electricity bill, gas bill, liquid gas bill, gasoline bill	5 sets for each class
15	AMP meter	5 set
16	High volume sampler	1 set
17	Oven	1 set
18	Measurement scales up to 4 digits	5 set
19	COD reactor	5 sets
20	Chemicals reagents and stabilizing chemicals	2 liters

21	Hardness meter	5 sets
22	Hardness kit box	5 sets
23	Filter paper	10 packets
24	Air Quality meter	5 sets

Recommended Books:

Sl	Book Name	Writer Name	Publisher Name & Edition
01	Pollution control in process industries	S. P. Mahajan	McGraw Hill Education 2017
02	Environmental Policy and Public Health: Air Pollution, Global Climate Change, and Wilderness	William N. Rom	Jossey-Bass
03	Air pollution Fundamentals of Air Pollution, Fourth Edition	Daniel A. Vallero	Elsevier Publications
04	Industrial Noise Control	Bruce Fader	John Wiley & Sons
05	পরিবেশ দূষণ (১ম ও ২য় খণ্ড)	আবদুল মালেক ভূইয়া	
06	পরিবেশ দূষণ	গৌতম পাল	
07	Sustainability Indicators	By Simon Bell, Stephen Morse	Routledge, London, 2001.
08	Down to Earth. Applying Business Principles to Environmental Management.	F. L. Reinhardt	Harvard Business School, Boston 2000, ISBN 1-57851-192-5.
09	Industrial Wastewater Treatment.	Patwardhan	2nd revised edition. PHI Learning. ISBN:8120353323; 2017
10	Industrial Wastewater Treatment, Recycling and Reuse.	Ranade & Rhandari	Butterworth-Heinemann. ISBN: 9780080999685 2014
11	Energy, Resources and Environment	Alan Reddish and John Blunden	Hodder Education, 2 nd edition
12	Exploring Environmental Issues-An integrated approach	David D. Kemp	Routledge, London

Website References:

Sl	Web Link	Remarks
01	http://doe.portal.gov.bd/sites/default/files/files/doe.portal.gov.bd/page/155eebe8_0092_4653_907d_421dc0890e6d/aian%20sonkolon%20fff-1-100.pdf	
02	http://doe.portal.gov.bd/sites/default/files/files/doe.portal.gov.bd/page/155eebe8_0092_4653_907d_421dc0890e6d/aian%20sonkolon%20fff-101-200.pdf	
03	http://doe.portal.gov.bd/sites/default/files/files/doe.portal.gov.bd/page/155eebe8_0092_4653_907d_421dc0890e6d/aian%20sonkolon%20fff-201-366.pdf	
04	Environmental Protection Agency https://www.epa.gov/laws-regulations	
05	Woodard & AMP: Industrial Waste Treatment Handbook, 2nd Edition (2006) Chapters available for free download on https://www.sciencedirect.com/book/9780750679633/industrial-waste-treatment-handbook	