आईएफटीएम विश्वविद्यालय, मुरादाबाद, उत्तर प्रदेश

IFTM University, Moradabad, Uttar Pradesh

NAAC ACCREDITED

Course Structure

&

Syllabus

of

Diploma
Civil Engineering

[Applicable w.e.f. Academic Session – 2022-23]

[As per CBCS guidelines given by UGC]

UNIVERSITY POLYTECHNIC
DEPARTMENT OF CIVIL ENGINEERING
IFTM UNIVERSITY, MORADABAD

आईएफटीएम विश्वविद्यालय, मुरादाबाद, उत्तर प्रदेश

IFTM University, Moradabad, Uttar Pradesh

NAAC ACCREDITED

IFTM UNIVERSITY

N.H.-24, Lodhipur Rajput, Delhi Road, Moradabad, Uttar Pradesh-244001

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Study & Evaluation Scheme of
Diploma (Civil Engineering)
[Session 2022-23]

(As per CBCS guidelines)

Programme	Diploma (Civil Engineering)
Course Level	Diploma
Duration	Three Years (Six Semesters) Full Time
Medium of instruction	English/Hindi
Minimum Required Attendance	75%
Maximum Credits	160

Evaluation Scheme:			
	Internal	***External***	***Total***
Theory	***30***	***70***	***100***
Practical	***30***	***70***	***100***
Seminar/Industrial Training	***100***	***--***	***100***
Project Reports	***60***	***140***	***200***

Evaluation of Performance

1. **Programmes:** Evaluation of performance of the students in a programme shall be a continuous process based on their performance in the class test, quizzes, assignments, and the end semester examinations.

   a. **Theory papers in semester system (Maximum Marks: 100)**

   The evaluation will be done through two class test and one end semester examination. This will be in addition to quizzes, assignments, attendance, etc. Each class test will carry a weightage of 10 marks, and the end semester examination will carry a weightage of 70 marks. The remaining 10 marks will be awarded based on attendance and performance in quizzes and assignments.

   b. **Practical in semester system (Maximum Marks: 100)**

   In each practical, the student will be required to carry out the number of experiments as specified in the syllabus. Each practical conducted will be assessed by the teacher based on the experiment done during the lab, submission of the practical file, and

understanding of the experiment done, which will carry a weightage of 30 marks. There shall be an end semester practical examination with or without an external examiner which will carry a weightage of 70 marks.

2. **Summer Training, Project, Dissertation, Seminar etc.:** Summer Training, Project, Seminar, Dissertation, and other learning-oriented activities shall have associated maximum marks and credits, as stated in the syllabus.
3. **Examination:**
    a. The minimum Grade required to pass in each Theory & Practical paper is 'GRADE D'.
    b. A candidate, in order to pass, minimum CGPA of 4.50 is required in a particular academic year inclusive of both semesters of that academic. And maximum number of carryover paper permissible for promotion to next academic year are 06 theory / practical / project papers.
    c. There shall be no minimum Grade required to pass in General Proficiency (GP). However, Grade obtained in General Proficiency (GP) shall be included in SGPA.
    d. In case of audit paper, the minimum Grade required to pass is Grade D. However, the Grade obtained in audit paper shall not be included in SGPA.

For further information, examination ordinance of IFTM University can be followed.

A. Objective of the program:

Diploma in Engineering plays a major role of all innovations. It is a program that focused on practical and skills-oriented training. It is a technical course and covers the basics and essentials used with an undergraduate engineering degree. It aims to provide students with technical job-related engineering knowledge, scientific skills, mathematical techniques, a good knowledge of English to communicate in the field and ability to apply problem-solving techniques.

There is always a good scope of Diploma in Engineering program as it provides numerous job opportunities in different companies. With the help of this program, there is also a secure and constant growth of career for students. Nowadays, no technical advancement is possible without the help of core branches of Diploma in Engineering i.e., Civil, Computer, Electrical, Electronics, and Mechanical. Syllabus for Diploma in engineering makes the students to work in variety of Engineering sectors. With the help of basic sciences, a student of Diploma in Engineering can develop understanding of scientific principles and analytical ability.

Basic sciences courses make a smooth path for the technical courses of Diploma in Engineering. English language course is also incorporated to enhance the communication skills for better job opportunities.

Diploma in Engineering program consists of six semesters that includes teaching of core courses, program electives, seminar/industrial training/project work, value added and open elective courses. The University continuously works with students for making a strong desire and capacity for learning.

After finishing Diploma in Engineering program, students have numerous opportunities in various renowned industries, while some students open their own start-ups. Some students have gone through for B. Tech. to pursue higher studies in the chosen specializations.

Diploma in Engineering holders will have several opportunities in industries like Telecommunication, Automobile and Electronics equipment manufacturing, production, construction in real states etc.

Diploma Mechanical engineers are generally working in manufacturing industries, defense, PWD and Telegraphs etc. Electronic and Communication engineers and Electrical engineers have several opportunities in industries such as electronics, IT, manufacturing, power, transport, construction, telecommunications, research and development, and petrochemicals. Civil engineers are having opportunities in construction of new set up and building in real state.

B. Choice Based Credit System (CBCS)

Choice based credit system (CBCS), provides a learning platform wherein the student or knowledge seeker has the flexibility to choose their course from a list of elective, core, and soft skill courses. This is a student-centric approach to achieve his target number of credits as specified by the UGC and adopted by our university.

The following is the course module designed for the Diploma Program:

Core Course (CC): Core courses of Diploma program will provide a foundation approach to Diploma in Engineering, giving students an overview of the field, a basis to build and specialize upon. These core courses are the strong foundation to establish engineering knowledge and provide broad multi-disciplined in-depth knowledge during the elective phase. The Core courses will provide more practical-based knowledge, case-based lessons, and collaborative learning models. It will train the students to analyze, decide, and lead-rather than merely know-while creating a common student experience that can foster deep understanding, develop decision-making ability, and contribute to the engineering and community at large. A wide range of Core courses with four credits hours each provides groundwork in the engineering disciplines: Elementary Physics, Elementary Chemistry, Elementary Mathematics, Elementary Engineering Mechanics, Elementary Mechanical Engineering, Workshop Technology, Computer fundamentals & Programming in C, Basic Electrical & Electronics Engineering, Engineering Drawing Lab, Physics Lab, Chemistry Lab, Workshop Lab, Basic Electrical & Electronics Engineering Lab. The integrated foundation is Diploma in Civil Engineering

Syllabus as per CBCS (2019-20). Diploma is important for students because it will not only allow them to build upon existing skills, but they can also explore career options in a range of industries, and expand their understanding of various business fields. We offer 11 Core courses with 4 credits, 08 Core Course with 01 credit for each during the Diploma Program.

***Ability Enhancement Compulsory Course (AECC)*:** As per the guidelines of Choice Based Credit System (CBCS) for all Universities, including the private Universities, the Ability Enhancement Compulsory Course (AECC) is a course designed to develop the ability of students in communication (especially English) and other related courses where they might find it difficult to communicate at a higher level in their prospective job at a later stage due to lack of practice and exposure in the language, etc. Students are motivated to learn the theories, fundamentals and tools of communication which can help them develop and sustain in the corporate environment and culture. We offer 02 AECC with credit 4 in first semester, while in fourth semester students must pass the course having no credit during the Diploma Program.

***Skill Enhancement Course (SEC)*:** General Proficiency, Industrial Training, Seminar, Project are skill enhancement courses in all Semester of Diploma in Engineering Program. These courses are designed so that students gain the industrial knowledge and improve his/her practical skills.

***Discipline Specific Course (DSC)*:** These are discipline Specific courses that do not have any choice and will be of 4 credits each for theory and 2 credits each for theory subjects related labs. Each student of Diploma in engineering program must compulsorily pass the discipline specific course. A wide range of Discipline Specific courses with four credits each provide groundwork in the engineering disciplines: Public Health Engineering, Surveying Practice-1, Building Construction & Maintenance, Basic Geotechnical Engineering, Basic Concrete Technology, Surveying Practice-II, Basic Structural Analysis, Basic Transportation Engineering, Construction Management & Entrepreneurship Development, Design of Concrete Structures, Estimation & Costing, Basic Earthquake Engineering, Engineering Geology, Irrigation Engineering & some of lab courses related to above specific courses etc. The integrated foundation is important for students because it will not only allow them to build upon existing skills, but they can also explore career options in a range of industries, and expand their understanding of various business fields.

***Discipline Specific Elective Course (DSE)*:** The discipline specific elective course is chosen to make students specialist or having specialized knowledge of a specific domain like Estimation & Costing, Basic Earthquake Engineering, Introduction to Bridge Engineering, and Design of Steel Structures. It will cover in two semesters (V & VI) of Third year of the program relevant to chosen disciplines of compulsory/core courses of the program. The student will have to choose any two electives out of the four DSE offered Estimation & Costing, Basic Earthquake Engineering, Introduction to Bridge Engineering, and Design of Steel Structures. Each student will have to choose two discipline specific

elective courses (DSEs) in all chosen; 1 in Semester V and 1 in Semester VI respectively. Each DSE will carry 4 credits.

***Open Elective courses (DOE)*:** Open electives are additional courses that students may take to meet course requirements beyond their Core Requirements. Open Elective is a powerful tool introduced in the final year of Diploma Engineering syllabus. With the concept of Open Elective, a student can study new subjects from other streams or subjects from the same stream but which were not initially available into the main stream curriculum.

There are 5 open elective courses Industrial Management & Entrepreneurship Development, Disaster Management, Total Quality management & Non-Conventional Energy Resources and NCC General. Students must choose 01 course in semester 5th out of 03 courses (Industrial Management& Entrepreneurship Development, Disaster Management and NCC General) and 01 course in semester 6th out of 02 courses (Total Quality management, Non-Conventional Energy Resources).

C. Program Outcomes (POs) (What she/he will be able to do at the entry point of industry soon after the Diploma programme)

PO1: Basic Knowledge- An ability to apply knowledge of basic mathematics, science and engineering to solve the engineering problems.

PO2: Engineering Tools, Experimentation and Testing- Apply modern engineering tools and appropriate technique to conduct standard tests and measurements.

PO3: Communication- Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give/receive clear instructions

PO4: The Engineer and Society- apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues, and the consequent responsibilities relevant to the professional engineering practice

PO5: Ethics- Identify and demonstrate knowledge of ethical values in non-classroom activities, such as service learning, internships, and field work

PO6: Environment and Sustainability- Understand the impact of the engineering solutions in societal and environmental contexts, and demonstrate the knowledge and need for sustainable development.

PO7: Individual and Team work- Function effectively as an individual, and as a member or leader in diverse/multidisciplinary teams.

PO8: Life-long Learning- Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the context of technological changes

D. Program Specific Outcomes (PSOs) of Civil Engineering Program

PSO1: The graduates of this programme will be able to meet the needs of public in the design and execution of quality construction work considering the health, safety, cultural, societal, and environmental factors.

PSO2: The graduates of this programme will be able to meet the needs of public in the design and execution of quality construction work considering the health, safety, cultural, societal, and environmental factors.

PSO3: Use effective communication skills and shoulder accountability in a professional role as a Civil Engineer independently, or as a team-member/team-leader in society.

PSO4: Practice ethics in socio-economical, environmental, and professional Civil Engineering activities.

PSO5: Pursue research and innovation in the field of Civil Engineering & allied fields for betterment of the society.

E. Pedagogy & Unique practices adopted:

Our teachers' use of communicative strategies encourages pedagogic practices that are interactive in nature and is more likely to impact on student learning outcomes. Some specific strategies, that promoted this interactive pedagogy includes:

Audio-Visual Based Learning:

Audio visual aids are important tools for teaching learning process. It helps the teacher to present the lesson effectively and students learn and retain the concepts better and for longer duration. Use of audio-visual aids improves student's critical and analytical thinking. It helps to remove abstract concepts through visual presentation. However, improper, and unplanned use of these aids can have negative effect on the learning outcome. Therefore, teachers should be well trained through in-service training to maximize the benefits of using these aids. The curriculum should be designed such that there are options to activity-based learning through audio-visual aids. In addition, government should fund resources to purchase audio-visual aids in colleges

Field / Live Projects:

The objective of their training program is to enhance knowledge of the students on any one of the Trending technologies according to the industry standards without which the student degree is a mere degree. This is done by making students work on live projects which equip them with the required skill needed for the corporate world.

Personality Development Program (PDP)

It is conducted by professional trainers/experts from corporates as also by dedicated in-house faculty to bring a change in the traits of students in terms of values, behavior, and personal growth. It enhances their body language, self-discipline, includes boosting one's confidence, improving language speaking abilities and widening one's scope of knowledge. Following PDP programs are undertaken in the Institute.

- **Aptitude**: Prepare students for placements by enhancing students' understanding in reasoning, numeric aptitudes, language proficiencies and general awareness.
- **Resume Writing**: Trains students about the current trend to present their Personal, Educational & Professional achievements and Strengths in an impressive manner. They learn how to write covering letter through which they can efficiently present their extra information. They also get an exposure to the Social Professional Sites like LinkedIn.
- **Group Discussion**: Help students to improve their ability to understand a topic/idea from different perspectives. They can realize its importance as a standard recruitment and selection tool. Students are trained to demonstrate their leadership, team work, oral and body language skills.
- **Personal Interview**: A platform to train students in improving their listening abilities and handling interviewer's questions and answer accordingly so that they can remove hesitation and anxiety during placement process.

Student Development Programs (SDP)

SDP has various modules dealing with professional development, Awareness and opinion building, communication, and self-presentation etc. The purpose of these modules is to help students grow as individuals, develop the power of critical thinking and, at a material level, secure better placements

Special Guest Lectures (SGL)

Guest lectures are a highly useful medium to provide exceptional knowledge to students, it also adds an extra variety to the classroom routine and universities put a lot of emphasis on the importance of Guest lectures. The Guest lecturers are the "real-world" arriving in the classroom in order to make classes more interesting.

Industrial Visits

Industrial visits are an integral part of Engineering and acknowledgment of technological up gradation. Industrial visit is considered as one of the tactical methods of teaching. The main reason behind this, it lets student to know things practically through interaction, working methods and employment practices. Moreover, it gives exposure from academic point of view. Main

aim of industrial visit is to provide an exposure to students about practical working environment. They also provide students a good opportunity to gain full awareness about industrial practices. Through industrial visit students get awareness about new technologies. Technology development is a main factor, about which a students should have a good knowledge. Visiting different companies help students to build a good relationship with those companies.

Industry Focused programs:

Industry oriented education is an approach to learning from an industry perspective where core subjects are taught in the context of application of that knowledge to product design, development, and operation.

Mentoring scheme:

The new process has been established as "Mentoring System". Each faculty will be the mentor of a group of 20 to 25 students. First, second-, and third-year students will have mentors from the parent department. Departmental faculties will continue to be mentors for the same group of students till their graduation.

HOD: The HOD will,

1. Meet all mentor of his/her department at least once a month to review proper implementation of the system
2. Advice mentors wherever necessary.
3. Initiate administrative action on a student when necessary.
4. Keep the head of the institute informed.

Extracurricular Activities:

In IFTM University, various Co-Curricular and Extra-Curricular activities are regularly conducted along with regular academic activities and students are continuously inspired and motivated to participate in these various activities to ensure the overall development of the students.

- **Cultural Activities:** The various activities undertaken are – Singing, Dancing, Playing Musical Instruments, Compering, Skit, Band, Stand-up Comedy, Poetry, Fashion Show etc. These activities help to develop self-confidence, cultural interest, creativity, and sense of cooperation among students.
- **Games & Sports:** IFTM strongly believes that a healthy physique leads to a healthy mind. The Institute encourages sports culture and students also reciprocate by actively participating and distinguishing themselves at Sports Meets. IFTM possesses proper playgrounds and hard courts for outdoor sports. In Boys hostels students enjoy the facilities of Gym, badminton, and Table

Tennis. The various sports activities undertaken are – cricket, football, basketball, volley ball, carom, chess, badminton, athletics etc. They increase self-esteem & mental alertness among students and promote team spirit. They also lead to balanced mental and physical growth of the students and teach them life skills like discipline, teamwork, leadership, patience, perseverance etc.

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Diploma (Civil Engineering)
(w.e.f session 2022-2023)

Cluster of Courses for Diploma (Civil Engineering) Programme

1. Elementary/Fundamental Science Core Courses (CC)

S. No	Course Code	Subject Name	Credit
1.	DPPH-101	Elementary Physics-I	04
2.	DPMA-101	Elementary Mathematics -I	04
3.	DPCH-101	Elementary Chemistry-I	04
4.	DPPH-151	Physics-I Lab	01
5.	DPCH-151	Chemistry-I Lab	01
6.	DPPH-201	Elementary Physics-II	04
7.	DPMA-201	Elementary Mathematics -II	04
8.	DPCH-201	Elementary Chemistry-II	04
9.	DPPH-251	Physics-II Lab	01
10.	DPCH-251	Chemistry – II Lab	01

2. Engineering Science Core Courses (CC)

S. No	Subject Code	Subject Name	Credit
1.	DPME-101 /DPME-201	Elementary Engineering Mechanics	04
2.	DPCS-101 / DPCS-201	Computer Fundamentals & Programming in C	04
3.	DPME-102 / DPME-202	Workshop Technology	04
4.	DPEE-101 / DPEE-201	Basic Electrical & Electronics Engineering	04
5.	DPME-151 / DPME-251	Engineering Drawing Lab	01
6.	DPCS-151 / DPCS-251	Computer Programming Lab	01
7.	DPME-152 / DPME-252	Workshop Lab	01
8.	DPEE-151 / DPEE-251	Basic Electrical and Electronics Engineering Lab	01
9.	DPME-203	Elementary Mechanical Engineering	04

3. Engineering Discipline Specific Core Courses (DSC)

S. No	Subject Code	Subject Name	Credit
1.	DPCE-301	Materials Science & Engineering	04
2.	DPCE-302	Public Health Engineering	04
3.	DPCE-303	Surveying Practice-1	04

4.	DPCE-304	Building Construction & Maintenance	04
5.	DPCE-305	Introductory Strength of Materials	04
6.	DPCE-351	Materials Science Lab	01
7.	DPCE-352	Public Health Engineering Lab	01
8.	DPCE-353	Surveying Practice-I Lab	01
9.	DPCE-354	Building Material Lab	01
10.	DPCE-401	Basic Geotechnical Engineering	
11.	DPCE-402	Basic Concrete Technology	
12.	DPCE-403	Surveying Practice-II	
13.	DPCE-404	Introductory Fluid Mechanics	
14.	DPCE-405	Basic Structural Analysis	04
15.	DPCE-451	Basic Geotechnical Engineering Lab	04
16.	DPCE-452	Concrete Technology Lab	04
17.	DPCE-453	Surveying Practice-II Lab	04
18.	DPCE-454	Fluid Mechanics Lab	04
19.	DPCE-501	Basic Transportation Engineering	01
20.	DPCE-502	Construction Management & Entrepreneurship Development	01
21.	DPCE-503	Design of Concrete Structures	01
22.	DPCE-551	Transportation Engineering Lab	01
23.	DPCE-552	CAD Lab	04
24.	DPCE-601	Engineering Geology	04
25.	DPCE-602	Irrigation Engineering	04
26.	DPCE-603	Environmental Pollution Studies	01
27.	DPCE-651	Engineering Geology Lab	01
28.	DPCE-652	Civil Engineering Drawing Lab	04

4. Discipline Elective Core Courses (DSC)

S. No	Subject Code	Subject Name	Credit
1.	DPCE-504	Estimation & Costing	04
2.	DPCE-505	Basic Earthquake Engineering	04
3.	DPCE-604	Introduction to Bridge Engineering	04
4.	DPCE-605	Design of Steel Structures	04

5. Open Elective Course (Inter disciplinary) (DOE)

S. No	Subject Code	Subject Name	Credit
1.	DOEC-051	Industrial Management & Entrepreneurship Development	04
2.	DOCE-051	Disaster Management	04
3.	NCC-01	NCC General	04
4.	DOME-061	Total Quality Management	04
5.	DOEE-061	Non-Conventional Energy Resources	04

6. Ability Enhancement Compulsory Course (AECC)

S. No	Subject Code	Subject Name	Credit
1.	FEC-101	Fundamentals of English Communication	04
2.	PSC-401	Professional Communication	00

7. Project/Seminar/Summer or Industrial Training (SEC)

S. No	Subject Code	Subject Name	Credit
1.	DPEC-553	Industrial Training	01
2.	DPEC-554	Seminar	01
3.	DPEC-653	Project	04
4.	DPGP-101	General Proficiency	01
5.	DPGP-201	General Proficiency	01
6.	DPGP -301	General Proficiency	01
7.	DPGP -401	General Proficiency	01
8.	DPGP -501	General Proficiency	01
9.	DPGP -601	General Proficiency	01

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STUDY AND EVALUATION SCHEME
YEAR I, SEMESTER-I

S. No.	Section	Course Code	Course Name	Periods			Evaluation Scheme				Course Total	Credit
							Mid Term Exam			External Exam		
				L	T	P	CT	AS +AT	Total			
THEORY												
1.	CC-01	DPPH-101	Elementary Physics-I	3	1	0	20	10	30	70	100	4
2.	CC-02	DPMA-101	Elementary Mathematics -I	3	1	0	20	10	30	70	100	4
3.	CC-03	DPCH-101	Elementary Chemistry-I	3	1	0	20	10	30	70	100	4
4.	CC-04	DPME-101/ DPCS-101	Elementary Engineering Mechanics / Computer Fundamentals & Programming in C	3	1	0	20	10	30	70	100	4
5.	CC-05	DPME-102/ DPEE-101	Workshop Technology / Basic Electrical & Electronics Engineering	3	1	0	20	10	30	70	100	4
6.	AECC-01	FEC-101	Fundamentals of English Communication	3	1	0	20	10	30	70	100	4
PRACTICALS/ PROJECT												
7.	CC-06	DPME-151/ DPCS-151	Engineering Drawing Lab / Computer Programming Lab	0	0	2	-	-	30	70	100	1
8.	CC-07	DPPH-151	Physics-I Lab	0	0	2	-	-	30	70	100	1
9.	CC-08	DPCH-151	Chemistry-I Lab	0	0	2	-	-	30	70	100	1
10.	CC-09	DPME-152/ DPEE-151	Workshop Lab / Basic Electrical and Electronics Engineering Lab	0	0	2	-	-	30	70	100	1
11.	SEC-01	DPGP-101	General Proficiency	-	-	-	-	-	100	-	100	1
			TOTAL	**18**	**06**	**08**	**-**	**-**	**-**	**-**	**1100**	**29**

Abbreviation: CC- Core Course, AECC - Ability Enhancement Compulsory Course, SEC - Skill Enhancement Course

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STUDY AND EVALUATION SCHEME
YEAR I, SEMESTER-II

S. No.	Section	Course Code	Course Name	Periods			Evaluation Scheme				Course Total	Credit
							Mid Term Exam			External Exam		
				L	T	P	CT	AS +AT	Total			
THEORY												
1.	CC-10	DPPH-201	Elementary Physics-II	3	1	0	20	10	30	70	100	4
2.	CC-11	DPMA-201	Elementary Mathematics -II	3	1	0	20	10	30	70	100	4
3.	CC-12	DPCH-201	Elementary Chemistry-II	3	1	0	20	10	30	70	100	4
4.	CC-13	DPME-201	Elementary Mechanical Engg.	3	1	0	20	10	30	70	100	4
5.	CC-14	DPEE-201 / DPME-202	Basic Electrical & Electronics Engineering / Workshop Technology	3	1	0	20	10	30	70	100	4
6.	CC-15	DPME-202/ DPCS-201	Elementary Engineering Mechanics / Computer fundamentals & Programming in C	3	1	0	20	10	30	70	100	4
PRACTICALS/ PROJECT												
7.	CC-16	DPPH-251	Physics-II Lab	0	0	2	-	-	30	70	100	1
8.	CC-17	DPEE-251 / DPME-252	Basic Electrical and Electronics Engineering Lab / Workshop Lab	0	0	2	-	-	30	70	100	1
9.	CC-18	DPCS -251/ DPME-251	Computer Programming Lab / Engineering Drawing Lab	0	0	2	-	-	30	70	100	1
10.	CC-19	DPCH–251	Chemistry – II Lab	0	0	2	-	-	30	70	100	1
11.	SEC-02	DPGP-201	General Proficiency	-	-	-	-	-	100	-	100	1
			TOTAL	**18**	**06**	**08**	**-**	**-**	**-**	**-**	**1100**	**29**

Abbreviation: CC- Core Course, SEC - Skill Enhancement Course

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STUDY AND EVALUATION SCHEME
YEAR II, SEMESTER-III

S. No.	Section	Course Code	Course Name	Periods			Evaluation Scheme				Course Total	Credit
							Mid Term Exam			External Exam		
				L	T	P	CT	AS +AT	Total			
THEORY												
1.	DSC-01	DPCE-301	Materials Science & Engineering	3	1	0	20	10	30	70	100	4
2.	DSC-02	DPCE-302	Public Health Engineering	3	1	0	20	10	30	70	100	4
3.	DSC-03	DPCE-303	Surveying Practice-1	3	1	0	20	10	30	70	100	4
4.	DSC-04	DPCE-304	Building Construction & Maintenance	3	1	0	20	10	30	70	100	4
5.	DSC-05	DPCE-305	Introductory Strength of Materials	3	1	0	20	10	30	70	100	4
PRACTICALS/ PROJECT												
6.	DSC-06	DPCE-351	Materials Science Lab	0	0	2	-	-	30	70	100	1
7.	DSC-07	DPCE-352	Public Health Engineering Lab	0	0	2	-	-	30	70	100	1
8.	DSC-08	DPCE-353	Surveying Practice-I Lab	0	0	2	-	-	30	70	100	1
9.	DSC-09	DPCE-354	Building Material Lab	0	0	2	-	-	30	70	100	1
10.	SEC-03	DPGP-301	General Proficiency	-	-	-	-	-	100	-	100	1
			TOTAL	**15**	**05**	**08**	**-**	**-**	**-**	**-**	**1000**	**25**

Abbreviation: DSC- Discipline Specific Course, SEC - Skill Enhancement Course

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STUDY AND EVALUATION SCHEME
YEAR II, SEMESTER-IV

S. No.	Section	Course Code	Course Name	Periods			Evaluation Scheme				Course Total	Credit
							Mid Term Exam			External Exam		
				L	T	P	CT	AS +AT	Total			
THEORY												
1.	DSC-10	DPCE-401	Basic Geotechnical Engineering	3	1	0	20	10	30	70	100	4
2.	DSC-11	DPCE-402	Basic Concrete Technology	3	1	0	20	10	30	70	100	4
3.	DSC-12	DPCE-403	Surveying Practice-II	3	1	0	20	10	30	70	100	4
4.	DSC-13	DPCE-404	Introductory Fluid Mechanics	3	1	0	20	10	30	70	100	4
5.	DSC-14	DPCE-405	Basic Structural Analysis	3	1	0	20	10	30	70	100	4
PRACTICALS/ PROJECT												
6.	DSC-15	DPCE-451	Basic Geotechnical Engineering Lab	0	0	2	-	-	30	70	100	1
7.	DSC-16	DPCE-452	Concrete Technology Lab	0	0	2	-	-	30	70	100	1
8.	DSC-17	DPCE-453	Surveying Practice-II Lab	0	0	2	-	-	30	70	100	1
9.	DSC-18	DPCE-454	Fluid Mechanics Lab	0	0	2	-	-	30	70	100	1
10.	SEC-04	DPGP-401	General Proficiency	-	-	-	-	-	100	-	100	1
			TOTAL	**15**	**05**	**08**	**-**	**-**	**-**	**-**	**1000**	**25**

Ability Enhancement Compulsory Course

S. No.	Section	Course Code	Course Name	Periods			Evaluation Scheme				Course Total	Credit
							Mid Term Exam			External Exam		
				L	T	P	CT	AS +AT	Total			
1.	AECC-02	PSC-401	Professional Communication	3	1	0	20	10	30	70	100	0

Note: Industrial Training of 4 – 6 weeks after IV Semester, which will be evaluated in V Semester
Abbreviation: DSC- Discipline Specific Course, AECC - Ability Enhancement Compulsory Course,
SEC - Skill Enhancement Course,

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STUDY AND EVALUATION SCHEME
YEAR III, SEMESTER-V

S. No.	Section	Course Code	Course Name	Periods			Evaluation Scheme				Course Total	Credit
							Mid Term Exam			External Exam		
				L	T	P	CT	AS +AT	Total			
THEORY												
1.	DSC-19	DPCE-501	Basic Transportation Engineering	3	1	0	20	10	30	70	100	4
2.	DSC-20	DPCE-502	Construction Management & Entrepreneurship Development	3	1	0	20	10	30	70	100	4
3.	DSC-21	DPCE-503	Design of Concrete Structures	3	1	0	20	10	30	70	100	4
Departmental Elective (Select any one)												
4.	DSE-01	DPCE-504	Estimation & Costing	3	1	0	20	10	30	70	100	4
	DSE-02	DPCE-505	Basic Earthquake Engineering									
Open Elective (Select any one)												
5.	DOE-01	DOEC-051	Industrial Management & Entrepreneurship Development	3	1	0	20	10	30	70	100	4
	DOE-02	DOCE-051	Disaster Management									
	DOE-03	NCC-01	NCC General	-	-	-	-	-	-	-	-	
PRACTICALS/ PROJECT												
6.	DSC-22	DPCE-551	Transportation Engineering Lab	0	0	2	-	-	30	70	100	1
7.	DSC-23	DPCE-552	CAD Lab	0	0	2	-	-	30	70	100	1
8.	SEC-05	DPCE-553	Industrial Training	0	0	2	-	-	100	-	100	1
9.	SEC-06	DPCE-554	Seminar	0	0	2	-	-	100	-	100	1
10.	SEC-07	DPGP-501	General Proficiency	-	-	-	-	-	100	-	100	1
			TOTAL	**15**	**05**	**08**	**-**	**-**	**-**	**-**	**1000**	**25**

Abbreviation: DSC- Discipline Specific Course, SEC - Skill Enhancement Course, DSE - Discipline Specific Elective Course, DOE- Open Elective Courses

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STUDY AND EVALUATION SCHEME
YEAR III, SEMESTER-VI

S. No.	Section	Course Code	Course Name	Periods			Evaluation Scheme				Course Total	Credit
							Mid Term Exam			External Exam		
				L	T	P	CT	AS +AT	Total			
THEORY												
1.	DSC-24	DPCE-601	Engineering Geology	3	1	0	20	10	30	70	100	4
2.	DSC-25	DPCE-602	Irrigation Engineering	3	1	0	20	10	30	70	100	4
3.	DSC-26	DPCE-603	Environmental Pollution Studies	3	1	0	20	10	30	70	100	4
Departmental Elective (Select any one)												
4.	DSE-03	DPCE-604	Introduction to Bridge Engineering	3	1	0	20	10	30	70	100	4
	DSE-04	DPCE-605	Design of Steel Structures									
Open Elective (Select any one)												
5.	DOE-04	DOME-061	Total Quality Management	3	1	0	20	10	30	70	100	4
	DOE-05	DOEE-061	Non-Conventional Energy Resources									
PRACTICALS/ PROJECT												
6.	DSC-27	DPCE-651	Engineering Geology Lab	0	0	2	-	-	30	70	100	1
7.	DSC-28	DPCE-652	Civil Engineering Drawing Lab	0	0	2	-	-	30	70	100	1
8.	SEC-08	DPCE-653	Project	0	0	8	-	-	60	140	200	4
9.	SEC-09	DPGP-601	General Proficiency	-	-	-	-	-	100	-	100	1
			TOTAL	**15**	**05**	**12**	**-**	**-**	**-**	**-**	**1000**	**27**

Abbreviation: DSC- Discipline Specific Course, SEC - Skill Enhancement Course, DSE - Discipline Specific Elective Course, DOE- Open Elective Courses

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DPPH 101: ELEMENTARY PHYSICS-I

Objective: This aim of this course is to impart knowledge in basic concepts of physics like unit, dimension, work, energy, and power etc. and their applications.

UNIT I **(8 Sessions)**

Unit and Dimensions

Physical quantities, Fundamental and derived units, Systems of unit (CGS, MKS and SI units), Dimensions and dimensional formulae of physical quantities (area, volume, velocity, acceleration, momentum, force, impulse, work, power, energy, surface tension, coefficient of viscosity and strain) , Dimensional equations and their uses with examples, Limitations of dimensional analysis.

UNIT II **(10 Sessions)**

Force and Motion

Scalar and vector quantities - examples, addition and multiplication of vectors, scalar product and vector product of vectors, Force, resolution and composition of forces – resultant, friction, law of friction and type of friction, Newton's Laws of motion – concept of momentum, determination of force equation from Newton's second law of motion, Newton's third law of motion Conservation of momentum, impulse and impulsive forces, simple numerical problems, Circular motion (Definition), Relation between linear and angular velocity and linear acceleration and angular acceleration , Centripetal force (derivation) and centrifugal force Banking of roads, Definition of torque ,Planetary Motion, Newton's law of gravitation, Kepler's law of planetary motion, Escape velocity (derivation)

UNIT III **(8 Sessions)**

Work, Power, and Energy

Work: definition and its units, Work done against friction in moving an object on horizontal and inclined plane (incorporating frictional forces),

Power: definitions and its units, calculation of power in simple cases,

Energy: Definitions and its units: Types: Kinetic energy and Potential energy, with examples and their derivation.

UNIT IV **(8 Sessions)**

Temperature and its measurement

Difference between heat and temperature based on K.E. of Molecules, Principles of measurement of temperature and different scales of temperature, Transfer of Heat, Modes of transfer of heat (conduction, convection, and radiation with examples), Coefficient of thermal conductivity, Properties of heat radiation. Prevost's theory of heat exchange, Laws of black body radiations: Stefan's law, Kirchhoff's law, Wien's law.

UNIT V **(10 Sessions)**

Properties of Matter

Elasticity, stress and strain, Different types of modulus of elasticity, Surface tension- its units, measurement of surface tension by capillary tube method, applications of surface tension, effect of

temperature and impurity on surface tension, Fluid motion, stream line and turbulent flow, Viscosity, and coefficient of viscosity.

Course Outcomes:

Students completing this course will be able to:

CO1: Identify different systems of units and convert units from one system to another as well as conversant with practical units.

CO2: Represent physical quantities as scalar and vectors, applying physical laws and concept of linear and circular motion in everyday life.

CO3: Differentiate between work, energy, and power.

CO4: Express physical work in terms of heat and temperature; measure temperature in various processes on different scales. Distinguish between conduction, convection, and radiations

CO5: Understand the concept of elasticity, surface tension pressure and laws governing moment of fluid.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

COs/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1	3	3	2	3	2	2	1	1
CO 2	3	3	3	2	3	1	2	1
CO 3	3	3	3	3	2	1	1	2
CO 4	3	3	3	3	2	2	1	1
CO 5	3	3	3	2	3	1	1	2

Suggested Readings:

1. Concept of Physics, Prof. H.C. Verma, Part-1 (Bharti Bhawan)
2. Concept of Physics, Prof. H.C. Verma, Part-2 (Bharti Bhawan)
3. A Text Book of Applied Physics: Eagle Prakashan, Jullandhar

Website Sources:

- https://thefactfactor.com
- https://i1.dainikbhaskar.com
- https://hplgit.github.io
- https://worldwidescience.org
- https://courses.lumenlearning.com
- https://www.machinedesign.com
- http://teacher.pas.rochester.edu

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DPMA 101: ELEMENTARY MATHEMATICS-I

Objective: - The main aims of this course are to understand basics and applications of algebra, determinants, vectors, trigonometry, and complex numbers. The focus of these topics in field to impart their knowledge in particular area of engineering branches and Comprehensive knowledge of basic mathematics.

UNIT I **(12 Sessions)**

Series: AP and GP; Sum of n terms, Partial fractions, Exponential and Logarithmic series, Binomial theorem for positive, Negative, and fractional index (without proof) Application of Binomial theorem, Permutation & combination.

UNIT II **(10 Sessions)**

Determinants: Elementary properties of determinants of order 2 and 3, Consistency and solution of system of algebraic equation by Cramer's rule, Matrices, Type of matrix, Properties (addition, subtraction, multiplication, adjoint, inverse) of matrix.

UNIT III **(10 Sessions)**

Vector algebra: Dot and Cross product, Scalar and vector triple product, Application to work done, Moment of a force.

UNIT IV **(10 Sessions)**

Trigonometry: Relation between sides and angles of a triangle, Statement of various formulae showing relationship between sides and angles of a triangle, trigonometrically equations, Inverse trigonometric function.

UNIT V **(10 Sessions)**

Complex numbers, Representation, Modulus and amplitude De-mover's theorem and its application in solving algebraic equations, Mod, Function, and its properties.

Course Outcomes:

CO1: Demonstrate basic knowledge of AP and GP; Sum of n terms, Exponential and Logarithmic series and understands the basic concept of factorial notion in permutation, combination, and binomial theorem.

CO2: To find area of triangle to understand properties to simplify determinants to solve system of equations using matrices.

CO3: Familiar with the basic concepts of scalar product, vector product, Triple products, and multiple products.

CO4: To understand basics and applications of trigonometry in field to impart their knowledge and comprehensive of basic mathematics.

CO5: This course enables the students to learn the concept of imaginary numbers and gives awareness about algebra of complex numbers.

PO-CO Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	2	3	2	2	1	1
CO2	3	3	3	2	3	1	3	2
CO3	3	3	3	3	2	3	3	2
CO4	3	3	3	3	2	3	1	2
CO5	3	3	3	2	3	1	3	2

Suggested Readings:

1. R.D. Sharma: Mathematics (I& II-XI), Dhanpat Rai Publication, Delhi.
2. B.S. Grewal: Engg. Mathematics, Khanna Publishers, New Delhi.
3. H.R. Luthra: Applied Mathematics, Bharat Bharti Prakashan & Co. Meerut.
4. Kailash Sinha: Applied Mathematics, Nav Bharat Publication, Meerut.
5. A Text Book of Mathematics (XI & XII) NCERT.

Website Sources:

- www.pdfdrive.com
- www.dmi.gov.in
- www.yourarticlelibrary.com
- onlinecourses.nptel.ac.in
- en.wikipedia.org

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DPCH 101: ELEMENTARY CHEMISTRY-I

Objectives: To emphasize the relevance of fundamentals and applications of chemistry for diploma holders and student will learn appropriate combinations of old and new emerging concepts. Also, to bring potential applications of chemistry and practical utility in order to become good engineers and entrepreneurs.

UNIT I **(8 Sessions)**

Structure of Atom: Basic concepts of atomic structure, Matter wave concept, Schrodinger wave equation (excluding derivation) Quantum number, Heisenberg's Uncertainty Principle, Shapes of orbitals.
Chemical Bonding**:** Basic concepts, Hydrogen bonding, Valence bond theory,
Hybridization, VSEPR theory, Molecular orbital theory as applied to diatomic homonuclear molecules of first and second period elements, Co-ordination bond.
Solid State: Types of solids (Amorphous and Crystalline), Classification ion (Molecular, Ionic, Covalent, Metallic), Band theory of solids (Conductors, Semiconductors, and Insulators), types of Crystals, FCC, BCC, Crystal imperfection.

UNIT II **(8 Sessions)**

Periodic Classification of Elements: Classification of elements (S, P, D and F block elements), Modern Periodic law, Periodic properties: Ionization energy electro negativity, Electron affinity.

UNIT III **(8 Sessions)**

Electro Chemistry: Arrhenius Theory of electrolytic dissociation, Transport number, Electrolytic conductance, Ostwald dilution law. Concept of Acid and bases: Bronsted, Arrhenius and Lewis theory. pH. Buffer solutions, Indicators, Solubility product, Common ion effect with their applications, Redox reactions, Electrode potential (Nernst Equation), Electro-chemical cells (Galvanic and Electrolytic). EMF of a cell and free energy change. Standard electrode potential, Electro chemical series and its applications., Laclanche's or dry cell, Acid storage cell (Lead accumulator) and Alkali stroge cell (Edison accumulator), Solar cell (Photovoltaic cell), Numerical problems based on topics.

UNIT IV **(8 Sessions)**

Chemical Kinetics: Introduction, rate of reaction, rate constant order and molecularity of reaction. Activation energy, Zero order First order and Second order (when initial concentration of both the reactants are same) reactions.
Catalysis: Definition, Characteristics of catalytic reactions, Catalytic promoters and
poison, Autocatalysis and Negative catalysis, Theory of catalysis, Application.

UNIT V **(8 Sessions)**

Colloids: Colloids and its types, Different system of colloids, Dispersed phase, and dispersion medium. Methods of preparation of colloidal solutions, Dialysis and electrodialysis.
Properties of colloidal solution with special reference to adsorption, Brownian Movement, TYNDAL effect, Electrophoresis, and coagulation. Gold number, Application of colloids.

Course Outcome:

Upon successful completion of this course students should be able to:

CO1: Describe atomic structure, concept of matter-wave chemical bonding and solid state

CO2: Describe the periodic table as a list of elements to demonstrate trends in their physical and chemical properties.

CO3: Understand the concept of conductance and electrochemistry as well as determine the EMF of the cells.

CO4: Evaluate rate constant of a reaction as well as understand theories of reaction rates.

CO5: Apply the concepts of sol, gel, and emulsions to various solutions.

PO-CO Mapping (Please write 3,2,1 wherever required)

(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped).

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	3	2	3	2	2	1	1
CO2	3	3	3	2	3	1	3	2
CO3	2	3	3	2	2	3	1	3
CO4	3	3	2	3	2	3	1	2
CO5	3	2	3	2	3	1	3	3

Suggested Readings:

1. Liquid Crystals and Plastic Crystals, vol.-I, edited by G.W. Gray and P.A. Winsor, Ellis Harwood Series in Physical Chemistry, New York.
2. Corrosion Engineering by M.G. Fontana McGraw Hill Publications.
3. Engineering Chemistry by J C Kuriacose and J. Rajaram, Tata McGraw-Hill Co, New Delhi (2004).
4. Chemistry of Engineering Materials by C.P. Murthy, C.V. Agarwal, and A. Naidu BS Publication Hyd.

Website Sources:

- http://www.commonchemistry.org/
- https://uri.idm.oclc.org/login?url=https://www.engineeringvillage.com/search/quick.url?CID=quickSearch&database=1
- https://www.technicalsymposium.com/

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DPME 101/DPME 201: ELEMENTARY ENGINEERING MECHANICS

Objective:
The primary objectives of elementary engineering mechanics course are to help the student develop this ability to visualize. This is so vital to problem formulation purpose of the study of elementary engineering mechanics. To develop the capacity to predict the effects of force and motion while carrying out the creative design functions of engineering.

UNIT I **(08 Sessions)**
Introduction: Mechanics and its utility. Concept of scalar and vector quantities. Effect of a force. Tension & compression. Rigid body. Principle of physical independence of force. Principle of transmissibility of a force.

UNIT II **(08 Sessions)**
System of Forces: Concept of co-planer and non-co-planer forces including parallel forces. Concurrent and non-concurrent forces. Resultant force. Equilibrium of forces. Law of parallelogram of forces. Law of triangle of forces and its converse. Law of polygon of forces. Solution of simple engineering problems by analytical and graphical methods such as simple wall crane, jib crane and other structures. Determination of resultant of any number of forces in one plane acting upon a particle, conditions of equilibrium of co-planer concurrent force system.

UNIT III **(08 Sessions)**
Moment & couple: Concept of Varignon's theorem. Generalized theorem of moments. Application to simple problems on levers-Bell crank lever, compound lever, steel yard, beams and wheels, lever safety valve, wireless mast, moment of a couple; Properties of a couple; Simple applied problems such as pulley and shaft.

UNIT IV **(08 Sessions)**
General Condition of Equilibrium: General condition of equilibrium of a rigid body under the action of co-planer forces, statement of force law of equilibrium, moment law of equilibrium, application of above on body.
Friction: Types of friction: statically, limiting, and dynamical friction, statement of laws of sliding friction, Coefficient of friction, angle of friction; problems on equilibrium of a body resting on a rough inclined plane, simple problems on friction. Conditions of sliding and toppling.

UNIT V **(08 Sessions)**
Stresses and Strains: Concept of stress and strain. Concept of various types of stresses and strains. Definitions of tension, compression shear, bending, torsion. Concept of volumetric and lateral strains, Poisson's ratio. Changes in dimensions and volume of a bar under direct load (axial and along all the three axes). Ultimate stress, working stress. Elasticity, Hook's law, load deformation diagram for mild steel and cast iron. Definition of modulus of elasticity, yield point, modulus of rigidity and bulk Modulus. Stresses and strains for homogeneous materials and composite sections.

Course Outcomes:

Students completing this course will be able to:

CO1: Makes the students able to recognize different force systems, moments, and couples.

CO2: The ability to draw Free Body Diagram and label the reactions to it & makes the students' abilities to apply equilibrium equations in statics.

CO3: The ability to understand Newton's law in motion, and recognize different kinds of particle motions.

CO4: The ability to find the moment and the couple.

CO5: Acquire knowledge about stress and strain and how to find in different parts in different conditions.

PO-CO Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2	1	2	3	3	2	1
CO2	3	2	3	1	2	2	2	3
CO3	3	2	1	2	3	1	1	3
CO4	3	2	3	1	2	2	2	3
CO5	3	2	1	2	1	2	3	3

Suggested Reading:

1. Engineering Mechanics by Irving H. Shames, Prentice-Hall
2. Mechanics of Solids by Abdul Mubeen, Pearson Education Asia.
3. Mechanics of Materials by E.P. Popov, Prentice Hall of India Private Limited.
4. Engineering Mechanics by R.K Bansal
5. Applied Mechanics by J.K. Kapoor, Bharat BhartiPrakashan.

Website Sources:

- www.onlinecourses.nptel.ac.in
- www.pdfdrive.com/engineering-mechanics-books.html
- https://en.wikibooks.org/wiki/Engineering_Mechanics
- http://library.iitj.ac.in/sp/subjects/guide.php?subject=ERL

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Diploma (CE) - I Year (I/II Semester)

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DPCS 101/ DPCS 201: COMPUTER FUNDAMENTALS AND PROGRAMMING IN C

Objective: To study about understanding of basic concepts of computer fundamentals, operating system, primary and secondary memory in detail, peripheral devices, and basic concepts of C programming language.

UNIT I **(09 Sessions)**

Introduction to Computer: Definition, Characteristics, Generation of Computers, Capabilities and Limitations, Introduction to Operating System, Concept of Bios, Booting Files, Basic Components of a Computer System-Control Unit, ALU, Input/output functions and characteristics. Memory Introduction, Classifications- Volatile Memory and Non- Volatile, Flash Memory, ROM, RAM, EPROM, PROM, EEPROM other types of memory.

UNIT II **(07 Sessions)**

Input/output and storage Units: Computer Keyboard, Pointing Devices: Mouse, Trackball, Touch Panel, and Joystick, Light Pen, Scanners, Various types of Monitors, Touch-sensitive screens, Optical Recognition System, Pen based systems, Digitizers, MICR, OCR, OMR, Bar-code Reader, digital camera. Hard Copy Devices: - Impact and Non- Impact Printers- Daisy Wheel, Dot Matrix, Line Printer, Chain Printer, Comb Printers, Non-Impact Printers- Desk Jet, Laser Printer, Thermal Transfer Printer, Barcode Printers, Electro static printers and plotters, High Level Language and Low-Level Language, Firmware, Compiler, Interpreter and Assembler.

UNIT III **(12 Sessions)**

Introduction and Features of "C" language: The structure of "C" program, Identifiers and Keywords, Constants, Variables, Scope of variables, Typedef, Type Conversion, Arithmetic Operators, Library Functions, Input/output Statements, get char (), Putchar (), scanf, printf, Compound statements and block. Relational Operators, Logical Operators, Bitwise Operators, Unary Operators, if-else Statement, Operators, Switch statement, go to statement and Label, Iteration statements: For Loop, While Loop, Do While Loop, Nested Loop, Continue and Break statements.

UNIT IV **(06 Sessions)**

Array and Structures: Declaration, Concept of One Dimensional and Multi-Dimensional arrays, Defining Structure, Declaration of Structure Variable, Accessing Structure members, nesting of structures, Array of structures.

UNIT V **(08 Sessions)**

Difference between Union and Structure: Functions: Need of "C" function, User Defined and Library Functions, Prototype of Function, Call by Value, Call by Reference, Nesting of Functions, Recursion, Array as Function Argument, Structure as Function Argument.

Course Outcomes:

CO1: Understand about basic computer fundamental and its major components.
CO2: To gain the knowledge about input and output devices.
CO3: Understanding the features of the C language, keyword, data type and statements in C
CO4: Understand about array and structure in detail
CO5: Gain the knowledge of functions in C language, union, and structure

PO-CO Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2	3	1	2	2	2	3
CO2	3	2	1	2	1	2	3	3
CO3	3	2	1	2	3	1	1	3
CO4	3	2	3	1	2	2	2	3
CO5	3	2	1	2	3	3	2	1

Suggested Readings:

1. Computer Fundamentals B. Ram
2. Computer fundamentals P.K Sinha (BPB Publications)
3. Programming in Ansi C E. balagurusamy (3rd edition McGraw Hill)

Website Sources:

- https://www.tutorialspoint.com/computer_fundamentals/index.htm
- https://www.javatpoint.com/computer-fundamentals-tutorial
- https://www.w3schools.in/c-tutorial/
- https://www.geeksforgeeks.org/difference-between-input-and-output-devices/
- https://en.wikipedia.org/wiki/C_(programming_language)
- https://www.cprogramming.com/

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DPME 102/DPME 202: WORKSHOP TECHNOLOGY

Objective: The subject aims at imparting knowledge and skill components in the field of basic workshop technology. It deals with different hand and machine tools required for manufacturing simple metal components and articles. The primary objectives of this subject are to understand how different objects can be made from the given raw material by using different mechanical machines and tools.

UNIT I **(08 sessions)**

General Introduction: Scope of subject "Workshop Technology" in engineering. Different shop activities and broad division of the shops based on nature of work done such as (i) Wooden Fabrication (Carpentry) (ii) Metal Fabrication (shaping and Forming, Smithy, Sheet metal and Joining-welding, Riveting, Fitting and Plumbing.

UNIT II **(08 sessions)**

Carpentry: Timber, seasoning of timber, types of seasoning. Common Carpentry Tools-Their classification, size, specification (name of the parts and use only)., Fundamental wood working operations, Marking & Measuring, Holding & Supporting, Cutting & Sawing, Drilling & Boring, Turning, Jointing;

UNIT III **(08 sessions)**

Metal Fabrication: Metal Shaping-Smithy: Operations involved (concept only. Tools and equipment used (Names, size, specification for identification only). Defects likely to occur during and after operations their Identification and Remedy. Defects due to wrong operation, wrong tool, and wrong heating. Safety of Personnel, Equipment & Tools to be observed. Sheet metal working: Tools and Operations involved (Names and concept only); Sheet metal joints - Lap, seam, Locked seam, hemp, wire edge, cup or circular, Flange, angular and cap. Common defects -Their identification and remedy. Defects due to wrong operation or wrong tool. Safety of Personnel, Equipment & Tools to be observed.

Metal Joining During Fabrication: Permanent Joining-Welding Methods-Forge welding, gas welding (high and low pressure-oxyacetylene welding, types of flames. Electric Arc welding- D.C. & A.C., Connected tools, operation, materials, and safety measures. Soldering & Brazing:

Familiarity with the use of Various Tools Used in Mechanical Engineering Workshop: Marking & Measuring, Holding Tools. Cutting Tools.

Hack saw (Fixed and Adjustable frame), chisels. Finishing tools-Files. Drills and Allied Tools. Miscellaneous Tools.

UNIT IV **(08 sessions)**

Machine Shop: Introduction to machine tools viz lathe, drilling machine, shaper and planer simple line and block diagram of components and their functions. Brief concept of NC and CNC machines.

UNIT V **(08 sessions)**

Foundry: Basic idea of types of sands, patterns, moulds, furnaces, and simple green sand moulding process.

Course Outcomes:

Students completing this course will be able to:

CO1: Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry, and welding.

CO2: Ability to design and model different prototypes in the carpentry trade such as Cross lap joint, Dove tail joint.

CO3: Ability to design and model various basic prototypes in the trade of Welding such as Lap joint, Lap Tee joint, Edge joint, Butt joint and Corner joint.

CO4: Acquire "Hands on" training and practice to students for use of various tools, devices, and machines.

CO5: Understand the Metal casting Techniques and basic structure of products.

PO-CO Mapping (Please write 3,2,1 wherever required)

(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2	3	1	2	2	2	3
CO2	3	2	3	2	1	2	3	2
CO3	2	3	1	2	3	1	1	2
CO4	3	2	3	3	2	2	2	3
CO5	3	3	1	2	3	1	3	1

Suggested Reading:

1. Manufacturing Process by- B.S Raghuvanshi (Dhanpat Rai & Co.)
2. Elementary Workshop Technology by- S.K Hazra Chaudhary (Media Promoters)
3. Workshop Practice by- S.K Garg (University Science Press)
4. Elementary Workshop Technology by J.K. Kapoor, Bharat Bharti Prakashan.

Website Sources:

- www.onlinecourses.nptel.ac.in
- https://www.pdfdrive.com/introduction-to-basic-manufacturing-processes-and-workshop-technology-e33408290.html
- https://books.google.co.in/books/about/Workshop_Technology.html?id=m6lDDAAAQBAJ&redir_esc=y

IFTM UNIVERSITY, MORADABAD

Diploma (Civil Engineering) Programme

Diploma (CE) - I Year (I/II Semester)

(w.e.f. session 2022-2023)

DPEE 101/ DPEE 201: BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

Objective: The objective of this course is to provide an understanding of basic terms related to the electrical and electronics engineering. It provides knowledge of basic elements used in electrical and electronics circuits, to develop the capability of analyzing and design simple electrical networks, an understanding of basic principle of various network theorems, an introductory knowledge of single phase and three phase AC supply, an introductory knowledge of semiconductor materials and devices manufactured by them like a PN junction diode and Bipolar Junction Transistor.

UNIT I (08 Sessions)

Basic Terminology & Their Concepts: Current, EMF, Potential difference, Resistance, Resistivity, & their units, Variation of resistance with temperature, Series & parallel connection of resistors, conductors and insulators, Electrical power & energy, Concept of inductance & mutual inductance, mutually induced emf and its role in electric circuits. Energy stored in an inductor, Concept of capacitor, parallel plate capacitor & its capacitance, energy stored in a capacitor, Dielectric, and its influence on the capacitance of a capacitor. Charging & discharging of capacitor. Simple numerical problems

UNIT II (08 Sessions)

D.C. Circuits: Kirchoff's laws-KCL & KVL, simple numerical problems.

Network Theorems- Thevenin's theorem, Norton's theorem, Superposition & Maximum power transfer Theorem, Simple numerical problems based on them

UNIT III (08 Sessions)

A.C. Circuits: Instantaneous value, RMS value, Peak value, Average value. Form factor & peak factor of a sine wave. Concept of phase, phase difference & phasor representation of ac voltage & current, R-L, R-C, R-L-C circuits, Active & Reactive power, power factor Simple numerical problems.

Poly-phase Systems: Advantages of a 3-phase system over single-phase system, Star & Delta connections & their conversion, Relationship between phase & line values of currents and voltages, Power in 3 phase system

UNIT IV (08 Sessions)

Magnetic Circuits: Magnetic circuit concepts- magnetic field intensity, magneto motive force, magnetic flux density**,** Permeability, Reluctance, Determination of Ampere turns, Kirchhoff's Law for magnetic circuit, Analogy between magnetic and electric circuits, Composite magnetic circuits, B-H characteristics, Hysteresis loss

UNIT V (08 Sessions)

Semiconductors: Classification of solids- conductors, Insulators & semiconductors, Intrinsic & Extrinsic semiconductors, P-N junction- biasing, VI characteristics of a diode.

Bipolar Junction Transistors: Biasing, working of NPN & PNP transistor, Transistor configurations-common emitter, common base common collector configurations and their characteristics, Transistor as an Amplifier, Simple numerical problems, Transistor as a switch-use of transistor as a switch for logic gates.

Combinational logic circuits: Logic gates- AND, OR, NOT, Exclusive OR, NAND & NOR gates with their truth tables

Course Outcomes:

Students completing this course will be able to:

CO1: The students can explain the various types of electrical and electronics circuits.

CO2: Can solve a simple type of electrical network problems.

CO3: It imparted the understanding of single phase and three phase AC supply and the superiority of three phase supply over single phase supply.

CO4: Students got an idea about magnetic field and how it is utilized.

CO5: The students have got an understanding of applications of semiconductor materials and devices based on them.

PO-CO Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2	3	1	2	2	2	3
CO2	3	2	1	2	1	2	3	3
CO3	3	2	1	2	3	1	1	3
CO4	3	2	3	1	2	2	2	3
CO5	3	2	1	2	3	3	2	1

Suggested Readings:

1. Electrical Engineering by Ashfaq Hussain, Dhanpat Rai & Co.
2. Electrical Engineering by J.S. Katre. Tech. Max Publications.
3. Electrical Engineering vol.-1. By B.L. Thareja-Technical Publications.
4. Basic Electrical Engineering by I.J. Nagarath, Tata McGraw Hill
5. Electrical and Electronics Engineering by S.K. Sahdev

Web Resources:

- www.engineering.nyu.edu
- www.elprocus.com/basics-of-network-theorems-in-electrical-engineering/
- www.electricalclassroom.com
- www.electronics-tutorials.ws/electromagnetism
- https://nptel.ac.in/courses/108/108/108108076/

IFTM UNIVERSITY, MORADABAD
Diploma (Civil Engineering) Programme
Diploma (CE) - I Year (I Semester)
(w.e.f. session 2022-2023)
FEC 101: FUNDAMENTALS OF ENGLISH COMMUNICATION

Objectives: The objectives of Fundamentals of English Communication are:

- To develop knowledge and understanding of grammar.
- To develop abilities to make use of the grammar in own writing English.
- To enhance competencies in writing paragraph, gist, or abstract/précis of the passage in own words/ language and in writing letters and applications of different kinds.
- To increase understanding and recall of what is read and listen including facts and main idea.

UNIT I **(06 Sessions)**

Basic Applied Grammar and Usage

The Sentences: Kinds of Sentences; Subject and Predicate
Phrases & Clauses, Idioms & Proverbs

UNIT II **(08 Sessions)**

Basic Applied Grammar Continued

Nouns: Kinds; Singular/Plural; Gender; Possession
Pronouns: Kinds; Usage
Adjectives: Kinds; Degrees of Comparison; Usage
Determiners: Kinds, Usage of Adjectives and Determiners

UNIT III **(08 Session**

Basic Applied Grammar Continued

Articles: Kinds, Omission of Articles, Repetition of Articles, Spotting the Errors
Verbs: Kinds-Transitive and Intransitive, Finite and Non-Finite Verbs
Tenses: Kinds; Usage

UNIT IV **(06 Sessions)**

Basic Applied Grammar Continued

Adverbs: Kinds; Position of Adverbs; Usage
Prepositions: Kinds; Correct Usage, Fill in the Blanks
Conjunctions: Kinds, Conversion of Compound to Complex Sentences and Vice-versa
Interjections: Definition and Types

UNIT V **(10 Sessions)**

Comprehension and Précis Writing

Reading Comprehension
Précis Writing: Techniques of Précis Writing and Exercises
Formal Letter Writing: Leave Application (for different reasons), Application for Fee Concession and Invitation (for family and friends)

Course Outcomes:

The students completing this course will be able to:

CO1: Have thorough knowledge of kinds and parts of sentences and to use idioms and proverbs in day-to-day communication.

CO2: Use Noun, Pronoun, Adjective, and determiners correctly.

CO3: Have knowledge of using Articles, Verbs and Tenses and to correct the sentences.

CO4: Frame different kinds of Sentences: double/ compound and complex using Adverb and Preposition and to express strong feelings and emotions in the words.

CO5: Write answer correctly and precisely based on Reading comprehension and to write the letters and applications for different reasons.

PO-CO Mapping (Please write 3,2,1 wherever required)

(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2	1	2	3	3	2	1
CO2	3	2	1	2	1	2	3	3
CO3	2	3	3	2	3	2	1	2
CO4	3	2	3	1	2	2	2	3
CO5	3	3	1	2	3	1	1	3

Suggested Readings:

1. Professional Communication by Malti Agarwal, Krishna Publications.
2. High School English Grammar & Composition by Wren & Martin, S. Chand & Company LTD., New Delhi.

Website Sources:

- www.wikipedia.org
- www.english grammar.org
- www.perfect-english-grammar.com
- www.sucesscds.net
- www.grammarly.com

IFTM UNIVERSITY, MORADABAD
Diploma (Civil Engineering) Programme
Diploma (CE) - I Year (I/II Semester)
(w.e.f. session 2022-2023)
DPME 151/DPME 251: ENGINEERING DRAWING LAB

Objective:

- To get the primary concept of Engineering Drawing.
- To know about equipment's in Engineering Drawing.
- To know various signs, lines, and dimensions.
- To know about the Principles of Projection: Orthographic Projections, Isometric Projection.

1. Drawing, instruments, and their uses.

1.1 Introduction to various drawing, instruments.
1.2 Correct use and care of Instruments.
1.3 Sizes of drawing sheets and their layouts.

2. **(a) Lettering Techniques**

Printing of vertical and inclined, normal single stroke capital letters.
Printing of vertical and inclined normal single stroke numbers. Stencils and their use. (**1 Sheet)**

(b) Introduction to Scales Necessity and use, R F Types of scales used in general engineering drawing. Plane, diagonal, and chord scales. **(1 Sheet)**

3. Conventional Presentation:

Thread (Internal and External), Welded joint, Types of lines, Conventional representation of materials, Conventional representation of machine parts. (**2 Sheet)**

4.(a) Principles of Projection

Orthographic, Pictorial and perspective. Concept of horizontal and vertical planes. Difference between I and III angle projections. Dimensioning techniques. (**1 Sheet)**
(b) Projections of points, lines, and planes. (**1 Sheet)**

5.(a) Orthographic Projections of Simple Geometrical Solids Edge and axis making given angles with the reference planes. Face making given angles with reference planes. Face and its edge making given angles with reference planes.
(b) Orthographic views of simple composite solids from their isometric views.
(c) Exercises on missing surfaces and views (**3 Sheet)**

6. Section of Solids Concept of sectioning Cases involving cutting plane parallel to one of the reference planes and perpendicular to the others. Cases involving cutting plane perpendicular to one of the reference planes and inclined to the others plane, true shape of the section. (**1 Sheet)**

7. Isometric Projection. (**2 Sheet)**
Isometric scale Isometric projection of solids.

8. Orthographic Projection of Machine Parts: (**2 Sheet)**
Nut and Bolt, Locking device, Wall bracket

Course Outcome:

After successful completion of this course, students will able to

CO1: A clear conception and appreciation of the shape, size, proportion, and design.

CO2: Learning how to draw the shapes, angels and lines and others which is essential for engineer.

CO3: Develop student's imagination and ability to represent the shape size and specifications of physical objects.

CO4: Understand the main idea of using dimension for engineering drawing.

CO5: Explain the principle of projection and sectioning.

Suggested Reading:

1. Engineering Drawing by- B. Agrawal and C.M. Agrawal (McGraw Hill Education (India) Pvt. Ltd.)
2. Engineering Drawing by K. Venkata Reddy (BS Publication).
3. Engineering Drawing by R. K. Dhawan (S Chand Publication)

Website Sources:

- https://www.google.co.in/books/edition/Engineering_Drawing/VRfAwAAQBAJ?hl=en&gbpv=1&printsec=frontcover
- https://www.engbookspdf.com/Drawing/textbook-of-engineering-drawing-second
- https://www.google.co.in/books/edition/A_Textbook_of_Engineering_Drawing_In_Fir/vTd3cJ91-RwC?hl=en&gbpv=1&printsec=frontcover

IFTM UNIVERSITY, MORADABAD
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Diploma (CE) - I Year (I/II Semester)
(w.e.f. session 2022-2023)
DPCS 151 / DPCS 251: COMPUTER PROGRAMMING LAB

Objective: To study about understanding of basic concept of Windows Operating System, understanding of the fundamentals of programming such as data types, keywords, variables, array, structure, conditional and iterative execution, methods, etc.

List of Experiments:
Introduction to GUI using Windows Operating System, DOS Commands, Introduction to Word, Introduction to MS-Excel.

1. WAP in C to print your name.
2. WAP in C for adding, subtraction, multiplication & division of two numbers.
3. WAP in C to calculate the area of a circle, rectangle, and triangle.
4. WAP to Convert Celsius to Fahrenheit.
5. WAP to find out whether the given year is a leap year or not.
6. WAP in C to find whether the given number is even or odd.
7. WAP to use switch statement display Monday to Sunday.
8. WAP to print table of given number.

Course Outcomes:
Students after this course will be able to:
CO1: Understand about GUI using windows operating system and DOS commands.
CO2: To understand how to write and execute C programs.
CO3: Execute statements in C language
CO4: Implement C programs with the help of array, structure, and nesting of structure.
CO5: Execute C programs with the help of functions.

Suggested Readings:
1. Computer Fundamentals B. Ram
2. Computer fundamentals P.K Sinha (BPB Publications)
3. Programming in Ansi C E. balagurusamy (3rd edition McGraw Hill)

Website Sources:
- https://www.programiz.com/c-programming#introduction
- https://www.javatpoint.com/c-programming-language-tutorial
- https://www.w3schools.in/c-tutorial/
- https://www.tutorialspoint.com/cprogramming/index.htmhttps://en.wikipedia.org/wiki/C_(programming_language)
- https://www.cprogramming.com/

IFTM UNIVERSITY, MORADABAD
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Diploma (CE) - I Year (I Semester)
(w.e.f. session 2022-2023)
DPPH 151: PHYSICS LAB - I

Objective: The main goal of this course is to share the knowledge to the students about the experiments so that students will get a better understanding of the concepts studied by them in the theory course and correlate with experimental observations

LIST OF EXPERIMENTS: **(20 Sessions)**

1. To find the surface tension of a liquid by Jaeger's method.
2. To find volume of solid cylinder and hollow cylinder using a Vernier caliper.
3. To determine the atmospheric pressure at a place using Fortin's Barometer.
4. To determine the thickness of glass strip and radius of curvature of a concave surface using a speedometer.
5. To determine the time period of simple pendulum and plot a graph between l & t
6. To determine the acceleration due to gravity with the help of a Bar Pendulum.
7. To determine the coefficient of viscosity of water with the help of Poiseuille method.
8. Verify parallelogram Law of forces.
9. To determine the modulus of rigidity (η) of the material of wire with the help of torsional pendulum using the inertia table
10. To find the thickness of wire using a screw gauge.

Course Outcomes:

Students completing this course will be able to:

CO1: Use the different measuring devices and meters to record the data with precision
CO2: Measurement of surface tension, volume, and atmospheric pressure.
CO3: Determine coefficient of viscosity and modulus of rigidity
CO4: Measurement of thickness of wire.
CO5: Apply the various procedures and techniques for the experiments.

Suggested Readings:

1. Concept of Physics, Prof. H.C. Verma, Part-1 (Bharti Bhawan)
2. Concept of Physics, Prof. H.C. Verma, Part-2 (Bharti Bhawan)
3. A Text Book of Applied Physics: Eagle Prakashan, Jullandhar

Website sources:

- http://dspace.wbpublibnet.gov.in
- https://www.scribd.com
- http://www.brainkart.com
- https://dkpandey.weebly.com
- https://images.topperlearning.com

IFTM UNIVERSITY, MORADABAD
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Diploma (CE) - I Year (I Semester)
(w.e.f. session 2022-2023)
DPCH 151: CHEMISTRY-I LAB

Objectives: Practical implementation of fundamental concepts of qualitative and quantitative analysis. Student will gain the knowledge on existing future upcoming devices, materials and methodology used in chemistry practical. They will rely on elementary treatment and qualitative analysis. These practical will provide an overview of quantitative analysis.

List of Experiments:

1. To analyses inorganic mixture for two acid and basic radicals from following radicals
   a) Basic Radicals: NH_4^+, Pb^{++}, Cu^{++}, Bi^{++}+, Cd^{++}, As^{+++}, Sb^{+++}, Sn^{++}, Al^{+++}, Fe^{+++}, Cr^{+++}, Mn^{++}, Zn^{++}, Co^{++}, Ni^{++}, Ba^{++}, Sr^{++}, Ca^{++}, Mg^{++}
   b) Acid Radicals: CO_3^{--}, S^{--}, SO_3^{--}, CH_3COO^-, NO_2^-, NO_3^- , Cl^-, Br^-, I^-, SO_4^{--}
2. To determine the percentage of available Chlorine in the supplied sample of bleaching powder.
3. To determine the total hardness of water sample in terms of $CaCO_3$ by EDTA titration method using Eriochroma black-T indicator.
4. To determine the strength of given HCl solution by titration against NaOH solution using Phenolphthalium as indicator
5. To determine the Chloride content in supplied water sample by using Mohr's methods.
6. Determination of temporary hardness of water sample by O^- Hener's method.

Course Outcome:

CO1: Demonstrate laboratory techniques in chemistry, including analysis of acidic and basic radicals, bleaching powder, hardness, and chloride content in water sample.

CO2: Demonstrate the ability to perform experiments, using proper glassware set-up, handling of hazardous chemicals, and following the prescribed experimental procedures safely and effectively.

Suggested Readings:

1. Applied Chemistry by R. S. Katiyar& J.P. Chaudhary Publication B.B.P. & Co. Meerut
2. March's Advanced Organic Chemistry: Reactions, Mechanisms and Structure Smith, Michael B./March, Jerry, John Willey & sons, 6th Edition, 2007.
3. Elements of Physical Chemistry, Glasstonne, Samuel B. ELBS, 2005.
4. Organic Chemistry, Finar, I.L.: Addision – Wesley Longman, Limited, 2004.
5. Principles of Physical Chemistry, by Puri B.R., Sharma L.R., S. Nagin & Company, Delhi

Website Sources:

- https://www.gopracticals.com/basic-engineering/
- https://edu.rsc.org/resources/practical
- https://play.google.com/store/apps/details?id=com.softwareindiavinod.chemistrypracticals&hl=en&gl=US

IFTM UNIVERSITY, MORADABAD
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Diploma (CE) - I Year (I/II Semester)
(w.e.f. session 2022-2023)
DPME 152/DPME 252: WORKSHOP LAB

Objective:

- To understand how different objects can be made from the given raw material by using different mechanical tools.
- To introduce students to the basic concepts of manufacturing via shaping, forming, machining
- To develop a knowledge of appropriate parameters to be operations used for various machining.
- To develop a knowledge of workshop practice and basic use of machine tools and workshop equipment.

1. Carpentry Shop:

EX-1 Introduction & demonstration of tools used in carpentry shop
EX-2 Planning and sawing practice
EX-3 Making of lap joint
EX-4 Making of mortise and tenon joint
Ex-5 Making of briddle joint
EX-6 Making of dovetail joint
Ex-7 Making of any one utility article such as wooden picture frame, hanger, peg, name plate, etc.

2. Sheet Metal Working and Soldering Shop:

EX-1 Introduction & demonstration of tools used in Sheet metal working shop.
EX-2 Cutting, shearing, and bending of sheet.
EX-3 To prepare a soap case by the metal sheet.
EX-4 To make a funnel with thin sheet and to solder the seam of the same.
EX-5 To make a cylinder and to solder the same.
EX-6 Preparation of different type of joints such as Lap joint-single seam, double seam. Hemp and wired joints.
EX-7 Study and sketch of various types of stakes/anvils.
EX-8 To braze small tube/conduit joints.

3. Fitting Shop:

EX-1 Introduction & demonstration of tools used in Fitting Shop.
EX-2 Hack sawing and chipping of M.S. flat.
EX-3 Filing and squaring of chipped M.S. job.
EX-4 Filing on square or rectangular M.S. piece.
EX-5 Making bolt & nut by tap and die set.
Ex-6 To drill a hole in M.S. Plate and taping the same to create threads as per need.
EX-7 Utility article-to prepare a screw driver or paper weight, double open mouth spanner for 18" hexagonal head of a bolt.

4. Plumbing Shop:

EX-1 Cutting and threading practice for using socket, elbow, and tee etc. and to fit it on wooden practice board.
EX-2 Study of-bib cock, cistern or stop cock, wheel valve and gate valve etc.

5. Smithy Shop:

EX-1 Study & Sketch of Tools used in smithy shop.
EX-1 To prepare square or rectangular piece by the M.S.rod.

EX-2 To braze M.S. Flats/Tipped tools on M.S. shank.
EX-3 To make a screw driver with metallic handle.
EX-4 To make a square or hexagonal head bolt.
EX-5 To make a ring with hook for wooden doors.
EX-6 Utility article-to prepare a ceiling fan hook.

6. Welding Shop:
EX-1 Welding practice-gas and electric.
EX-2 Welding for lap joint after preparing the edge.
EX-3 Welding of Butt joint after preparation of the edge.
EX-4 'T' joint welding after preparation of edge.
EX-5 Spot welding, by spot welding machine.
EX-6 Welding of plastic pieces by hot strip method.
EX-7 Welding practice by CO2 gas welding

7. Machine Shop
EX-1 Study & sketch of lathe machine.
Ex-2 Plain and step turning & knurling practice.
Ex-3 Study and sketch of planning/Shaping machine and to plane a Rectangle of cast iron.
8. Fastening Shop
EX-1 Practice of bolted joints
EX-2 To prepare a rivetted joint
EX-3 To make a pipe joint
EX-4 To make a threaded joint
EX-5 Practice of sleeve joint

Course Outcome:
After successful completion of this course, students will able to
CO1: Acquire skills in basic engineering practice.
CO2: Identify the hand tools and instruments, gain measuring skills, and obtain practical skills in the trades.
CO3: Read and use a manufacturing drawing as a definition for the manufacturing of a part.
CO4: Select proper tools and cutting data for a given material and manufacturing process.
CO5: Identify safe welding practices and procedures conforming to Welding standards.

Suggested Reading:
1. A Textbook of Workshop Technology: Manufacturing Processes by R.S Khurmi and J.K Gupta (S Chand).
2. Introduction to Basic Manufacturing Processes and Workshop Technology by Rajender Singh

Website Sources:
- https://www.abebooks.com/servlet/BookDetailsPL?bi=30061491479&cm_sp=rec-_-pd_hbdp&reftag=pd_hw_i_1
- https://www.google.co.in/books/edition/Introduction_to_Basic_Manufacturing_Proc/ky7r-BclY8cC?hl=en&gbpv=1&pg=PP1&printsec=frontcover

IFTM UNIVERSITY, MORADABAD
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Diploma (CE) - I Year (I/II Semester)
(w.e.f. session 2022-2023)
DPEE 151/DPEE 251: BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LAB

Objective: The objective of this lab is to provide an understanding of basic electrical and electronic components used in various types of circuits, to know how the basic principles of electrical and electronic engineering like Ohm's Law, KCL, KVL work. To know about how the electricity consumed in a circuit is measured by the energy meter. To know how the resistance of a filament varies according to temperature, to know the working of electronic devices like a PN junction diode and NPN/PNP transistors and logic gates.

List of Experiments:

1. To study and identify the various components.
2. To verify Ohm's Law.
3. To verify Kirchhoff's Current Law (KCL).
4. To verify Kirchhoff's Voltage Law (KVL).
5. To observe the variation of resistance of a lamp with temperature by plotting V-I curve for 60 W and 100 W filaments lamp.
6. To study Star to Delta and Delta to Star conversion.
7. To verify the truth table of OR, AND, NOT, NAND, NOR and EXOR logic gates.
8. To study and plot V-I characteristics of a PN junction diode.
9. To study the biasing and working of NPN/PNP transistor.
10. To study a single-phase Induction type energy meter.

Course Outcomes:

Students completing this course will be able to:

CO1: The students can know the identification and application of the various types of components used in electrical and electronics circuits.
CO2: Can understand how Ohm's Law works and its limitations.
CO3: It imparted the understanding of KCL, KVL and their applications.
CO4: Students got an idea about the variation of resistance with temperature and working principle of an energy meter & its use.
CO5: The students have got an understanding of working and application of semiconductor devices.

Suggested Readings:

1. Handbook of laboratory experiments in electronics engineering by A.M. Zungeru
2. Basic electrical and electronics lab by Bharat Bhushan Jain
3. Laboratory Manual for Introductory Electronics Experiments by L.K. Maheshwari.

Website Sources:

- www.concept-of-physics.com/electromagnetism/verification-of-ohmas-law-using-voltmeter-and-ammeter.php
- www.jetir.org
- www.digitalelectronicsforstudents.files.wordpress.com

IFTM UNIVERSITY, MORADABAD
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(w.e.f. session 2022-2023)
DPPH 201: ELEMENTARY PHYSICS-II

Objective: The objective of this course is to provide an understanding of optics, electro statistics and semiconductors etc.

UNIT I **(8 Sessions)**

Waves and Vibrations: Introduction, Types of wave motion with examples, Relation between velocity of wave, frequency and wave length of a wave ($v = \eta\lambda$), Simple harmonic motion: definition, expression for displacement, Velocity, acceleration, time period, frequency in S.H.M., Vibration of spring mass system, Free, forced, and resonant vibrations with examples.

UNIT II **(8 Sessions)**

Optics: Concept of mirrors, lenses, reflection & refraction of light, refractive index, lens formula (no derivation), real and virtual image, magnification, Power of lens, Simple and compound microscope, magnifying power, and its calculation (in each case), Total internal reflection

UNIT III **(10 Sessions)**

Electrostatics: Coulomb's law, Gauss's Law, Electric field intensity and electric potential, Electric field of point charge, charged sphere, Capacitance, types of capacitors, capacitance of parallel plate capacitor, series and parallel combination of capacitors, Dielectric, and dielectric constant.

UNIT IV **(10 Sessions)**

Current Electricity: Ohm's law, Resistance of a conductor, specific resistance, Series and Parallel, Combination of resistors, effect of temperature on resistance, Kirchhoff's laws, Wheatstone bridge principle and its applications, Heating effect of current and concept of electric power.

UNIT V **(8 Sessions)**

Semi-Conductor Physics: Energy bands, Intrinsic and Extrinsic semiconductor, p-n junction diode and its characteristics, Diode as rectifier-half wave and full wave rectifier.

Course Outcomes:

Students completing this course will be able to:

CO1: Differentiate between wave and vibrations.

CO2: Understand mirror, lens, phenomenon of reflection and refraction, working and principle of Simple Microscope and compound microscope.

CO3: Explain Coulomb's law, Gauss Law, and their applications.

CO4: Apply Ohms law to solve problems.

CO5: Understand semiconductors and characteristics of diodes.

PO-CO Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1	3	2	3	1	2	2	2	3
CO 2	3	2	1	2	1	2	3	3
CO 3	3	2	1	2	3	1	1	3
CO 4	3	2	3	1	2	2	2	3
CO 5	3	2	1	2	3	3	2	1

Suggested Readings:

1. Concept of Physics Prof. H.C. Verma, Part-1 (Bharti Bhawan)
2. Concept of Physics, Prof. H.C. Verma, Part-2 (Bharti Bhawan)
3. A Text Book of Applied Physics: Eagle Prakashan, Jullandhar

Website sources:

- https://courses.lumenlearning.com
- https://en.wikipedia.org
- https://cnx.org
- http://www.sakshieducation.com
- https://www.toppr.com
- https://opentextbc.ca
- https://www.askiitians.com/
- https://www.askiitians.com

IFTM UNIVERSITY, MORADABAD
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Diploma (CE) - I Year (I Semester)
(w.e.f. session 2022-2023)
DPMA 201: ELEMENTARY MATHEMATICS-II

Objective: - The main aims of this course are to understand and develop the basic Mathematical skills of diploma engineering students that are imperative for effective understanding of engineering subjects. To understand basics and applications of differential & integral Calculus and coordinate geometry.

UNIT I **(10 Sessions)**

Differential Calculus-I: Functions, Limits, Continuity, Functions and their graphs, Range and domain, Elementary methods of finding limits (right and left), Elementary test for continuity and differentiability. Methods of finding derivative, Function of a function, Logarithmic differentiation, Differentiation of implicit functions.

UNIT II **(10 Sessions)**

Higher Order Derivatives, Leibnitz's theorem. Special functions (Exponential, Logarithmic, Hyperbolic, Inverse, and circular function), Definition, Graphs, Range and Domain and Derivations of each of these functions.

UNIT III **(10 Sessions)**

Application - Finding Tangents, Normal, Points of maxima and minima, Increasing and Decreasing functions, sketching of some simple curves (without assumptions, question, not to be asked in the examination), Rate, Measure, Velocity, Acceleration, Errors, and approximations.

UNIT IV **(10 Sessions)**

Integral Calculus-I: Methods of indefinite integration: - Integration by substitution, by partial fraction and by parts, Integration of special functions Meaning and properties of definite integrals, Evaluation of definite integrals.

UNIT V **(12 Sessions)**

Co-Ordinate Geometry: Standard form of curves and their simple properties-Parabola Ellipse, Hyperbola, Tangent and normal, Straight lines, Planes and Spheres in space-distance between two points in space, Direction cosines and direction ratios, Finding equation of a straight line and shortest distance between two lines under different conditions equation of a plane, Relation between lines and Planes, Sphere.

Course Outcomes:

CO1: Basic Knowledge of function, limit, and derivatives.
CO2: Apply differential calculus and higher order to solve engineering problems.
CO3: Find velocity, acceleration, errors, and approximation in engineering problems with application of derivatives.
CO4: Calculate simple integration by methods of integration and evaluate the area under curves, surface by using definite integrals.
CO5: Understand the geometric shapes used in engineering problems by co-ordinate geometry.

PO-CO Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2	1	2	3	1	1	3
CO2	3	2	3	1	2	2	2	3
CO3	3	2	1	2	3	3	2	1
CO4	3	2	3	1	2	2	2	3
CO5	3	2	1	2	1	2	3	3

Suggested Readings:

1. R.D. Sharma: Mathematics (I& II-XI), Dhanpat Rai Publication, Delhi.
2. B.S. Grewal: Engg. Mathematics, Khanna Publishers, New Delhi.
3. H.R. Luthra: Applied Mathematics, Bharat Bharti Prakashan & Co. Meerut.
4. Kailash Sinha: Applied Mathematics, Nav Bharat Publication, Meerut.
5. A Text Book of Mathematics (XI & XII) NCERT.

Website Sources:

- www.pdfdrive.com
- www.dmi.gov.in
- www.yourarticlelibrary.com
- onlinecourses.nptel.ac.in
- en.wikipedia.org

IFTM UNIVERSITY, MORADABAD
Diploma (Civil Engineering) Programme
Diploma (CE) - I Year (II Semester)
(w.e.f. session 2022-2023)
DPCH 201: ELEMENTARY CHEMISTRY-II

Objectives: To emphasize the relevance of fundamentals and applications of chemistry for diploma holders and student will learn appropriate combinations of old and new emerging concepts. Also, to bring potential applications of chemistry and practical utility in order to become good engineers and entrepreneurs.

UNIT I **(08 Sessions)**

Lubricants: Definition, classification, Necessity, and various kinds of lubricants. Function and mechanism of action of lubricants with examples. Properties of lubricants, Importance of additive compounds in lubricants, Synthetic lubricants and cutting fluids.

UNIT II **(08 Sessions)**

Fuels and Environmental Pollution: Definition of fuel, its classification, and their composition, Knocking, Anti-knocking agents, Octane number and Cetane number. Cracking and its type, Gaseous Fuel - Water gas, Bio gas, LPG, CNG and solar energy.

Concept and various types of environmental pollution, air pollution and water pollution. General measures to control environmental pollution. Depletion of Ozone layer, Greenhouse effect, Acid rain, Smog formation.

UNIT III **(08 Sessions)**

Water Treatment and Corrosion: Concept of hard and soft water, Hardness of water, Softening method (Only Ion exchange resin process). Disadvantages of hard water in different industries, Boiler feed water.

Corrosion- Concept of metallic corrosion, factors affecting the corrosion rate, Prevention of corrosion by various methods.

UNIT IV **(08 Sessions)**

Glass and Ceramics: Concept of glass and its constituents, Classification and uses of different glass, Elementary idea of manufacturing process of glass.

UNIT V **(08 Sessions)**

Organic Chemistry:

Isomerism- Types of isomerism

1. Structural isomerism
2. Stereoisomerism (a) Geometrical (b) Optical
   a) Electrophiles and nucleophiles
   b) Reaction Intermediates

i. Free radical
ii. Carbocation
iii. Carbanion

Polymers:

1. Basic terms used in polymer chemistry and Polymerization.
2. Characteristics of Polymers and their classification

Course Outcomes:

CO1: Understand the classification, properties, and importance of lubricants.

CO2: Learn about the various fuels, their classification and pollution to the environment

CO3: Learn about the treatment of water and basic concept of metallic corrosion.

CO4: Understand the concept, classification and uses of glass and ceramics.

CO5: Describe basic concepts of organic chemistry and polymerization.

PO-CO Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	3	3	1	2	2	2	2
CO2	3	2	3	2	1	2	3	2
CO3	2	2	1	2	3	1	3	3
CO4	3	2	3	3	3	3	2	1
CO5	3	2	3	1	2	2	2	2

Suggested Readings:

1. Liquid Crystals and Plastic Crystals, vol.-I, edited by G.W. Gray and P.A. Winsor, Ellis Harwood Engineering Chemistry by J C Kuriacose and J. Rajaram, Tata McGraw-Hill Co, New Delhi (2004)
2. Chemistry of Engineering Materials by C.P. Murthy, C.V. Agarwal, and A. Naidu BS Publication Hyd.

Website Sources:

- http://www.commonchemistry.org/
- https://uri.idm.oclc.org/login?url=https://www.engineeringvillage.com/search/quick.url?CID=quickSearch&database=1
- https://www.technicalsymposium.com/

IFTM UNIVERSITY, MORADABAD
Diploma (Civil Engineering) Programme
Diploma (CE) - I Year (II Semester)
(w.e.f. session 2022-2023)
DPME 203: ELEMENTARY MECHANICAL ENGINEERING

Objective:
To provide a comprehensive knowledge of basic mechanical systems, basic concepts from mechanical engineering sciences. Modern engineering tools (machine-tools) and related subjects to design mechanical engineering components.

UNIT I **(08 Sessions)**

Thermal Engineering: A. SOURCES OF ENERGY; Basic ideas, conventional and nonconventional forms- Thermal, Hydel, Tidal, wind, Solar, Biomass and Nuclear and their uses. B. FUELS & COMBUSTION; Introduction to common fuels - solid, liquid and gases and their composition. Combustion of fuels- their higher and lower calorific values. Combustion equations for carbon, Sulphur, hydrogen, and their simple compounds. Calculation of minimum amount of air required for complete combustion. Combustion analysis on mass basis and on volume basis. Concept of excess air in a boiler furnace combustion. Heat carried away by flue gases. Analysis of flue gases by Orsat apparatus. Simple numerical problems Idea of specific properties of liquid fuels such as detonation, knock resistance (cetane and octane numbers), viscosity, solidification point, flash point and flame point.

UNIT II **(08 Sessions)**

Machine Components: Brief Idea of loading on machine components. (i) Pins, Cotter, and Knuckle Joints. (ii) Keys, Key ways, and spline on the shaft. (iii)Shafts, Collars, Cranks, Eccentrics. (vi) Couplings and Clutches. (v) Bearings-Plane, Bushed, Split-step, ball, Roller bearing, Journal bearing, Foot step bearing, thrust bearing, collar bearing and Special type bearings and their applications. Selection of ball bearing and roller bearing for given application using design data book.

UNIT III **(08 Sessions)**

(i) Gears: Different types of gears, gear trains and their use for transmission of motion. Determination of velocity ratio for spur gear trains; spur gear, single and double helical gears, Bevel gears, Mitre wheel, worms, Rack and Pinion. Simple and compound and epicyclic gear trains and their use. Definition of pitch and pitch circle & module**. (ii) Springs:** Compression, Tension, Helical springs, Torsion springs, Leaf and Laminated springs. Their use and material. Selection of spring by design data book, simple numerical problem.

UNIT IV **(08 Sessions)**

Mechanisms: Definition of link, Frame, and mechanism. Difference between machine and mechanism, kinematic pairs, lower and higher pairs. Velocity diagram for four bar mechanism, slider crank mechanism, quick return mechanism. Introduction to Cam and its use.

UNIT V **(08 sessions)**

Lubrication: Different lubrication system for lubricating the components of machines. Principle of working of wet sump and dry sump system of lubrication. (Explained with simple line diagram). Selection of lubricant based on different application (Requirement with the help of manufacturer catalogue).

Course Outcomes:

Students completing this course will be able to:

CO1: To understand various energy resources and energy systems available to produce power.

CO2: To understand about different mechanical components with their applications.

CO3: To make the student conversant with commonly used mechanism for industrial application.

CO4: To understand basic principle, related terms and apply principles of gear design.

CO5: To understand about lubrication systems and its importance.

PO-CO Mapping (Please write 3,2,1 wherever required)

(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	3	3	1	2	2	1	3
CO2	3	2	2	2	3	3	2	2
CO3	2	3	3	2	2	1	1	3
CO4	3	2	3	1	2	2	2	3
CO5	2	3	2	2	2	2	2	1

Suggested Reading:

1. Elements of Mechanical Engineering by J.K. Kapoor (Bharat Bharti Prakashan).
2. Elements of Mechanical Engineering by R.P. Garg, BBP Pub. Pvt. Ltd, Meerut.

Website Sources:

- www.onlinecourses.nptel.ac.in
- https://khannapublishers.in/index.php?route=product/category&path

IFTM UNIVERSITY, MORADABAD
Diploma (Civil Engineering) Programme
Diploma (CE) - I Year (II Semester)
(w.e.f. session 2022-2023)
DPCH 251: CHEMISTRY-II LAB

Objectives: Practical implementation of fundamental concepts of qualitative and quantitative analysis. Student will gain the knowledge on existing future upcoming devices, materials and methodology used in chemistry practical. They will rely on elementary treatment and qualitative analysis. These practicals will provide an overview of quantitative analysis.

List of Experiments: **(20 Sessions)**

1. Determination of pH of common substances.
2. Measurement of soil pH (1:5 or 1:2).
2. Preparation of soap.
3. Determination of the strength of serous sulphate using standard ferrous ammonium sulphate and potassium dichromate as Intermediate Solution.
2. Determination of acids effect on Metals.
3. Determination of relative viscosity of a given liquid using Ostwald viscometer.
4. Determination of the strength of copper sulphate solution using a standard solution of sodium thiosulphate solution.
5. Extract synthetic coloring agents in food products and identify them by paper chromatography.
6. To identify functional groups in each organic compound.
7. Determination of temporary and permanent hardness of water sample.

Course Outcome:

CO1: Understand about the standard solution, carrying out simple qualitative tests and of defining the optimal conditions for a reaction to proceed.

CO2: Volumetric quantitative determinations, preparations, and standard analysis procedures.

Suggested Readings:

1. Applied Chemistry by R. S. Katiyar & J.P. Chaudhary Publication B.B.P. & Co. Meerut
2. March's Advanced Organic Chemistry: Reactions, Mechanisms and Structure Smith, Michael B./March, Jerry, John Willey & sons, 6th Edition, 2007.
3. Elements of Physical Chemistry, Glasstonne, Samuel B. ELBS, 2005.
4. Organic Chemistry, Finar, I.L.: Addision – Wesley Longman, Limited, 2004.
5. Principles of Physical Chemistry, by Puri B.R., Sharma L.R., S. Nagin & Company, Delhi

Website Sources:

- https://www.gopracticals.com/basic-engineering/
- https://edu.rsc.org/resources/practical
- https://play.google.com/store/apps/details?id=com.softwareindiavinod.chemistrypracticals&hl=en&gl=US

IFTM University, Moradabad
Diploma (Civil Engineering) Programme
Diploma (CE) - I Year (II Semester)
(w.e.f. session 2022-2023)
DPPH 251: PHYSICS LAB-II

Objective: This course aim is to give exposure to the students about the experiments so that students will get a better understanding of the concepts studied by them in the theory course and can correlate with experimental observations.

LIST OF EXPERIMENTS **(20 Sessions)**

1. To determine and verify the time period of cantilever by drawing graph between load and depression
2. To determine the magnifying power of a compound microscope
3. To determine the magnifying power of an astronomical telescope
4. To verify Ohm's law
6. To verify law of resistances in series
7. To verify law of resistances in parallel
8. To convert a galvanometer into an ammeter of given range
9. To convert a galvanometer into a voltmeter of a given range

Course Outcomes:

Students completing this course will be able to:

CO1: Evaluate time period of cantilever
CO2: Determine magnifying power
CO3: Verify law of resistances
CO4: Apply the mathematical concepts/equations to obtain quantitative results.
CO5: Develop basic communication skills through working in groups in performing the laboratory experiments and by interpreting the results.

Suggested Readings:

1. Concept of Physics Prof. H.C. Verma, Part-1 (Bharti Bhawan)
2. Concept of Physics, Prof. H.C. Verma, Part-2 (Bharti Bhawan)
3. A Text Book of Applied Physics: Eagle Prakashan, Jullandhar

Website sources:

- https://www.learncbse.in
- http://notesforfree.com
- https://www.cmi.ac.in
- http://amrita.olabs.edu.in
- http://sisphysics.weebly.com

IFTM UNIVERSITY, MORADABAD
Diploma (Civil Engineering) Programme
Diploma (CE) - II Year (III Semester)
(w.e.f. session 2022-2023)
DPCE 301: MATERIAL SCIENCE & ENGINEERING

Objective: The objective of this course provides students an introduction to metals, ceramics, polymers, an understanding of basic structure and crystal arrangement of materials, Phase diagrams, advantages of heat treatment and the method of heat treatment processes.

UNIT I **(06 sessions)**

General:

Brief introduction to the subject metallurgy and its scope in engineering field, classification of materials of industrial importance. Their chemical thermal, electrical, magnetic, mechanical, and technological properties, and their selection criteria for use in industry.

UNIT II **(10 sessions)**

Structures of metals and their deformation:

Structure of metals and its relation to their physical, mechanical, and technological properties. Elementary idea of arrangement of atoms in metals, molecular structures crystal structures and crystal imperfections. Deformation of metals, effects of cold and hot working operations over them. Recovery recrystallization and grain growth, solid solutions, alloys and inter metallic compounds, allotropy of metals, effect of grain size on properties of metals. Corrosion its causes and prevention.

UNIT III **(12 sessions)**

Properties and usage of metals:

1. Metals
   a) Ferrous Metals.
   b) Non-Ferrous Metals
2. Nonmetallic Materials.

1. Metals:

(a) Ferrous Metals:

i. Classification of iron and steel. Sources of iron ores and places of availability. Outline of manufacture of pig iron, wrought iron, cast iron and steel. (Flow diagram only)
ii. Cast iron: Types as per I.S. - White, malleable, grey mottled, modular and alloy, properties, and common uses.
iii. Classification of steels according to carbon content and according to use as per I.S. Mechanical properties of various steels and their uses. Name and places of steel plant in India. Availability of various section of steel in market, its forms, and specifications.
iv. Alloy Steel: Effect of alloying various elements, viz Cr, Ni, Co, V, W, Mo, Si and Mn on mechanical properties of steel, Common alloy steels, viz,

(a) Ni-Steel (b) Ni-Cr-steel (c) Tungsten Steel (d) Cobalt steel (e) Stainless steel (f) Tool steel- High Carbon Steel, High Speed tool Steel, Satellite Metal, Tungsten Carbide Diamonds. (g) Silicon manganese steel (h) Spring steel (i) Heat resisting alloy steels (Nimonic steels). (j) Impact hardening steel

(b) Non-ferrous Materials:

i. Important ores and their metal content, outline of manufacturing methods, trade names, properties (Phy/Mech./Elect.) and use of the following metals: Aluminum, Zinc, Copper, Tin, Silver, Lead.

ii. Base metal with principal alloying elements (I.S.I. specification). Important properties and use of the following alloys:

a) Aluminum Alloys: Aluminum-Copper alloy, Al, Zn alloy, Aluminum- Silica Alloy-Al-Ni-Alloy, Dialuminium-derived alloys (R.R. and Y-alloy).

b) Copper Alloys: Brass, Bronze, Gun metal, Phosphor Bronze, Aluminum Bronze, Ni Bronze.

c) Nickel Silver: Nickel-Copper Alloy (monel metal) Inconel, Nickel, Silver.

d) Bearing Metals: Lead base alloys, tin base alloys. (White metals or babbit metals) Copper base alloys.

e) Solders: Solders-(Lead, Tin solder, Plumber solder, Tinman's solder, or Tin solder) Silver solder, Brazing alloys (spelter), Inconel alloys.

2. NON-METALIC MATERIALS:

a) Timber: Conversion of Timber: Its meaning necessity, Seasoning of timber, Preservation of Timber: Types of preservation, Methods of application, Defects in timber, Surface treatment, Soaking treatment, Hot and Cold treatment; Common Indian timber specific uses, properties identification, units of purchase.

b) Plastic and Other Synthetic Materials: Plastics-Important Sources-Natural and Synthetic, Classification, thermo set and thermoplastic, Various trade names, Important Properties, and engineering use of plastics. Market forms-Pallets, Granules, Powder, and Liquid forms; Uses of Sunglass rexin, Linoleum

UNIT IV **(06 sessions)**

Identification and Testing of Metal Alloys: Selection, specification forms and availability of materials. Testing of materials (Destructive and non-destructive), Identification of metal by giving mini project.

UNIT V **(06 sessions)**

Heat Treatment of Metals: Elementary concept, purpose, Iron-carbon equilibrium diagram. T.T.T. or 'S' curve in steels and its significance, micro structure of steels and martensitic transformation (elementary idea). Hardening, Tempering, Annealing, Normalizing and case hardening. Ageing, Various temperature ranges for different metals and alloy (From heat treatment hand book).

Course Outcomes:

Upon completion of this course the student will be able to:

CO1: Explain metallurgy and its scope in engineering field and explain the different properties of materials of industrial importance.

CO2: Identify the properties of metals with respect to crystal structure and grain size.

CO3: Classify and distinguish difference between metallic (ferrous & non-ferrous materials) and non-metallic materials and their types also.

CO4: Get knowledge of different types of Destructive and Non-Destructive tests.

CO5: Describe the concept of heat treatment of steels & strengthening mechanisms

PO – CO Mapping (Please write 3,2,1 wherever required) (Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	1	2	1	1	3	2	1	2
CO2	2	1	2	3	1	3	2	2
CO3	2	2	2	1	1	2	1	3
CO4	3	3	1	2	2	1	1	1
CO5	1	1	3	1	1	2	3	1

Suggested Readings:

1. K.M. Gupta: Materials Science. Umesh Publication.
2. Rajput, R.K.: A Textbook of Material Science & Engineering. S.K. Kataria & Sons.
3. Singh, I.P.: - Materials Science & Engineering. Jain Brothers.
4. Narula - Material Science. TMH.

Website resources:

- www.nptel.ac.in/courses
- https://en.wikipedia.org
- www.youtube.com
- www.asm-recycling.co.uk/ferrous-and-non-ferrous-metals/

IFTM UNIVERSITY, MORADABAD
Diploma (Civil Engineering) Programme
Diploma (CE) - II Year (III Semester)
(w.e.f. session 2022-2023)
DPCE 302: PUBLIC HEALTH ENGINEERING

Objective: The objective of this course is to familiarize the students with the quantity and quality of water, demand for water, population forecasting, and sanitation system of water. It also includes a brief idea regarding water supply and its treatment before supplying to the consumers and the disposal of the sewage.

UNIT I **(10 Sessions)**

Introduction: Necessity and a brief description of the water supply system. Water requirement Per capita consumption for domestic, industrial, public, and firefighting uses as per IS standards. Consumption, demand, and its variation. Quality of water and suitability. Water Treatment: Suspended colloidal and dissolved impurities. Physical, chemical, and bacteriological tests and their significance. Minimum standards are required for drinking water. Principles of Sedimentation, Coagulation, Flocculation, Filtration, Disinfection, Disinfection (Chlorination), including Jar Test, Break Point Chlorination, and Residual chlorine. Function, constructional details, working and operation of (i) Aeration fountain (ii) Mixer (iii) Flocculator (iv) Clarifier (v) Slow and rapid sand filter (vii) Chlorination chamber (viii) Water Softening.

UNIT II **(08 Sessions)**

Water Distribution:(i) Pipes: Different types of pipes cast iron, steel, plastic, (PVC, LDPE, HDPE), asbestos cement, concrete, plastic, GI, and lead pipes, Details of their sizes, joints and uses. (ii)Appurtenances: Sluice (Gate and spindle), air, reflux, scour and safety valves, fire hydrants, their working and uses. (iii)Distribution system: Requirements of distribution. Minimum head and rate. Types of lay out-dead end, grid, radial and ring systems. System of water supply-intermittent and continuous.

UNIT III **(06 Sessions)**

Waste: Dry, semi-liquid, liquid, Necessity of systematic collection and disposal of waste. Brief description of the sewage disposal system. Conservancy and Water carriage system, their advantages, and disadvantages.

UNIT IV **(06 Sessions)**

Quantity of Sewage:

a) Sewage**:** Domestic, industrial and storm water
b) Volume of domestic sewage (DWF), the variability of flow, limiting velocities in sewers.

UNIT V **(10 Sessions)**

Sewerage Systems:

a) Types of sewerage systems separate, combines, and partially separate.
b) Sewers: Stoneware, cast iron, concrete, and masonry sewers their sizes and joints.
c) Appurtenances: (Location, function, and construction) manholes, drop manhole, lamp hole catch basin, inverted siphon, flushing tanks, ventilating shafts, and storm water flows.

Course Outcomes:

Students completing this course will be able to:

CO1: Know about the quality and quantity of water.

CO2: Get knowledge regarding the treatment of water & distribution system.

CO3: Know the basics of sanitation system and disposal of the sewage.

CO4: Know about quantity of sewage.

CO5: Know about drains and sewer sections.

PO – CO Mapping (Please write 3,2,1 wherever required) (Note: 3 for highly mapped , 2 for medium mapped and 1 for low mapped

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	1	2	2	1	2	3	1
CO2	1	3	2	3	2	2	1	2
CO3	2	1	3	2	1	3	1	2
CO4	3	2	1	1	1	1	2	3
CO5	1	1	1	2	3	1	1	1

Suggested Readings:

1. Punmia, B.C.: Water Supply Engineering part-I. Laxmi Publications.
2. Punmia, B.C.: Waste Water Engineering part-II. Laxmi Publications.
3. Lal, D. and Upadhyay, A.K.: Water Supply and Waste Water Engineering. S K Kataria& Sons
4. Garg S.K.: Water Supply Engineering. Khanna publication

Website Sources:

- www.nptel.ac.in/
- www.sctevtservices.nic.in/
- www.sgipolytechnic.in/civil
- www.digimat.in/nptel/courses/video/105105201/L01.html

IFTM UNIVERSITY, MORADABAD
Diploma (Civil Engineering) Programme
Diploma (CE) - II Year (III Semester)
(w.e.f. session 2022-2023)
DPCE 303: SURVEYING PRACTICE-I

Objective: The aim of surveying is to prepare a map to show the relative positions of the objects on the surface of the earth also to collect field data. To prepare plan or map of the area surveyed. To analyse and calculate the field parameters for setting out operation of actual engineering works. To set out the field parameters at the site for further engineering works.

UNIT I **(08 Sessions)**

Introduction: Concept of surveying, purpose of surveying. Measurements linear and angular, units of measurement, instruments used for taking these measurements. Classification of survey based on instruments. Basic principles of surveying.

UNIT II **(10 Sessions)**

Chain Surveying: Purpose of chain surveying. Principles of chain surveying. Equipment used in chain surveying Viz. chains, tapes, ranging rods, arrows, pegs, cross staffs, India optical square their construction and uses different operations in chain surveying Ranging (direct/indirect), offset (perpendicular/oblique), chaining (flat and sloping ground), conducting chain survey over an area Recording the field data, plotting the chain surveying.

(a) Errors in chain surveying.

(b) Correction for erroneous length of chain, simple problems. Testing and adjustment of chain.

UNIT III **(10 Sessions)**

Compass Surveying: Purpose of compass surveying. Construction and working of prismatic compass. Use of prismatic Compass. Method of setting and taking observations. Concept of following. (a) Meridian -Magnetic, true, and arbitrary, (b) Bearing- Magnetic, true, and arbitrary. (c) Whole circle bearing and reduced Bearing. (d) Fore and back bearing. (e) Magnetic dip and declination Local attraction-causes, detection, errors, and correction. Problems on local attraction, magnetic declination, and calculation of included angles in a compass traverse.

UNIT IV **(06 Sessions)**

Traversing: Concept of traverse. Open and closed traverse. Traversing with a prismatic compass. Checks for an open and closed traverse. Plotting of a traverse- By included and deflection angles. Concept of closing error Adjustment of traverse graphically by proportionate method. Errors in compass surveying Testing and adjustment of a prismatic compass. Use of surveyor's compass and its construction details, comparison with prismatic compass.

UNIT V **(10 Sessions)**

Leveling: Purpose of leveling, concept of a level surface, horizontal surface, vertical surface, datum, reduced level, and bench marks. Principle and construction of dumpy, I.O.P. (tilting) levels. Concepts of line of collimation, axis of the bubble tube, axis of the telescope and vertical axis. Leveling staff (i) single piece (ii) folding (iii) sop with (iv) invar precision staff. Temporary adjustment setting up and leveling, adjusting for parallax of Dumpy and I.O.P. level. Differential leveling, concept of back sight, foresight, intermediate sight, station, change point, height of instrument Level book and reduction of levels by (a)

Height of collimation method and (b) Rise and fall method. Arithmetical checks. Problem on reduction of levels. Contours.

Course Outcomes:

Students completing this course will be able to:

CO1: To provide knowledge of linear and angular measurement, classification, principle of surveying.

CO2: Develop skills to find out area and linear measurement in the field using chain.

CO3: To provide knowledge of compass & find the bearings of lines using compass instruments.

CO4: Develop skills to conduct traverse survey & to find the area.

CO5: To provide knowledge of leveling instruments & Calculate R.L. by different methods.

PO – CO Mapping (Please write 3,2,1 wherever required)

(Note: 3 for highly mapped , 2 for medium mapped and 1 for low mapped

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CO2	3	2	3	3	3	3	2	2
CO3	1	2	2	2	1	2	1	3
CO4	2	3	1	1	2	1	1	1
CO5	1	1	2	2	1	2	3	1

Suggested Readings:

1. Punmia, B.C.: Surveying. Laxmi Publications.
2. Basak, N.N.: Surveying and Leveling. McGraw Hill Education (India).
3. S.K. Duggal: Surveying. McGraw Hill.
4. Chandra A.M.: Plane Surveying. New age international publishers.

Website Sources:

- http://nptel.ac.in/video.php?subjectId=105104101
- http://media.sakshat.ac.in/NPTEL-IIT-Videos/
- http://nptel.iitk.ac.in/courses/Civil_Eng/IIT%20Roorkee/Surveying.htm
- http://nptel.iitk.ac.in/

IFTM UNIVERSITY, MORADABAD
Diploma (Civil Engineering) Programme
Diploma (CE) - II Year (III Semester)
(w.e.f. session 2022-2023)
DPCE 304: BUILDING CONSTRUCTION & MAINTENANCE

Objective: The main objective of this course is to provide knowledge of building components and its different material

UNIT I **(06 Sessions)**

Introduction: Definition of a building, classification of buildings based on occupancy, requirements of a good residential building. Different parts of a building. **Foundations:** Functions of foundation, objects of foundation, general inspection of sites. Types of foundations

UNIT II **(08 Sessions)**

Masonry: Classification of bricks – properties and uses of first class, second-class, third class; over burnt bricks and under burnt brick - their field tests. Selection of suitable type of masonry Construction procedures, Mortar - Types & specific uses. **Building Components:** Door, window, ventilator, cupboard, wardrobe, etc. Floors, types and methods of construction, floor finishes. Roof, roof coverings and false ceilings. Vertical circulation (stair, lift)

UNIT III **(10 Sessions)**

Building Items: Plastering & pointing- its purpose, various types, construction procedures, advantages and disadvantages, suitability of each. Damp proof course (DPC), Anti-termite measures and treatments. Grouting- its purpose, construction procedures, advantages, and disadvantages. Example of specific uses. **Scaffolding and Centering:** Purpose& types of scaffolding and centering, Suitability of scaffolding as per situations and type of structures. Erection of centering for different components.

UNIT IV **(08 Sessions)**

Paints and Varnishes: Introduction, purpose and use of paints, Types, ingredients, properties and uses of oil paints, water paints and cement paints, covering capacity of various paints, Types, properties, and uses of varnishes

UNIT V **(08 Sessions)**

Building Maintenance: Purpose, need, importance, methods, Causes and types of defects in buildings, Preparation of report on maintenance work including estimating, Remedial measures, and execution procedure of any one type of building maintenance work.

Course Outcomes:

Students complete this course will be able to:

CO1: Ability to identify types of building and basic requirements of building components
CO2: Explain the foundations and uses of different types of foundations
CO3: Understand the concept of various methods of manufacture of bricks
CO4: Ability to describe types and purpose of scaffolding and centering
CO5: Study the causes and types of cracks in building structure

PO – CO Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped , 2 for medium mapped and 1 for low mapped

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	1	2	2	1	2	3	1
CO2	1	3	2	3	2	2	1	2
CO3	2	1	3	2	1	3	1	2
CO4	3	2	1	1	1	1	2	3
CO5	1	1	1	2	3	1	1	1

Suggested Reading:

1. P.C.Varghese, Engineering Materials, 1st edition, PHI Learning
2. S.K.Duggal, Building Materials, 3rd Edition, New Age International Publishers
3. Sushil Kumar, Building Construction, Standard Publishers Distributors
4. M.S.Shetty, Concrete Technology: Theory and Practice, S. Chand Publishers
5. A.R.Santhakumar, Concrete Technology, Oxford University Press

Website Sources:

- http://ascelibrary.org/
- http://nptel.ac.in/noc
- CivilDigital.com

IFTM UNIVERSITY, MORADABAD
Diploma (Civil Engineering) Programme
Diploma (CE) - II Year (III Semester)
(w.e.f. session 2022-2023)
DPCE 305: INTRODUCTORY STRENGTH OF MATERIALS

Objective: In mechanics of materials, the strength of a material is its ability to withstand an applied load without failure or plastic deformation. Strength of materials basically considers the relationship between the external loads applied to a material and the resulting deformation or change in material dimensions.

UNIT I **(08 Sessions)**

Classification of Materials Elastic materials, plastic materials, ductile materials, and brittle materials. Stresses and strain: introduction, types of stresses and strain, hook's law. Permissible stresses, principle of superposition and composite sections. Thermal stresses, Poisson's ratio, and volumetric strain. Elastic modulus with their relationship.

UNIT II **(10 Sessions)**

Shear force and Bending Moment: Type of Support, type of beams, type of load. Shear force and bending moment. SFD and BMD for cantilevers, simply supported and overhanging beam for concentrated and uniformly distributed load. Relationship between S.F and B.M

UNIT III **(10 Sessions)**

Geometrical properties of area: Center of area or centroids, moment of inertia and second moment of area. Theorem of parallel and perpendicular axes. Second moment of area of rectangular, circular, T, I, L and built-up section

UNIT IV **(06 Sessions)**

Bending stresses in Beams: concept of pure/simple bending, assumptions made in the theory of simple bending, derivation, and application of bending equation to circular cross-section, I section, T & L sections only, moment of resistance, calculations of bending stresses in simply supported beam.

UNIT V **(08 Sessions)**

Columns and Struts: Introduction, short and long columns. Euler's theory; assumptions, derivation for Euler's buckling load for different end conditions, limitations of Euler's theory. Rankin -Gordon's formula for columns.

Course Outcomes:

Students completing this course will be able to:

CO1: To understand the basic concepts of properties for different materials and fundamental concepts of stress, strain, and elastic behavior of materials.

CO2: Develop skills to find out the shear forces and bending moment in two dimensional structural beams.

CO3: Develop skills to geometrical properties of area for different shapes.

CO4: To provide knowledge of pure bending stresses and application of bending equation to different shapes.

CO5: Develop skills to evaluate the behavior of columns and struts with end conditions.

PO – CO Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	1	2	1	1	3	2	1	2
CO2	2	1	2	3	1	3	2	2
CO3	2	2	2	1	1	2	1	3
CO4	3	3	1	2	2	1	1	1
CO5	1	1	3	1	1	2	3	1

Suggested Readings:

1. Ramamrutham, S.: Strength of Materials. Dhanpat Rai and sons, New Delhi.
2. Punmia, B.C.: Strength of Materials. Standard publishers, Delhi.
3. R.K. Bansal: Strength of Materials. Laxmi Publications, Delhi.
4. R.K. Rajput: Strength of Materials. Laxmi Publications.

Website Sources:

- https://nptel.ac.in/courses/105/105/105105108/
- https://www.youtube.com/watch?v=TgK6VdpVF3o
- https://www.youtube.com/watch?v=Bls5KnQOWkY
- https://www.youtube.com/watch?v=hwpGAxa8UoI

IFTM UNIVERSITY, MORADABAD
Diploma (Civil Engineering) Programme
Diploma (CE) - II Year (III Semester)
(w.e.f. session 2022-2023)
DPCE 351: MATERIAL SCIENCE LAB

Objective: The objective of this course provides students an introduction to metals, ceramics, polymers, an understanding of basic structure and crystal arrangement of materials, testing of the materials i.e., type of hardness testing, tensile test, microscope examination, bending moment diagrams and microstructural study.

LIST OF EXPERIMENTS:

1. To determine the ultimate tensile strength, its modulus of Elasticity, Stress at yield point, % Elongation and contraction in x-sectional area of a specimen by U.T.M. through necking phenomenon.
2. To determine the ultimate crushing strength of materials like steel and copper and compare their strength.
3. To determine Rock Well Hardness No. Brinell Hardness No. of a sample.
4. To estimate the Shock Resistance of different qualities of materials by Izod's test and charpy test.
5. To determine the bending moment at a given section of a simply supported beam for different loading.
6. To determine the various parameters of Helical coil spring.
7. To determine the angle of twist for a given torque by Torsion apparatus and to plot a graph between torque and angle of twist.
8. Study of diamond polishing apparatus.
9. Study metallurgical microscope.
10.
    a) To prepare specimens for microscope examination (For Polishing and etching).
    b) To examine the microstructure of the above specimens under metallurgical microscope.
    c) To know composition of alloy steel by spebbersteeloscope
    d) To know carbon in steel by carbon steel estimation apparatus
11. Preparation of specimens and study of microstructure of eight given metals and alloys on metallurgical microscope.
    a) Brass.
    b) Bronze.
    c) Grey Cast Iron.
    d) Malleable Cast Iron.
    e) Low Carbon Steel.
    f) High Carbon Steel.
    g) High Speed Steel.
    h) Bearing Steel.
12. To perform heat treatment process on materials of known carbon percentage:
    a) Annealing
    b) Normalizing
    b) Case Hardening.

Course Outcomes:

Upon completion of this course the student will be able to:

CO1: Identify the various crystal lattice and prepare the specimen for metallographic examination.

CO2: Describe the working of Universal Testing Machine (UTM) and Evaluate Mechanical Properties of given specimen under Tensile, Compressive, Shear and Bending loading condition.

CO3: Describe the working of Torsion testing machine and determine experimentally the twisting moment and modulus of rigidity of specimen using torsion testing machine.

CO4: Explain hardness of materials, Brinell, Rockwell. Describe the working of Brinell and Rockwell hardness testing machine, perform hardness test and determine the Brinell and Rockwell hardness number of given specimen.

CO5: Describe the working of Impact testing machine. Differentiate between Izod and Charpy tests. Experimentally determine resilience of given materials by impact test.

Suggested Readings:

1. Sood Hemant: Laboratory Manual on Testing of Engineering Materials. New Age International Private Limited.
2. Chawla, Ravi; Kukreja C.B.; K, Kishore: Material Testing Laboratory Manual for Quality Control. Standard publishers.

Website resources:

- www.youtube.com/watch?v=mMNE0U17v-E
- www.youtube.com/watch?v=frBDo8NNfoU
- www.youtube.com/watch?v=n8sor9rwGB4
- www.youtube.com/watch?v=DSr4G3l8e78

IFTM UNIVERSITY, MORADABAD
Diploma (Civil Engineering) Programme
Diploma (CE) - II Year (III Semester)
(w.e.f. session 2022-2023)
DPCE 352: PUBLIC HEALTH ENGINEERING LAB

Objective: The objective of this course is to familiarize the students with the study of water and its different test

LIST OF EXPERIMENTS:

1. To determine dissolved and suspended solids in water.
2. To determine pH value of water sample.
3. To determine turbidity of water.
4. To calculate: (i). Oxygen Demand (OD) (ii). Biological Oxygen Demand (BOD) (iii). Chemical Oxygen Demand (COD).
5. To determine residual chlorine in water sample.
6. To perform Jar Test for Coagulants.
7. To collect samples of water from shallow & deep wells.
8. To perform chlorine demand test.
9. To determine hardness of water.
10. To determine available chlorine in bleaching powder.
11. To perform field test for the detection of intermediate pollution in drinking water by OT test.

Course Outcomes:

Students completing this course will be able to:

CO1: To know about the quality and quantity of water
CO2: To know the treatment of water & distribution system
CO3: To perform chlorine demand test.
CO4: To determine hardness of water
CO5: To determine detection of intermediate pollution in drinking water

Suggested Readings:

1. Punmia, B.C.: Water Supply Engineering. Laxmi Publications.
2. Lal, D. and Upadhyay, A.K.: Water Supply and Waste Water Engineering. S K Kataria& Sons.

Website Sources:

- https://nptel.ac.in/
- https://sites.google.com/site/erkrashmifaculty/home/public-health-engineering/lecture-notes

IFTM UNIVERSITY, MORADABAD
Diploma (Civil Engineering) Programme
Diploma (CE) - II Year (III Semester)
(w.e.f. session 2022-2023)
DPCE 353: SURVEYING PRACTICE -I LAB

Objective: The objective of surveying laboratory is to make student familiar and competent enough to draw map in suitable scale by using different surveying instruments like chain, cross staff and Indian optical square, compass, auto level, dumpy level, etc.

LIST OF EXPERIMENTS

Chain Surveying

Ex.(i) (a) Ranging a line.
(b) Chaining a line and recording in the field book.
(c) Testing and adjustment of chain.

Ex.(ii) (a) Chaining of a line involving reciprocal ranging.
(b)Taking offsets and setting out right angles with cross staff and Indian optical square.

Ex.(iii) Chain survey of a small area.

Ex.(iv) Chaining a line involving obstacles in ranging.

Compass Survey

Ex. (v) (a) Setting the compass and taking observations.
(b) Measuring angles between the lines meeting at a point by prismatic compass.

Ex. (vi) Traversing with the prismatic compass and chain of a closed traverse. (Recording and plotting by included angles) Plate II

Setting a regular Pentagon of given side & bearing Plate III

Ex. (vii) Traversing with the Prismatic compass and chain of a closed and open traverse (Recording and plotting by deflection angles) Plate IV

Ex. (viii) Determination of local attraction at a station by taking fore and back bearing.

Ex. (ix) To find true bearing of a line at a place.

Leveling:

Ex. (x) To find the difference of level between two distant points by taking staff readings on different stations from the single setting.

Course Outcomes:

Students completing this course will be able to:

CO1: To prepare a topographical map which shows the hills, valleys, rivers, villages, towns, forests, etc. of a country.

CO2: To prepare a cadastral map showing the boundaries of fields, houses, and other properties.

CO3: To prepare an engineering map which shows the details of engineering works such as roads, railways, reservoirs, irrigation canals, etc.

CO4: To prepare a military map showing the road and railway communications with different parts of a country. Such a map also shows the different strategic points important for the defense of a country.

CO5: Calculation of areas, drawing plans and contour maps using different measuring equipment at field level

Suggested Readings:

1. Punmia, B.C.: Surveying Volume I. Laxmi Publications.
2. Duggal, S. K.: Surveying Volume I. McGraw Hill.
3. Hamilton, George: Engineering Surveying Kendall Hunt Publishing; 2nd edition
4. James Anderson, Edward Mikhail: Surveying: Theory and Practice. McGraw Hill.

Website Sources:

- https://www.slideshare.net
- http://sreevahini.edu.in/pdf/surveying-1.pdf
- https://aust.edu/lab_manuals/CE/ce_104.pdf
- https://www.youtube.com/watch?v=7bJYfOHyPvQ

IFTM UNIVERSITY, MORADABAD
Diploma (Civil Engineering) Programme
Diploma (CE) - II Year (III Semester)
(w.e.f. session 2022-2023)
DPCE 354: BUILDING MATERIAL LAB

Objective: The objective of this course is to familiarize the students with the study of different building material. Different test of cement, coarse aggregate, fine aggregate, and brick will be carryout.

I. Cement (Two turns only)
1. Normal Consistency of cement.
2. Initial & final setting time of cement
3. Compressive strength of cement
4. Fineness of cement by air permeability and Le-chatalier's apparatus.
5. Soundness of cement.
6. Tensile strength

II. Coarse Aggregate (Two turns only)
1. Crushing value of aggregate
2. Impact value of aggregate
3. Water absorption of aggregate
4. Sieve Analysis of Aggregate
5. Specific gravity & bulk density
6. Grading of aggregates.

III Fine Aggregate: (one turns only)
1. Sieve analysis of sand
2. Silt content of sand
3. Bulking of sand

IV Destructive and non-destructive testing on concrete.

V Bricks:
1. Water absorption.
2. Dimension Tolerances
3. Compressive strength
4. Efflorescence.

Course Outcomes:
Students complete this course will be able to:
CO1: Conduct quality control tests on cement
CO2: Conduct quality control tests on fine aggregate
CO3: Conduct quality control tests on coarse aggregate
CO4: Conduct quality control tests on destructive and non-destructive testing on concrete
CO5: Conduct quality control tests on bricks

Suggested Reading:

1. Neville A.M: Concrete Technology. Standard Publishers Distributors, Delhi
2. Shetty M.S: Textbook of Concrete Technology. S Chand Publication
3. Ramachandran V.S: Concrete Admixtures Handbook. Standard Publisher Distributors

Website Sources:

- http://ascelibrary.org/
- http://nptel.ac.in/noc
- https://www.iitk.ac.in/ce/test/IS-codes/is.12269.2013
- https://nptel.ac.in/courses/105/104/105104030/

IFTM UNIVERSITY, MORADABAD
Diploma (Civil Engineering) Programme
Diploma (CE) - II Year (IV Semester)
(w.e.f. session 2022-2023)
DPCE 401: BASIC GEOTECHNICAL ENGINEERING

Objective: To impart knowledge on the various factors governing the Engineering behavior of soils and the suitability of soils for various Geotechnical Engineering applications and to characterize stress-strain behavior of soils, the failure criteria and to evaluate the shear strength and compressibility parameters of soils.

UNIT I **(08 Sessions)**

Soil Formation: Origin of soil, formation of soil, weathering of rock and types of soils. **Soil Classification and Plasticity Characteristics of soil;** Particle size classification, Indian Standard Classification system, texture classification system, plasticity of soil, consistency limits, plasticity index, liquidity, and consistency indexes.

UNIT II **(08 Sessions)**

Physical Properties: Constituents for soil, phase diagram for soil, definition and meaning of void ratio, porosity, degree of saturation, water content, air content, percentage of air voids, specific gravity of soil grains, unit weight. Weight simple numerical problems with the help of phase diagrams.

UNIT III **(10 Sessions)**

Permeability: Definition, Darcy's law, factor affecting permeability, permeability of stratified soils, and laboratory and field determination of coefficient of permeability. **Compaction;** Definition, different method of compaction, standard proctor test, factor affecting compaction, compaction equipment. **Consolidation;** Definition, its importance on foundation settlement, difference between compaction and consolidation.

UNIT IV **(06 Sessions)**

Effective Stress Principal Effective stress principal, nature of effective stress, effects of water table fluctuations of effective stress, seepage pressure, quick sand conditions. Shear strength, stress system with principal planes parallel to the coordinate axis, Mohr's circle, important characteristics of Mohr's circle, direct shear test, triaxial compression test.

UNIT V **(06 Sessions)**

Stability of Slopes: Types of slope failure, analysis of finite and infinite slopes in cohesion less and cohesive soil, Swedish and friction circle method, stability of slope under steady seepage condition.

Course Outcomes:

Students completing this course will be able to:

CO1: Characterize and classify soils.

CO2: Impart knowledge on the various physical properties of soils and the suitability of soils for various Geotechnical Engineering applications.

CO3: Understand the principles of compaction and consolidation & its control.

CO4: Identify shear strength parameters for field conditions.

CO5: Understand the mechanism of slope failure for various types of slopes both in static and seismic case.

PO – CO Mapping (Please write 3,2,1 wherever required)

(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	1	2	1	1	3	2	1	2
CO2	2	1	2	3	1	3	2	2
CO3	2	2	2	1	1	2	1	3
CO4	3	3	1	2	2	1	1	1
CO5	1	1	3	1	1	2	3	1

Suggested Readings:

1. Punamia, B.C.: Soil Mechanics and Foundations. Laxmi Publications (P) Ltd.
2. Arora, K.R.: Soil Mechanics and Foundations. Standard Publishers.
3. Rao, A. S. R. and Ranjan, Gopal: Basic and Applied Soil Mechanics. New Age International Publishers.
4. Modi, P.N.: Soil Mechanics and Foundation Engineering. Standard Book House.

Website Sources:

- www.nptel.ac.in/
- www.en.wikipedia.org/wiki/Geotechnical_engineering
- www.civilenggforall.com/basics-of-geotechnical-engineering
- www.youtube.com/watch?v=V1m3cB-Aqy8

IFTM UNIVERSITY, MORADABAD
Diploma (Civil Engineering) Programme
Diploma (CE) - II Year (IV Semester)
(w.e.f. session 2022-2023)
DPCE 402: BASIC CONCRETE TECHNOLOGY

Objective: The objective of this course is to define and understand concepts related Concrete technology which involves types and property of concrete and different adhesive materials and its vital use for safe, economic development for the buildings

UNIT I **(10 Sessions)**

Introduction Definition of concrete, brief introduction to properties of concrete, advantages of concrete, uses of concrete in comparison to other building materials. **Cement Chemical**, composition of cement, process of manufacturing of cement, heat of hydration, hydration of cement, bogues compounds. Types of cements and its applications. Testing of cement

UNIT II **(06 Sessions)**

Aggregates: (i) Classification of aggregates according to source, size, and shape (ii) Characteristics of aggregates: Particle size and shape, crushed and rounded aggregates, surface texture, specific gravity of aggregate, bulk density, water absorption, surface moisture, bulking of sand, deleterious materials in the aggregate. (iii) Grading of aggregates, coarse aggregate, fine aggregate; All in aggregate; Fineness modulus.

UNIT III **(06 Sessions)**

Water & admixtures: Qualities of water, use of sea water for mixing concrete. plasticizers, super plasticizers, accelerators, retarders, air entraining agents, damp proofing, and water proofing. Fresh Concrete: workability, factors affecting workability, measurement of workability, segregation, bleeding, process of manufacturing of concrete.

UNIT IV **(08 Sessions)**

Strength of concrete: Water cement ratio, gel space ratio, gain of strength of age, maturity concept of concrete, relation between compressive and tensile strength. Elasticity, creep, and shrinkage: Elastic properties of aggregate, Relation between modulus of elasticity and strength, factor affecting modulus of elasticity, dynamic modulus of elasticity, poisons ratio. Creep, measurement of creep, factor affecting creep, effect of creep. Shrinkage: plastic shrinkage, drying shrinkage, factor affecting shrinkage

UNIT V **(12 Sessions)**

Concrete mix design: General, concept of mix design, variables in proportioning, various method of proportioning, statistical quality control of concrete, common terminologies, calculation of standard deviation and coefficient of variation, Relation between Average Design Strength and Specified Minimum Strength, Indian Standard Recommended Method of Concrete Mix Design**.** Special Concrete (i) Light weight concrete, Aerated concrete, No fines concrete, High Density concrete, fiber reinforced concrete, Polymer concrete.

Course Outcomes:

Students complete this course will be able to:

CO1: Explain the properties of the constituent materials of concrete

CO2: Describe the physical & mechanical properties of aggregates

CO3: Fundamental knowledge of admixture used in concrete

CO4: To understand factors affecting the strength, workability, and durability of concrete

CO5: Understand the factors influencing concrete mix & know the BIS method of mix design

PO – CO Mapping (Please write 3,2,1 wherever required)

(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	1	1	2	2	1	2	1	2
CO2	3	2	3	3	3	3	2	2
CO3	1	2	2	2	1	2	1	3
CO4	2	3	1	1	2	1	1	1
CO5	1	1	2	2	1	2	3	1

Suggested Reading:

1. Neville A.M: Concrete Technology. Standard Publishers Distributors, Delhi
2. Shetty M.S: Textbook of Concrete Technology. S Chand Publication
3. Ramachandran V.S: Concrete Admixtures Handbook. Standard Publisher Distributors

Website Sources:

- http://ascelibrary.org/
- http://nptel.ac.in/noc
- CivilDigital.com
- https://nptel.ac.in/courses/105/106/105106206/
- https://nptel.ac.in/courses/105/106/105106176/

IFTM UNIVERSITY, MORADABAD
Diploma (Civil Engineering) Programme
Diploma (CE) - II Year (IV Semester)
(w.e.f. session 2022-2023)
DPCE 403: SURVEYING PRACTICE -II

Objective: The objective of this course is to familiarize the students with the development and plan process for any civil engineering project, at first field survey of that area is carried out and various type of survey maps are prepared. These maps and drawings are used for taking various decisions regarding the planning, designing, estimation, execution, and construction process, etc. It also includes the study of field survey and the basic requirement for preparing any engineering maps or drawings.

UNIT I **(10 Sessions)**

Tachometric Surveying: Determination of constants of a tachometer, Determination of distance and elevation of a point by tachometers observations, Determination of gradient between two points of different elevations by stadia tachometry, tangential tachometric observation

UNIT II **(08 Sessions)**

Theodolite Survey: Use of theodolite, temporary adjustment, measuring horizontal and vertical angles, theodolite traversing

UNIT III **(10 Sessions)**

Survey adjustments: Errors - Sources, precautions, and corrections - Classification of errors - True and most probable values - Weighted observations - Method of equal shifts - Principle of least squares - Normal equation - Correlates - Level nets - Adjustment of simple triangulation networks.

UNIT IV **(08 Sessions)**

Curve surveying: Curves, types of curves, simple circular curves, compound curves, reverse curves, transition curves and vertical curve, sources of error setting of works

UNIT V **(04 Sessions)**

Hydrographic and advance surveying: Introduction to underground surveying, hydrographic surveying, photogrammetric surveying, remote sensing, and geographic information system

Course Outcomes:

Students completing this course will be able to:

CO1: Able to apply the concept of Tacheometry for surveying in difficult and hilly areas to obtain the topographical map of area.

CO2: Able to understand the uses of theodolite, temporary adjustment, measuring horizontal & vertical angles, and traversing of theodolite.

CO3: Able to control the accumulation of errors in surveying and understand the errors - Sources, precautions, and corrections.

CO4: Able to Understand the Curves, types of curves and sources of error setting of works.

CO5: Able to understand the underground surveying, hydrographical surveying, photogrammetric surveying, remote sensing, and geographic information system.

PO – CO Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	1	2	2	1	2	3	1
CO2	1	3	2	3	2	2	1	2
CO3	2	1	3	2	1	3	1	2
CO4	3	2	1	1	1	1	2	3
CO5	1	1	1	2	3	1	1	1

Suggested Readings:

1. Punmia, B.C.: Surveying Volume II. Laxmi Publications.
2. Duggal, S. K.: Surveying Volume II. McGraw Hill.
3. Basak, N. N.: Surveying &Levelling. Tata McGraw-Hill Education.
4. K.R. Arora: Surveying, Vol.-I, II, III, Standard Book House

Website Sources:

- https://nptel.ac.in/courses/105/101/105101201/
- https://www.engineeringcivil.com/
- https://www.youtube.com/watch?v=U1oAqwKn8xI
- https://www.youtube.com/watch?v=g3hwVzmPIhk&t=4137s

IFTM UNIVERSITY, MORADABAD
Diploma (Civil Engineering) Programme
Diploma (CE) - II Year (IV Semester)
(w.e.f. session 2022-2023)
DPCE 404: INTRODUCTORY FLUID MECHANICS

Objective: The objective of this course is to familiarize the students with the behaviour of fluid flow in different conditions in pipes, channels, canals, notches, weirs etc. is necessary for civil, environmental and transportation engineers. It includes the basic knowledge about hydraulics which is useful in subjects like Irrigation, Water Resources Management and Public Health Engineering. In this course, basics of hydraulics and its application-oriented content has been kept with a focus that students should be able to solve practical problems.

UNIT I **(10 Sessions)**

Introduction: Definition of Fluids, types of fluids, properties of fluid (Mass density, specific weight, specific gravity, viscosity, surface tension - cohesion, adhesion, capillarity, vapour pressure and compressibility). Newton's Law of Viscosity, Types of Flow

UNIT II **(08 Sessions)**

Fluids Statics: Fluid pressure, Pascal's Law, pressure intensity and pressure Head. Derivation and Application of Basic Formula for pressure intensity. Types of hydraulic energy: Potential energy, kinetic energy, pressure energy, Bernoulli's theorem; statement and description (without proof of theorem)

UNIT III **(06 Sessions)**

Flow Measurements: Orifice (Definition and Types of Orifices, Hydraulic Coefficients) Venturimeter and mouthpiece (Definition and Types of Mouthpieces), Pitot tube, Current meters, Notches, and weirs (Definition and types of Notches and Weirs. Discharge Formulae for Rectangular, Triangular and Trapezoidal Notch)

UNIT IV **(06 Sessions)**

Flow through Pipes: Definition of pipe flow; Reynolds number, laminar and turbulent flow - explained through Reynold's experiment, Critical velocity, and velocity distributions in a pipe for laminar flow, Head loss in pipe lines due to friction, sudden expansion and sudden contraction, entrance, exit, obstruction and change of direction (No derivation of formula. Hydraulic gradient line and total energy line

UNIT V **(10 Sessions)**

Flow through open channels: Definition of an open channel, uniform flow and non-uniform flow, Discharge through channels using Chezy's formula and Manning's formula. Pump: Hydraulic pump, reciprocating pump, and centrifugal pumps

Course Outcomes:

Students completing this course will be able to:

CO1: Identify importance of various fluid properties at rest and in transit.

CO2: Calculate the pressure distribution for incompressible fluids and the hydrostatic pressure & force on plane and curved surfaces.

CO3: Calculate the discharge of different types of openings in hydraulic structures.

CO4: Calculate the head losses of flowing liquid in the pipe.

CO5: Calculate the flow of a liquid with a free surface.

PO – CO Mapping (Please write 3,2,1 wherever required)

(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	1	2	1	1	3	2	1	2
CO2	2	1	2	3	1	3	2	2
CO3	2	2	2	1	1	2	1	3
CO4	3	3	1	2	2	1	1	1
CO5	1	1	3	1	1	2	3	1

Suggested Readings:

1. Bansal, R.K.: Fluid Mechanics and hydraulic machines.
2. Modi P.N., and Seth, S.M.: Hydraulics and fluid mechanics. Standard Publisher's distributor.
3. Khurmi, R.S: Hydraulics Machines. S. Chand and Co.
4. Rajput, R.K.: Fluid Mechanics and Hydraulic Machines. S. Chand Publishing.

Website Sources:

- www.nptel.ac.in/
- www.youtube.com/watch?v=pGd7M3yckrM
- www.tutorialspoint.com/videot...
- www.nptel.iitm.ac.in

IFTM UNIVERSITY, MORADABAD
Diploma (Civil Engineering) Programme
Diploma (CE) - II Year (IV Semester)
(w.e.f. session 2022-2023)
DPCE 405: BASIC STRUCTURAL ANALYSIS

Objective: Civil engineering projects such as buildings, bridges, earthen dams, and roadways require detailed subsurface information as part of the design process. The ground below us ultimately supports all structures and to be successful, the ground must not fail under the applied structural load.

UNIT I **(06 Sessions)**

Structural Systems: Introduction, idealizations and assumptions, conditions of equilibrium, compatibility conditions, simple and compound systems, linear and non-linear systems.

UNIT II **(10 Sessions)**

Deflection of Beams: Moment area theorems, derivation of moment area theorems, calculation of maximum slope and deflection for the following standard cases of cantilever & simply supported beams due to point load & UDL.

UNIT III **(08 Sessions)**

Strain Energy: Strain energy and complementary strain energy, strain energy due to axial load, bending and shear, law of conservation energy, principle of virtual work, Castigliano's theorems.

UNIT IV **(08 Sessions)**

Rolling loads and influence lines for beams: Introduction, influence line diagrams, ILD for simply supported beams, cantilever beams, use of ILD.

UNIT V **(08 Sessions)**

Three Hinged Arches: introduction, three hinged arches, analysis for static loads, bending moment diagrams.

Course Outcomes:

Students completing this course will be able to:

CO1: Able to understand the conditions of equilibrium, compatibility conditions, simple and compound systems, linear and non-linear systems.

CO2: Able to compute deflection of beams by moment area theorems, and calculation of maximum slope and deflection for the cantilever & simply supported beams.

CO3: Able to understand the Strain energy and strain energy due to axial load, bending and shear, law of conservation energy, principle of virtual work, Castigliano's theorems.

CO4: Able to draw the influence line diagram for rolling loads.

CO5: Able to analysis for static loads, bending moment diagrams for three hinged arches.

PO – CO Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	1	1	2	2	1	2	1	2
CO2	3	2	3	3	3	3	2	2
CO3	1	2	2	2	1	2	1	3
CO4	2	3	1	1	2	1	1	1
CO5	1	1	2	2	1	2	3	1

Suggested Readings:

1. Ramamrutham, S.: Theory of Structures. Dhanpat Rai Publishing Company.
2. Bhavikatti, S.S: Structural Analysis. Vikas Publishing House Pvt. Ltd
3. R. Agor: Structural Analysis. Khanna Publishing House.
4. B.C punima: Theory of structures. Laxmi publication.

Website Sources:

- https://nptel.ac.in/
- https://sctevtservices.nic.in/
- https://www.youtube.com/watch?v=RyNsxkdEv00&t=55s
- https://www.youtube.com/watch?v=RcBQqrPWiDQ

IFTM UNIVERSITY, MORADABAD
Diploma (Civil Engineering) Programme
Diploma (CE) - II Year (IV Semester)
(w.e.f. session 2022-2023)
DPCE 451: BASIC GEOTECHNICAL ENGINEERING LAB

Objective: The main objectives of developing the soil mechanics and foundation engineering lab are: To carry out all soil mechanics fundamental experiments according to standards. Analyze and interpret experimental data. To understand the techniques, skills, and modern engineering tools necessary for engineering practice.

LIST OF EXPERIMENTS

1. Determination of natural moisture content.
2. Determination of specific gravity.
3. Determination of In-situ density by core cutter Method
4. Compaction test.
5. Grain size distribution of cohesionless soil by sieving.
6. Direct shear test.
7. Determination of compaction characteristics of soil by is light compaction
8. Determination of co-efficient of permeability by constant head permeameter (coarse grained soil)
9. Determination of co-efficient of permeability by variable head parameter (fine grained soil).
10. Determination of liquid limit (L.L) by Casagrandes.

Course Outcomes:

Students completing this course will be able to:

CO1: Describe the nature of soil a problem encountered in civil engineering and gives an overall preview of the behavior of soil.

CO2: Describes the nature of soil, especially the transmission of stresses between soil particles.

CO3: Studying primarily the dry soil behavior since many aspects of soil behavior can be understood by considering the interaction of soil without the presence of water.

CO4: Draw the particle size distribution curve and to find the particle size.

CO5: To apply the result and soil investigation and sampling, to use soil as construction material economically.

Suggested Readings:

1. Punamia, B.C.: Soil Mechanics and Foundations. Laxmi Publications (P) Ltd.
2. Arora, K.R.: Soil Mechanics and Foundations. Standard Publishers.
3. C. Venkat Ramaiah, Geotechnical Engineering, New Age International publishers, 2012.
4. Gopal Ranjan and A. S. R. Rao, Basic and Applied Soil Mechanics, New Age International Publishers, 2012.

Website Sources:

- https://www.bitmesra.ac.in/UploadedDocuments/admincivil/files/smfe%20labs.pdf
- https://www.youtube.com/watch?v=55RwyS0ySo&list=PL3MO67NH2XxKxWtYte3GeJJN8LNQWcJqP
- https://www.youtube.com/watch?v=EcXJ961qjGA&list=PLQg3bpKLu5yqK2EHRZPH6wK8TJxlZA3C

IFTM UNIVERSITY, MORADABAD
Diploma (Civil Engineering) Programme
Diploma (CE) - II Year (IV Semester)
(w.e.f. session 2022-2023)
DPCE 452: CONCRETE TECHNOLOGY LAB

Objective: The objective of this course is to familiarize the students with the study of test of concrete. Different test of concrete in fresh and harden stage will be carryout

LIST OF EXPERIMENTS

1. To determine the physical properties of Cement as per BIS Codes
2. To determine flakiness and elongation index of coarse aggregates
3. Method to determine silt in fine aggregate
4. Determination of specific gravity and water absorption of aggregates
5. Determination of bulk density and voids of aggregates
6. Determination of particle size distribution of fine, coarse, and all-in aggregate by sieve analysis (grading of aggregate)
7. To determine necessary adjustment for bulking of fine aggregate
8. To determine workability by slump test.

Course Outcomes:

Students complete this course will be able to:

CO1: Conduct Quality Control tests on cement
CO2: Conduct Quality Control tests on fine aggregate
CO3: Conduct Quality Control tests on coarse aggregate
CO4: Conduct Quality Control tests on fresh & hardened concrete
CO5: Conduct Quality Control tests on concrete making materials

Suggested Reading:

1. Neville A.M: Concrete Technology. Standard Publishers Distributors, Delhi
2. Shetty M.S: Textbook of Concrete Technology. S Chand Publication
3. Ramachandran V.S: Concrete Admixtures Handbook. Standard Publisher Distributors

Website Sources:

- http://ascelibrary.org/
- http://nptel.ac.in/noc
- CivilDigital.com

IFTM UNIVERSITY, MORADABAD
Diploma (Civil Engineering) Programme
Diploma (CE) - II Year (IV Semester)
(w.e.f. session 2022-2023)
DPCE 453: SURVEYING PRACTICE-II LAB

Objective: The objective of this course is to conduct experimentation for using different surveying instruments like total station, theodolite, auto level, global positioning system (GPS), geographical information system (GIS), electromagnetic distance measurement (EDM), plane table, compass, etc. Students learn to survey from conventional as well as contemporary methods and technology.

LIST OF EXPERIMENTS

1. Measurement of horizontal and vertical angles by theodolite
2. Traversing by theodolite
3. G.P.S (demonstration)
4. Setting out curves by different methods
5. Contouring
6. Total station (demonstration)

Course Outcomes:

Students completing this course will be able to:

CO1: Have the fundamental knowledge to measure both horizontal distance and elevations without the use of sophisticated instruments.

CO2: Measurement of horizontal and vertical angles by theodolite.

CO3: Have knowledge to modern methods of surveying like Photogrammetry, Total station, and Hydrographic survey.

CO4: To prepare a map showing the road and railway communications with different parts of a country.

CO5: Calculation of areas, drawing plans and contour maps using different measuring equipment at field.

Suggested Readings:

1. Pant, M.K.: Laboratory Manual for Civil Engineering Students. S. K. Kataria & Sons.
2. Madhu & Gobi: Advanced Surveying. Pearson India.
3. BC Punamia: Surveying Vol.-I, II, III. Laxmi Publications.

Website Sources:

- https://www.youtube.com/watch?v=HGQM913rI10&list=PLkUEX3IbW7lclZ9jK-thjumHM2-meHGjF
- http://sreevahini.edu.in/pdf/surveying-1.pdf
- https://aust.edu/lab_manuals/CE/ce_104.pdf

IFTM UNIVERSITY, MORADABAD
Diploma (Civil Engineering) Programme
Diploma (CE) - II Year (IV Semester)
(w.e.f. session 2022-2023)
DPCE 454: FLUID MECHANICS LAB

Objective: The objective of this course is to conduct experimentation for calibration of flow measuring devices and determination of friction factor for pipes and minor losses in pipes.

LIST OF EXPERIMENTS

1. Verification of Bernoulli's Theorem.
2. Determination of Cd of the given external cylindrical mouth-pieces
3. Determination of Cd the given triangular / rectangular notch
4. Determination of loss coefficient due to sudden expansion and sudden contraction for the given pipe arrangement
5. Determination of coefficient of friction for given pipe
6. Determination of meter coefficient (Cd) for the given Venturimeter / Orifice-meter
7. Viscosity determination by falling sphere viscometer
8. Study of the type of the flow by Reynold's apparatus
9. Determination of the efficiency of the given centrifugal pump

Course Outcomes:

Students completing this course will be able to:

CO1: Calibrate flow measuring devices such as Venturimeter, orifice meter and v-notch
CO2: Determine friction factor in pipes.
CO3: Determine minor losses in the pipes.
CO4: Verify Bernoulli's theorem.
CO5: Understand the performance of hydraulic turbine and pumps under different working conditions.

Suggested Readings:

1. Gupta, V.P.: Laboratory Manual of Fluid Mechanics and Machines. S. K. Kataria& Sons.
2. Poonia, M.P. & Jakhar, O.P.: Laboratory Manual for Fluid Mechanics. PHI Learning Pvt Ltd.
3. Swamy, N. K.: Fluid Mechanics & Machinery Laboratory Manual. Charotar books.
4. Padmanabhan, G.: Fluid Mechanics Laboratory Manual for Civil Engineering Students. Kendall/Hunt Publishing Co, U.S.

Website Sources:

- www.youtube.com/watch?v=m90wPNvxAIg
- www.youtube.com/watch?v=o3wGNVLMDN0
- www.youtube.com/watch?v=sycOzXg04SI
- www.youtube.com/watch?v=ILY4QMQIY5s

IFTM UNIVERSITY, MORADABAD
Diploma (Civil Engineering) Programme
Diploma (CE) - III Year (V Semester)
(w.e.f. session 2022-2023)
DPCE 501: BASIC TRANSPORTATION ENGINEERING

Objective: The objective of this course is to familiarize the students with the knowledge and understanding of various aspects of highway geometrics, traffic engineering, different road materials, design of pavements, highway drainage, railway engineering, airport engineering, and docks and harbors in waterways engineering. It also includes the study about the aspects of roads, railways airways, and waterways to develop their understanding to apply their knowledge in improving civil infrastructure for transportation.

UNIT I **(04 Sessions)**

Introduction: Modes and development of traffic systems-their features and requirements. History of road development

UNIT II **(10 Sessions)**

Highways: Ideal road - alignment of highways- classification of highways- the concept of expressways- highway geometric and their standards: width elements, camber, gradient, superelevation, and sight distance- highway materials, their requirements- bitumen- flexible and rigid pavements: water - bound macadam roads, blacktop roads, concrete roads, and their joints

UNIT III **(10 Sessions)**

Railways: Functions, requirements, and components of the permanent way - stations and yards - selection and requirements of the site, classification - working principle of simple turnout - signals and their classifications.

UNIT IV **(10 Sessions)**

Airports: Selection of site for an airport - elements and the typical layout of an airport - orientation, length, and patterns of runways - identification of runways (runway numbering) - parking of aircraft.

UNIT V **(06 Sessions)**

Docks and Harbors: Seaport: Selection of the site- elements and typical layout - functions, requirements, and classifications of docks and harbors - breakwater and their types dredging.

Course Outcomes:

Students completing this course will be able to:

CO1: Know about the different modes, features and requirements of transportation and history of road development.

CO2: Understand the principles of highway geometrics, selection of suitable road materials for the design of different types of pavements and planning of proper drainage system.

CO3: Get knowledge regarding the Components of Railway Track, different Railway Gauges, various types of Track Turnouts and purposes & facilities at Railway Stations and signals.

CO4: Get knowledge of Airport planning, layout and runway and taxiway components.

CO5: Get knowledge about Docks and Harbour Engineering for the water transportation in the context of regional and intercontinental transportation.

PO – CO Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	1	2	1	1	3	2	1	2
CO2	2	1	2	3	1	3	2	2
CO3	2	2	2	1	1	2	1	3
CO4	3	3	1	2	2	1	1	1
CO5	1	1	3	1	1	2	3	1

Suggested Readings:

1. Khanna, S. K., and Justo, C. E. G.: Highway Engineering. Nem Chand and Bros.
2. Saxena, S. C., and Arora, S. P.: A text book of Railway Engineering. Dhanpat Publications.
3. Rangwala, S.C., and Rangwala, P.S.: Airport Engineering. Charotar Publishing House Pvt. Limited.
4. Gautam, H. Oza, and Hasmukh, P. Oza: Dock and Harbour Engineering. Charotar Publishing House Pvt. Limited.

Website Sources:

- www.nptel.ac.in/
- www.courses.com/
- www.youtube.com/watch?v=5zKC_aq4ypM
- www.youtube.com/watch?v=37WMS483T7Y

IFTM UNIVERSITY, MORADABAD
Diploma (Civil Engineering) Programme
Diploma (CE) - III Year (V Semester)
(w.e.f. session 2022-2023)

DPCE 502: CONSTRUCTION MANAGEMENT AND ENTREPRENEURSHIP DEVELOPMENT

Objective: The objective of this course is to familiarize the students with the construction works management and equipment used on the site. This consists study about the application of new construction activities and scheduling techniques, CPM & PERT.

UNIT I **(04 Sessions)**

Introduction and planning of civil engineering projects: Definition of construction management - Need for construction management - Scope of construction management. Preliminary planning - Factors to be considered - Reconnaissance survey - Preliminary survey - Analysis and plotting of data - Preliminary estimate - Project report - land acquisition - Administrative approval - Technical sanction - Budget provision.

UNIT II **(12 Sessions)**

Resource management - Optimum utilization of resources Finance, Materials, Machinery, Human resources, Labor legislation, Safety in Civil Engg. Works, Resource leveling, Resource scheduling. Construction Planning; Construction stages - Construction Operations - Construction Schedule - Materials - Equipment and Machinery - Labor - Programme and progress chart - Gantt chats - Uses and limitations.

UNIT III **(08 Sessions)**

Applications of Network Techniques: CPM and PERT networks- Advantages -Network concept - Activities -Dummy activities -Events -Networks Preparation -Numbering the Events -Time Estimates - Activity oriented time estimate -Event oriented time estimate -Floats -Project completion time and Critical path -Part - time estimates -Expected time -Standard deviation and variance -comparison between PERT and CPM -Network problems.

UNIT IV **(08 Sessions)**

Tenders and Documents: Tenders - Definitions -Sealed tender -Tender documents -Tender notice - Earnest money deposit -Security Deposit -Opening of tenders -Scrutiny of Tenders -Acceptance of Tenders -Works orders -Contract documents -Execution of agreement -General and specific conditions. **Contracts:** Contract system -Different types of contracts -forms of contract -piece work agreement -A Lump sum contract -item rate or Unit price contract -cost plus percentage contract -merits and demerits - Negotiated rates -sub contract -procedure for enlisting of contracts -Legal implication of contract - Penalties and Arbitration.

UNIT V **(08 Sessions)**

Entrepreneurship and Finance: Definition and concept -role and significance -Risks and awards - profile and requirement of an entrepreneur development -Need for coordinated efforts -Follow up and institutional support needed -Programme Existing in India -SISI, DIC, TIIC, SIDCO -Assistance programs to entrepreneurs small business enterprises -forms of business enterprises -sole proprietorship - partnership -private limited company -public limited company -cooperative -state enterprises (Definition only) Role of Bank in the development of small business enterprises -Elements of cash flow -Cash inflow

and cash outflow -cash flow diagram -time value of money -interest rate of capital -the present value of computation -calculation.

Course Outcomes:

Students completing this course will be able to:

CO1: Gain the knowledge and understanding of construction works and its management.

CO2: Know about the construction planning, scheduling & controlling.

CO3: Know about the material and labor management, equipment management, safety management

CO4: Gain the knowledge about the basics of tender & tendering process. Also, to know about the contract and contract management.

CO5: Know about the need for Entrepreneurship development in the context of Globalization and Liberalization and to develop entrepreneurial qualities. Also, to know about the financial and human resource management for an enterprise.

PO – CO Mapping (Please write 3,2,1 wherever required)

(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	1	1	2	2	1	2	1	2
CO2	3	2	3	3	3	3	2	2
CO3	1	2	2	2	1	2	1	3
CO4	2	3	1	1	2	1	1	1
CO5	1	1	2	2	1	2	3	1

Suggested Readings:

1. Chitkara, K.K.: Construction Project Management. McGraw Hill India.
2. Punmia, B.C.: Project Planning and Control with PERT and CPM. Laxmi Publications.
3. Sharma, S.C.: Construction Engineering & Management of Projects. Khanna Publishers
4. Sengupta ,B. and Guha ,H. : Construction Management and Planning. McGraw Hill Education.

Website Sources:

- www.nptel.ac.in/courses
- www.onlinecourses.nptel.ac.in
- www.youtube.com
- www.onlinecourses.nptel.ac.in/noc21_ce21/preview

IFTM UNIVERSITY, MORADABAD
Diploma (Civil Engineering) Programme
Diploma (CE) - III Year (V Semester)
(w.e.f. session 2022-2023)
DPCE 503: DESIGN OF CONCRETE STRUCTURES

Objective:
The objective of this course is tounderstand the concept of working stress and limit state methods and to gain the knowledge of limit state design for flexure, shear, torsion, bond, and anchorage

UNIT I **(10 Sessions)**
Introduction: Different grade of concrete and steel, I.S. specification, purpose of providing reinforcement, modular ratio, types of loads on structures as per IS:875. Methods of design- Aims of design-RCC- Limit State method- Assumptions- Stress-Strain behavior of Steel and Concrete- Stress block parameters- Working stress method- comparison of design process

UNIT II **(08 Sessions)**
Design of Beam (Limit State Method)
Analysis and Design of Singly Reinforced Beams- Analysis of Singly Reinforced RC Section Neutral Axis-Balanced-Under Reinforced-Over Reinforced Sections- Moment of Resistance Design parameters- Design examples. Analysis and Design of Doubly Reinforced Beams- Necessity of Doubly Reinforced sections Analysis of Doubly Reinforced RC Section-Moment of Resistance- Design parameter

UNIT III **(08 Sessions)**
Design of T-Beam (Limit State Method)
Design T and L shaped beams in flexure, minimum and maximum reinforcement requirement.

UNIT IV **(06 Sessions)**
Design of Shear & Development Length: Design of Sections in shear, bond and torsion, diagonal tension, shear reinforcement, development length, equivalent shear, Torsional reinforcement.

UNIT V **(08 Sessions)**
Columns and Slab: Concept of long and short columns. IS specifications for main and lateral reinforcement. Behavior of RCC columns under axial load. Design of Axially loaded short and long columns with hinged ends. Design of RCC Slabs- Design of One-way slabs- Effect of edge conditions- Moment of resistance-Torsion reinforcement at corners

Course Outcomes:
Students complete this course will be able to:
CO1: To develop understanding of various design philosophies and their differences
CO2: To understand behavior of RCC members under flexural shear
CO3: Able to solve problems in context to T- reinforced beam
CO4: Ability to analyze and design of Shear & Development Length
CO5: To understand behavior of compression members

PO – CO Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	1	1	2	2	2	1	2
CO2	3	3	3	2	3	3	3	3
CO3	2	1	1	3	2	2	1	2
CO4	1	2	2	1	1	1	2	1
CO5	2	1	1	1	2	2	1	2

Suggested Reading:

1. Reinforced Concrete by A.K. Jain, Nem Chand & Bros, Roorkee
2. Plain and Reinforce Concrete, Vol I by Jai Krishna and O.P. Jain, Nem Chand & Bros, Roorkee
3. Limit state design by P.C. Varghese, Prentice Hall of India
4. Plain and Reinforced Concrete- Code of Practice, IS: 456- 2000, Manak Bhawan, New Delhi
5. Handbook on Concrete Reinforcement and Detailing, SP 34-1987, Amendment in March 1989

Website Sources:

- http://ascelibrary.org/
- https://nptel.ac.in/courses/105/105/105105104/
- https://nptel.ac.in/courses/105/105/105105105/

IFTM UNIVERSITY, MORADABAD
Diploma (Civil Engineering) Programme
Diploma (CE) - III Year (V Semester)
(w.e.f. session 2022-2023)
DPCE 504: ESTIMATION & COSTING

Objective: Cost estimation enables the manufacturer to fix the selling price of a product well in advance of actual production. Cost estimation indicates to the manufacturer whether the contemplated programme of production and distribution will be economical or not. To determine whether the product and its parts can be manufactured economically in the plant itself or to be purchased from outside.

UNIT I **(08 Sessions)**

Introduction: Porous and importance of estimates- Principles of estimate-Types of estimates - Units of measurements - Methods of estimates -Specification, general and detailed-General items of work for estimates Units and measurement, method of accounting for the deduction no of openings etc.

UNIT II **(10 Sessions)**

Estimates: Preparing detailed estimates of various types of buildings, -R.C.C. works-earth work calculations for roads-estimating of culverts Services for building such as water supply-drainage and electrification.

UNIT III **(08 Sessions)**

Rate Analysis: Definition of analysis of rate-Prime cost- Work charged establishment- Quantity of materials per Unit of work for major civil engineering items- Resource planning through analysis of rates-market rates-Current schedule of rates. (C.S.R.)

UNIT IV **(08 Sessions)**

Valuation: Purposes, depreciation, sinking fund, scrap value, year's purchase, gross and net income, dual rate interest, methods of valuation, rent fixation of buildings.

UNIT V **(08 Sessions)**

Specification and Tender: Data - Schedule of rates - Analysis of rates - Specifications - sources - Detailed and general specifications - Tenders - Contracts - Types of contracts - Arbitration and legal requirements.

Course Outcomes:

Students completing this course will be able to:

CO1: To provide knowledge of purposes, principles, methods, importance, and types of estimates and Unit measurement.

CO2: Develop skills to Prepare quantity estimates for Buildings, roads & rails and culvert structures as per specifications.

CO3: Draft detailed specifications and work out Rate Analysis for all works related to civil engineering projects.

CO4: Develop skills to Prepare cost estimate and valuation of civil engineering works.

CO5: To provide knowledge of Prepare tenders & contract documents. Evaluate contracts and tenders in construction practice.

PO – CO Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	1	2	2	1	2	3	1
CO2	1	3	2	3	2	2	1	2
CO3	2	1	3	2	1	3	1	2
CO4	3	2	1	1	1	1	2	3
CO5	1	1	1	2	3	1	1	1

Suggested Readings:

1. Dutta, B.N.: Estimating and Costing in Civil Engineering. UBS Publishers' Distributors Ltd.
2. D. D. Kohli, R. C. Kohli: Estimating and Costing. S CHAND.
3. M Chakraborti: Estimating and Costing in Civil Engineering. M Chakraborty.
4. V.N. Vazirani , S.P.Chandola :Civil Engineering Estimating, Costing & Valuation. Khanna publishers.

Website Sources:

- https://nptel.ac.in/
- https://sctevtservices.nic.in/
- https://en.wikipedia.org/wiki/
- https://www.youtube.com/watch?v=56WbNCJVhLI

IFTM UNIVERSITY, MORADABAD
Diploma (Civil Engineering) Programme
Diploma (CE) - III Year (V Semester)
(w.e.f. session 2022-2023)
DPCE 505: BASIC EARTHQUAKE ENGINEERING

Objective: The objective of this course is to provide coherent development to the students for the courses in the sector of earthquake engineering. This course includes the study of foundations of many basic engineering concepts related to earthquake engineering. This course gives experience in the implementation of engineering concepts that are applied in the field of earthquake engineering and involves the application of scientific and technological principles of planning, analysis, design of buildings according to earthquake design philosophy.

UNIT I **(10 Sessions)**

Introduction: Causes of earthquakes and seismic waves, magnitude, intensity, and energy release, Basic terminology, Characteristics of earthquakes, Seismic hazard, vulnerability and risk, Seismic Zoning. Earthquake's performance of structures in past earthquakes. Philosophy of earthquake-resistant design and concept of ductility, short and long period structures, Concept of the spectrum, Static force calculations.

UNIT II **(08 Sessions)**

Architectural Considerations: Architectural Considerations: Architectural considerations: Building simplicity, symmetry. Irregularities, Continuity, and Uniformity, Effect of soils and liquefaction, Remedial measures, Construction of earth structures.

UNIT III **(10 Sessions)**

Seismic Construction:

Seismic construction of masonry buildings, precisions of IS: 4326. Seismic construction of RC buildings detailing, provisions of IS: 13920.

UNIT IV **(06 Sessions)**

Retrofitting: Retrofitting of masonry and reinforced concrete buildings.

UNIT V **(06 Sessions)**

Disaster Management: Definition of disaster - Natural and Manmade, Type of disaster management, How disaster forms, Destructive power, Causes and Hazards, Case study of Tsunami Disaster, National policy- It's objective and main features, National Environment Policy, Need for central intervention, State Disaster Authority- Duties and powers, Case studies of various Disaster in the country, Meaning and benefit of vulnerability reduction, Factor promoting vulnerability reduction and mitigation, Emergency support function plan. Main feature and function of National Disaster Management Frame Work, Disaster mitigation and prevention, Legal Policy Frame Work, Early warning system, Human Resource Development and Function, Information dissemination, and communication.

Course Outcomes:

Students completing this course will be able to:

CO1: To get a knowledge of earthquakes and its resistant features for different types of buildings

CO2: Able to design earthquake resistant structures as IS Codes

CO3: To acquire knowledge in knowing the performance of buildings under past earthquakes

CO4: To obtain skills in the field of repairing and retrofitting techniques

CO5: Understand disasters, disaster preparedness and mitigation measure

PO – CO Mapping (Please write 3,2,1 wherever required)

(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	1	1	2	2	2	1	2
CO2	3	3	3	2	3	3	3	3
CO3	2	1	1	3	2	2	1	2
CO4	1	2	2	1	1	1	2	1
CO5	2	1	1	1	2	2	1	2

Suggested Readings:

1. Sharma, Neelam: Earthquake Resistant Building Construction. S K Kataria& Sons.
2. Agarwal, Pankaj, and Shrikhande, Manish: Earthquake Resistant Design of Structures. PHI Learning Pvt. Limited.

Website Sources:

- https://nptel.ac.in/
- https://nptel.ac.in/courses/105/101/105101004/
- https://nptel.ac.in/courses/105/108/105108204/

IFTM UNIVERSITY, MORADABAD
Diploma (Civil Engineering) Programme
Diploma (CE) - III Year (V Semester)
(w.e.f. session 2022-2023)
DOCE 051: DISASTER MANAGEMENT

Course Objectives:

To provide students an exposure to disasters and students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction.

UNIT I **(10 Sessions)**

Introduction to Disasters: Concepts, and definitions (Disaster, Hazard, Vulnerability, Resilience, Risks), Disasters: Classification, Causes, Impacts (including social, economic, political, environmental, health, psychosocial, etc.). Differential impacts- in terms of caste, class, gender, age, location, disability Global trends in disasters urban disasters, pandemics, complex emergencies, Climate change

UNIT II **(08 Sessions)**

Approaches to Disaster Risk reduction: Disaster cycle - its analysis, Phases, Culture of safety, prevention, mitigation, and preparedness community based DRR, Structural- non-structural ensures, roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), states, Centre, and other stake-holders.

UNIT III **(08 Sessions)**

Disasters: hazard, global and Indian scenario, general perspective, importance of study in human life, Direct and indirect effects of disasters, long term effects of disasters. Introduction to global warming and climate change.

UNIT IV **(06 Sessions)**

Natural Disasters - Natures and extent of disasters, natural calamities such as earthquake, floods, drought, coasts hazards, cloud burst, Avalanches, Cyclone, landslides etc.

UNIT V **(08 Sessions)**

Manmade Disasters Chemical and industrial hazards, nuclear hazards, fire hazards, etc., Role of growing population and subsequent industrialization, urbanization and changing lifestyle of human beings in frequent occurrences of manmade disasters.

Course Outcomes:

After completion of this course, the student shall able to

CO1: To understand basic concepts in disaster management, definitions and terminologies used in disaster management

CO2: Explain the core elements and phases of disaster risk management and develop possible measures to reduce disaster risks across sector and community

CO3: To understand direct and indirect effects of disasters like global warming and climate change

CO4: Obtain knowledge on different types of natural disaster

CO5: Obtain knowledge on different types of man- made disaster

PO – CO Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	1	1	2	2	1	2	1	2
CO2	3	2	3	3	3	3	2	2
CO3	1	2	2	2	1	2	1	3
CO4	2	3	1	1	2	1	1	1
CO5	1	1	2	2	1	2	3	1

Suggested Reading:

1. Sharma, V. K. (1999), "Disaster Management", National Centre for Disaster Management, IIPE, Delhi
2. Anil, K. Gupta and Sreeja, S. Nair (2011), "Environmental Knowledge for Disaster Risk Management", NIDM, New Delhi
3. Nick (1991), "Disaster Management: A Disaster Manager's Handbook", Asian Development Bank, Manila Philippines
4. Kapur, et al. (2005), "Disasters in India: Studies of Grim Reality", Rawat Publishers, Jaipur

Website Sources:

- https://nptel.ac.in/courses/105/104/105104183/
- https://nptel.ac.in/courses/124/107/124107010/
- https://onlinecourses.nptel.ac.in/noc20_ce07/preview

IFTM UNIVERSITY, MORADABAD
Diploma (Civil Engineering) Programme
Diploma (CE) - III Year (V Semester)
(w.e.f. session 2022-2023)
DPCE 551: TRANSPORTATION ENGINEERING LAB

Objective: The objective of this course is to familiarize the students with the basic properties of bituminous & aggregate materials. It also includes the calculations of different materials required for concrete and bituminous mixes as per IS Code provisions.

LIST OF EXPERIMENTS

1. Crushing Value Test of Aggregate
2. Impact Value Test of Aggregate
3. Los Angeles Abrasion Value of Aggregate
4. Shape Test (Flakiness Index, Elongation Index) of Aggregate
5. Penetration Test of Bituminous Sample
6. Softening Point Test of Bituminous Sample
7. Stripping Test of Bituminous Sample
8. Ductility Test of Bituminous Sample
9. Flash & Fire Point Test of Bituminous Sample
10. California Bearing Ratio (CBR) test Apparatus

Course Outcomes:

Students completing this course will be able to:

CO1: Evaluate the strength of subgrade soil by CBR test.

CO2: Recognise the knowledge about different physical properties of aggregates by performing different test on road aggregates.

CO3: Outline the various properties of bitumen material and mixes by performing various tests on it.

CO4: Design cross section elements, sight distance, horizontal and vertical alignment

CO5: Determine the characteristics of pavement materials.

Suggested Readings:

1. Khanna, S. K., and Justo, C. E. G.: Highway Material Testing Laboratory Manual. Nem Chand and Bros.
2. Relevant IS Codes and IRC Codes.
3. Ajay K. Duggal: Laboratory Manual in Highway Engineering. New Age International Private Limited.
4. R. Srinivasa Kumar: Transportation Engineering. Orient Blackswan Pvt. Ltd

Website Sources:

- https://www.researchgate.net/publication/309477120_Highway_Material_Testing_Manual
- https://www.youtube.com/watch?v=Jx5YsNkZdNI
- https://www.youtube.com/watch?v=aZ5_cEjSOdo
- https://www.youtube.com/results?search_query=bituminous+lab+test

IFTM UNIVERSITY, MORADABAD
Diploma (Civil Engineering) Programme
Diploma (CE) - III Year (V Semester)
(w.e.f. session 2022-2023)
DPCE 552: CAD LAB

Objective: The objective of this course is to familiarize the students with the usage of Auto cad, the latest software, and basic drawing fundamentals in various civil engineering applications, especially in building drawings.

LIST OF EXPERIMENTS

1. **Exercise-1**
   Starting AutoCAD-AutoCAD screen components-Starting a drawing: Open drawings, create drawings (Start from scratch, use a template & use a wizard)-Invoking commands in AutoCAD-Drawing lines in AutoCAD-Co-ordinate systems: Absolute co-ordinate system, Relative co-ordinate system-Direct distance method-Saving a drawing: Save & Save As-Closing a drawing-Quitting AutoCAD
2. **Exercise-2**
   Draw Commands: ARC command-RECTANG command-ELLIPSE command, elliptical arc-POLYGON command (regular polygon)-PLINE command-DONUT command-POINT command-Construction Line: XLINE command, RAY command-MULTILINE command. UNDO / REDO commands-ZOOM command-PAN command, panning in real time-Setting Units-Object snap, running object snap mode-Drawing circles
3. **Exercise-3**
   Editing Commands: MOVE command-COPY command-OFFSET command-ROTATE command-SCALE command-STRETCH command-LENGTHEN command –TRIM command-EXTEND command-BREAK command-CHAMFER command-FILLET command-ARRAY command-MIRROR command –MEASURE command-DIVIDE command-EXPLODE command-MATCHPROP command-Editing with grips: PEDIT
4. **Exercise-4**
   Drawing Aids: Layers-Layer Properties Manager dialog box-Object Properties: Object property toolbar, Properties Window, Creating Text, Fundamental dimensioning terms: Dimension lines, dimension text, arrowheads, extension lines, leaders, centre marks and centrelines, alternate units-Associative Dimensions-Dimensioning Methods-Drawing leader. Inquiry Commands
5. **Exercise-5**
   Editing Dimensions, Hatching, Block, Plotting Drawings in AutoCAD: PLOT command-Plot Configuration-Pen Assignments-Paper Size & Orientation Area-Plot Rotation & Origin-Plotting Area-Scale
6. **Exercise-6**
   Draw working plan, elevation of Three bed room duplex bungalow with the given plot size
7. **Exercise-7**
   Draw working plan, elevation of Hostel building
8. **Exercise-**8
   Draw working plan, elevation of School buildings

Course Outcomes:

Students completing this course will be able to:

CO1: Use the AutoCAD commands for drawing 2D & 3D building drawings required for different civil engineering applications.

CO2: Plan and draw Civil Engineering Buildings as per aspect and orientation.

CO3: Presenting drawings as per user requirements and preparation of technical report.

CO4: Understand development of front elevation and sectional elevation from a given plan

CO5: Understand development of plan, front elevation, and sectional elevation from line diagram.

Suggested Readings:

1. Sagar, Linkan: Auto CAD 2018 Training Guide. BPB Publications.
2. Tikku, Prof. Sham: Auto CAD 2020 Workbook. BPB Publications.
3. Wahab Azhar: A Hand Book on Auto CAD Tools Practice. Notion Press.
4. Pandey, Sunil K.: Learn AutoCAD in an Easy Way. S.K. Kataria & Sons.

Website Sources:

- www.youtube.com/watch?v=92VvxRtZ_Tk
- https://www.youtube.com/watch?v=uy2GvFwVJU4&list=PL970B66C256FA05E1
- https://www.youtube.com/watch?v=RA0O6AZewTc
- https://www.youtube.com/watch?v=pvKVy-eMDYc

IFTM UNIVERSITY, MORADABAD
Diploma (Civil Engineering) Programme
Diploma (CE) - III Year (VI Semester)
(w.e.f. session 2022-2023)
DPCE 601: ENGINEERING GEOLOGY

Objective: The objective of this course is to familiarize the students with the study of Origin, Internal, and surface structures of the earth. It includes the study and identifies different types of natural materials like rocks (Igneous, Sedimentary, and Metamorphic), & minerals, and soil. It also includes the study of geological structures (Joint, veins, crack, faults, and fold), reasons for formation for each type, and their side effects on the engineering projects.

UNIT I **(10 Sessions)**

Minerals: Their physical and detailed study of certain rock - forming minerals. Rocks**:** Their origin, structure, Texture, and classification of igneous sedimentary and metamorphic rocks and their suitability as engineering materials.

UNIT II **(10 Sessions)**

Stratification: Lamination bedding. Outcrop-its relation to topography, dip, and strike of bed, overlap, outlier, and inliers. Rock deformation: Folds, Faults, joints unconformity and their classification, causes, and relation to engineering. The Behavior of rock masses.

UNIT III **(08 Sessions)**

Earthquake: its causes, classification, seismic zones of India, and Geological consideration for construction of a building projects in seismic areas. Landslides, its causes, classification, and preventive measures.

UNIT IV **(08 Sessions)**

Underground water: Origin, Aquifer, Aquicludes, Artesian Wells, underground provinces of India, and its role as a geological hazard. Building Stones Engineering., Properties of rocks, Alkali aggregate reaction, Grouting, Pozzolanic materials.

UNIT V **(04 Sessions)**

Geological investigations: Geological investigations for site selection of dams and reservoirs, tunnels, bridges, and highways.

Course Outcomes:

Students completing this course will be able to:

CO1: Get basic knowledge about natural materials like rocks and minerals and their usage as well as their availability.

CO2: Analyze Engineering consideration of faults, fold, joints and unconformities, Dip, and strike.

CO3: Distinguish geological formations.

CO4: Identify geological structures and processes for rock mass quality identify subsurface information and groundwater potential sites through geophysical investigations.

CO5: Know the significance of geological investigations for civil engineering projects and site selection as well as for the preparation of feasibility reports and others.

PO – CO Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	1	2	1	1	3	2	1	2
CO2	2	1	2	3	1	3	2	2
CO3	2	2	2	1	1	2	1	3
CO4	3	3	1	2	2	1	1	1
CO5	1	1	3	1	1	2	3	1

Suggested Readings:

1. Singh, Prabin: Engineering and General Geology. S.K. Kataria& Sons.
2. Bangar, K.M.: Principles of Engineering Geology. Standard Publishers Distributors.
3. Rao, Prakash: Engineering Geology. Nirali Prakashan
4. Varghese P.C.: Engineering Geology for Civil Engineers. Prentice Hall India Learning Private Limited.

Website Sources:

- www.nptel.ac.in/
- www.youtube.com/watch?v=aTVDiRtRook&t=9s
- www.youtube.com/watch?v=k8h4FKBPYoY&list=PLdM-WZokR4tZoAqn1B6Py_cYYnQ78lQS3
- www.youtube.com/watch?v=eh3VSqsHicE&t=143s

IFTM UNIVERSITY, MORADABAD
Diploma (Civil Engineering) Programme
Diploma (CE) - III Year (VI Semester)
(w.e.f. session 2022-2023)
DPCE 602: IRRIGATION ENGINEERING

Objective: The objective of this course is to familiarize the students with the basic concepts and design, planning, and management of irrigation & drainage systems and construction of various hydraulic structures.

UNIT I **(06 Sessions)**

Introduction: -Definition of irrigation, Necessity of irrigation, Types of irrigation, Methods of Irrigation. **Water Requirement of Crops: -**Duty, Delta and Base Period, their relationship, Gross command area, culturable command area, Intensity of irrigation, The water requirement of different crops of different seasons-Kharif, and Rabi.

UNIT II **(08 Sessions)**

Rain Fall & Run–Off: - Definition of rainfall & run-off, catchment area, Types of rain gauges - Automatic & Non -automatic. **Water Logging and Drainage: -**Definition, causes and effects, detection and remedies, Surface, and sub-surface drains.

UNIT III **(10 Sessions)**

Lift Irrigation: Types of Wells - shallow & deep well, aquifer types, groundwater flow, the yield of an open/tube well. **Flow Irrigation**: Irrigation canals, Perennial Irrigation, Different Parts of irrigation canals and their functions, Design of irrigation canals -Chezy's formula, Manning's formula, Kennedy's and Lacey's silt theory and equations, critical velocity ratio. Various types of canal lining - Advantages & Disadvantages.

UNIT IV **(10 Sessions)**

Canal Head Works: Definition, object, general layout, functions of different parts, Difference between Weir, and Barrage. **Regulatory Works:** Functions and explanation of terms used, Cross and Head regulators, Canal Falls, Outlets-Different types, Escapes.

UNIT V **(06 Sessions)**

Cross Drainage Works: - Functions and necessity of the following types: Aqueduct, Siphon, Super passage, Level crossing, inlet, and outlet. **Dams**: Types of dams, earthen dams-causes of failure, Gravity dams-elementary profile and stability criterion, Spillways.

Course Outcomes:

Students completing this course will be able to understand:

CO1: The different types & methods of irrigation and calculation of water requirement for crops.
CO2: The different methods to calculate the rainfall and causes, effects & remedies of water logging.
CO3: The difference between Lift & Flow Irrigation and design parameters of irrigation canals.
CO4: The functions of canal head works and regulatory works.
CO5: The functions and necessity of cross drainage works, dams and spillways.

PO – CO Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	1	1	2	2	2	1	2
CO2	3	3	3	2	3	3	3	3
CO3	2	1	1	3	2	2	1	2
CO4	1	2	2	1	1	1	2	1
CO5	2	1	1	1	2	2	1	2

Suggested Readings:

1. Modi, P.N.: Irrigation, Water Resources and Water Power Engineering. Standard Book House.
2. Garg, S.K.: Irrigation Engineering and Hydraulic Structures. Khanna Publishers.
3. Punmia, B.C. and Pande, B.B. Lal: "Irrigation and Water Power Engineering. Laxmi Publication.
4. Basak, N. N.: Irrigation Engineering. McGraw Hill Education.

Website Sources:

- www.nptel.ac.in/
- www.youtube.com/watch?v=Y2r0IB314kI
- www.digimat.in/nptel/courses/video/126105010/L01.html
- www.youtube.com/watch?v=h_zIgSEfzUM

IFTM UNIVERSITY, MORADABAD
Diploma (Civil Engineering) Programme
Diploma (CE) - III Year (VI Semester)
(w.e.f. session 2022-2023)
DPCE 603: ENVIRONMENTAL POLLUTION STUDIES

Objective: The main objective of this course is to evaluate the impact on environment that has occurred already to assess the existing air quality, extent of pollution of water bodies due to developmental activities and to assess the quality of soil and extent of soil pollution and soil degradation.

UNIT I **(08 Sessions)**

Impact of man on environment: atmosphere, biosphere, lithosphere, hydrosphere, hydrological cycle, nutrient cycles, food web, food chain, Energy in Ecosystem, Global environmental issues: Ozone depletion, global warming.

UNIT II **(08 Sessions)**

Air pollution: Introduction, classification of air pollution, causes of air pollution, effects of air pollution on human health, common air pollutants, control measures of air pollution, acid rain, The Taj mahal: A case study, air quality.

UNIT III **(08 Sessions)**

Water pollution: Introduction, Sources of water pollution, classification of water pollutants, control of water pollution, Dissolve oxygen, biochemical oxygen demand, five-day BOD, Effects of water pollution, wastewater treatment.

UNIT IV **(08 Sessions)**

Land pollution: Introduction, sources of land pollution, effects of land pollution, solid waste management- generation, storage, collection, transport, processing, and disposal.

UNIT V **(08 Sessions)**

Noise pollution: Introduction, Sources of noise pollution, effects of noise pollution, control measures for noise pollution, case study: Deepawali crackers noise

Course Outcomes:

Students complete this course will be able to:

CO1: Gain knowledge about environment and ecosystem
CO2: Aware students about problems of air pollution
CO3: Aware students about problems of water pollutants, BOD, COD, DO
CO4: To understanding land pollution and effect of solid waste management
CO5: Control measures for noise pollution

PO – CO Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	1	1	2	2	1	2	1	2
CO2	3	2	3	3	3	3	2	2
CO3	1	2	2	2	1	2	1	3
CO4	2	3	1	1	2	1	1	1
CO5	1	1	2	2	1	2	3	1

Suggested Reading:

1. Garg S. K: Environmental Engineering. Khanna Publication
2. Deswal Surinder. Energy: Environment Ecology and Society. Dhanpat and Co.
3. Rao C.S: Environmental Pollution Control Engineering. New Age International Publication

Website Sources:

- http://ascelibrary.org/
- http://nptel.ac.in/noc

IFTM UNIVERSITY, MORADABAD
Diploma (Civil Engineering) Programme
Diploma (CE) - III Year (VI Semester)
(w.e.f. session 2022-2023)
DPCE 604: INTRODUCTION TO BRIDGE ENGINEERING

Objective: The main objective of this course is to provide a basic knowledge of bridge and its components.

UNIT I **(10 Sessions)**

Bridge: Its Function and Component Parts, Difference between a Bridge and a Culvert, Classification of Bridges. Temporary Bridges: Necessity, Description with Sketches of Pontoon, and Boat Bridges

UNIT II **(08 Sessions)**

Site selection: Factors Affecting the Selection of Site for a Bridge, Data to be Collected Bridge Span: Economical Span and Factors Affecting It. Design Loads: Load Factors, Loads to Be Considered Including Wind and Seismic Loads, AASHTO Vehicle Loads, IRC Loading Standards

UNIT III **(08 Sessions)**

Piers: Definition, Parts, Types: Solid (Masonry and RCC), Open Cylindrical and Abutments Piers, Definitions of Following Terms: Height of Pier, Water Way (Natural and Artificial), Afflux and Clearance. Abutment and Wing Walls: Definition, Type of Abutments (Straight and Tee), Abutment with Wing Walls (Straight, Splayed, Return and Curve)

UNIT IV **(08 Sessions)**

Bridge bearing: Purpose of Bearing, Types: Fixed Plate, Sliding Plate, Deep Cast Base, Rocker and Roller Bearing, Their Functions with Sketches Foundation: General Aspects, Types of Foundation: Pile Foundation, Well Foundation, Caisson Foundation

UNIT V **(06 Sessions)**

Reinforced concrete bridges: Advantages, Types Pre-stressed Concrete Bridges: Advantages, Types Steel Bridges: Advantages, Types Maintenance of Bridges: Inspection of Bridges, Routine Maintenance

Course Outcomes:

Students complete this course will be able to:

CO1: Able to learn about components, classifications, and choice of bridge type along with the investigation for bridges in details

CO2: Discuss the IRC standard live loads and design the deck slab type bridges

CO3: Able to apply the knowledge about R.C.C bridge piers: classification and different components.

CO4: To understand various types of sub-structures and foundations, bearing, joints and appurtenances required for bridges.

CO5: Able to learn about methods of construction and maintenance of bridges along with causes of bridge failure.

PO – CO Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	1	1	2	2	2	1	2
CO2	3	3	3	2	3	3	3	3
CO3	2	1	1	3	2	2	1	2
CO4	1	2	2	1	1	1	2	1
CO5	2	1	1	1	2	2	1	2

Suggested Reading:

1. Raju N.K: Design of Bridges. Oxford & IBH Publishing Co. Pvt. Ltd.
2. Victor D.J: Essentials of Bridge Engineering. Publishing Co. Pvt. Ltd

Website Sources:

- http://ascelibrary.org/

IFTM UNIVERSITY, MORADABAD
Diploma (Civil Engineering) Programme
Diploma (CE) - III Year (VI Semester)
(w.e.f. session 2022-2023)
DPCE 605: DESIGN OF STEEL STRUCTURES

Objective: To provide the students the tools necessary for designing steel structures and familiarize the students with international design codes. To provide an understanding of Load from Allowable Stress Design (ASD). Structural engineers are qualified to correctly design and supervise the structural structures during development and ensure the full application of the structural design.

UNIT I **(08 Sessions)**

Structural Steel and Sections: Properties of structural steel as per IS: 226 and IS: 197. Designation of structural steel sections as per IS handbook and IS:800. Concept of determinate and indeterminate structures

UNIT II **(12 Sessions)**

Structural Steel Connections:

- **i.** Riveted connections - types of rivets, permissible stresses in rivets. Types of riveted joints, Failure of riveted joints, Assumptions made in the design of riveted joints. Specification for riveted joints. Design of riveted joints for axially loaded members.
- **ii.** Welded Connections- comparison between riveted and welded joints, types of welds, permissible stresses in welds, types of welded connections, strength of welded joint.
- **iii.** Bolted Connections

UNIT III **(08 Sessions)**

Tension Members: Forms of common sections. Permissible Stresses in tension for steel. Strength of a tension member. Design of tension members (flats, angles & Tee Sections only). Tension splice and their design.

UNIT IV **(08 Sessions)**

Compression Members: Design of struts and columns as per IS: 800. Effective length, slenderness ratio and permissible stresses, simple and built-up sections, concept of lacings in built up columns. Column bases, design of simple column base.

UNIT V **(06 Sessions)**

Beams: Design criteria, allowable stresses, Design of laterally restrained beams including simple built-up sections. Checks for web bulking, web crippling and deflection.

Course Outcomes:

Students completing this course will be able to:

CO1: Understand the properties and designation of structural steel members and concept of determinate and indeterminate structures.

CO2: Able to analyze and design simple connections between structural members including riveted, welded, and bolted connections.

CO3: Able to design flats, angles & Tee Sections for tension members and Permissible Stresses in tension for steel.

CO4: Able to analyze and design struts and columns as per IS: 800 (compression members), built up sections, concept of lacings and Column bases.

CO5: Understand the design criteria, allowable stresses, design of laterally restrained beams and checks for web bulking, web crippling and deflection.

PO – CO Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	1	2	2	1	2	3	1
CO2	1	3	2	3	2	1	1	2
CO3	2	1	3	2	1	3	1	2
CO4	3	2	1	1	1	2	2	3
CO5	1	1	1	2	3	1	1	1

Suggested Readings:

1. Duggal, S.K.: Design of Steel Structures. Tata McGraw-Hill Education.
2. Negi, L.S.: Design of Steel Structures. McGraw Hill India.
3. N. Subramanian: Design of Steel Structures. Oxford University Press.
4. S.S. Bhavikatti: Design of Steel Structures. I K International Publishing House Pvt. Ltd.

Website Sources:

- https://nptel.ac.in/
- https://sctevtservices.nic.in/
- https://en.wikipedia.org/wiki/
- https://nptel.ac.in/courses/105/106/105106112/

IFTM UNIVERSITY, MORADABAD
Diploma (Civil Engineering) Programme
Diploma (CE) - III Year (VI Semester)
(w.e.f. session 2022-2023)
DPCE 651: ENGINEERING GEOLOGY LAB

Objective:
To provide students an exposure to understand the role of geology in the design and construction process of underground openings in rock also to identify and characterize intact rock/rock mass properties.

LIST OF EXPERIMENTS
1. Identification of minerals based on their physical properties- five samples.
2. Identification of rocks based on their physical properties- five samples.
3. To draw contour patterns of hills, valleys, rivers, plateau, saddle, topographic basin etc.
4. To draw geological section from the given map.
5. To determine the strike & dip of rock formation.
6. To determine the thickness of beds of the geological formation.

Course Outcomes:
Students completing this course will be able to:
CO1: Ability to categorize rocks and minerals by their origin and engineering properties.
CO2: Ability to apply geological principles to rock masses and discontinuities for use in engineering design e.g., rock slopes, foundation.
CO3: To draw geological section from the given map.
CO4: To determine the strike & dip of rock formation.
CO5: To determine the thickness of beds of the geological formation.

Suggested Readings:
1. Singh, Prabin: Engineering and General Geology. S.K. Kataria& Sons.
2. Bangar, K.M.: Principles of Engineering Geology. Standard Publishers Distributors.

Website Sources:
- http://202.53.81.85/autonomus14/21/civil/ce3l2.pdf
- https://www.nitw.ac.in/media/Scheme&Syllabus-2014/B.Tech-Civil-Syllabus_new.pdf

IFTM UNIVERSITY, MORADABAD
Diploma (Civil Engineering) Programme
Diploma (CE) - III Year (VI Semester)
(w.e.f. session 2022-2023)
DPCE 652: CIVIL ENGINEERING DRAWING LAB

Objective: The objective of this course is to familiarize the students with the basic concepts about civil engineering and the drawing regarding residential and public building.

LIST OF EXPERIMENTS

1. Section A

Introduction: Drawing Instrument & their use, Types of lines & letters. Scales, Projection, Dimensions & their types, planning of a sheet, and Types of Engineering Drawings.

2. Section B

Building Drawings: Building symbols .and Types of building drawings, proposed drawing, submission drawing, working drawing & completion drawing.

3. Section C

- **Drawing I:** Details of spread footing foundations for load-bearing and no-load bearing wall for a given thickness of walls with the help of given data or rule of the thumb, showing offsets, the position of DPC; Details of basement showing necessary damp proofing. Detail of cavity wall.
- **Drawing II:** Plans of T corner junction of walls 1 brick, 1-1/2 brick, and 2 brick thick in English and Flemish bonds brick pillars.

4. Section D

- **Drawing III:** Elevation, sectional plan, and sectional side elevation of paneled and glaze the door flush door, steel windows and aluminum window.
- **Drawing IV:** Drawing plan, the elevation of a small building by measurement.

5. Section E

- **Drawing V:** The detailed plan, elevation, and section of a two - bedroom residential building from a given line plan, showing details of foundations, roof, and parapet.
- **Drawing VI:** Detailed working drawing of a small double - storey building on a given plot, keeping in view building eye laws, showing sloping roof or surface drainage plan and flooring details.

Course Outcomes:

Students completing this course will be able to:

CO1: Explain Building bye - laws and Principles of Planning for residential and public buildings.

CO2: Prepare a detailed drawing for residential and public buildings.

CO3: Interpret conventional signs, symbols, and working drawings of various civil engineering structures.

CO4: To prepare a detailed drawing of residential and public buildings.

CO5: To prepare perspective view of a given building.

Suggested Readings:

1. Layal, J.S.: Civil Engineering Drawing. Satya Prakashan, New Delhi
2. Sikka, V.B.: Civil Engineering Drawing. S. K. Kataria & Sons, New Delhi
3. Verma, B.P.: Civil Engineering Drawing & House Planning. Khanna Publishers.
4. Rangwala: Civil Engineering Drawing. Charotar Publishing House Pvt. Ltd.

Website Sources:

- www.youtube.com/watch?v=pdbQvIbGd_4
- www.youtube.com/watch?v=pdbQvIbGd_4&t=117s
- www.youtube.com/watch?v=mM_HkSm_wKY
- www.youtube.com/watch?v=q8rI6ROU7Sw