COMPETENCY BASED CURRICULUM

DIPLOMA
IN
CIVIL ENGINEERING

(Duration 03 Years)
NSQF Level – 5

Under
Haryana State Board of Technical Education

Developed By

Curriculum Development Center

National Institute of Technical Teachers Training & Research
(Ministry of Education, Government of India)

Sector - 26, Chandigarh, UT, India

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1. PREFACE

Learning and learning experience are the foundation of any education system. Appropriateness of education and its useful implications stand on the platform of knowledge and skill. But the knowledge and skill cannot be quantified qualitatively without ensuring learning experience. Curriculum is the pathway to select and organise learning experience. It helps the teachers to provide tangible resources, goals and objectives to learners. Curriculum acts as a catalyst to stimulate creativity, innovation, ethics, values, responsibility and many human factors. Curriculum embodies rigour and high standards and creates coherence to empower learner to meet the industrial and societal needs. Curriculum is a central guide for a teacher to plan a standard based sequence for the instructional delivery.

The industrial revolution 4.0 has forced the technical education system to reinvent the curriculum to meet the human resource requirement of the industry. The data driven systems relying on the subjects like machine-learning, Artificial Intelligence, Data Science etc are literally forcing the technical education system to offer different subjects differently to address the emerging challenges. The non-linear way of learning now facilitates students to choose path of knowledge to skill or vice-versa. The bi-directional process requires innovative curriculum design and revision. Diploma Programme is now more challenging than ever. The level of skill and knowledge demanded by industry from diploma holders are highly interdisciplinary at the same time address special need. Hence, there is a need to align the curriculum to National Skill Qualification Framework (NSQF).

National Education Policy, NEP-2020 has now opened up diversities for the education system to explore and exploit to make the education relevant. The policy emphasises to inculcate value, ethics, respect to culture and society etc along with industry ready knowledge and skill among the students. The interdisciplinary nature of curriculum, academic bank of credits and integration of technology in teaching- learning envisaged in NEP-2020 make it more challenging for curriculum development. NITTTR, Chandigarh has developed the art of curriculum development over 54 years of its existence. The expertise and experience available in the institute follow time-tested and acclaimed scientific methods to design/revise curriculum. The experienced faculty members entrusted with the curriculum development or revision activities are well-versed with NSQF, NEP and Outcome based education. I am happy to note that **Haryana State Board of Technical Education, Panchkula, Haryana** reposed their confidence on this expertise to develop **AICTE/NSQF/NEP 2020** aligned curriculum for the state. This documented curriculum is an outcome of meticulous planning and discussions among renowned experts of the subject through series of workshops. The effective implementation of this curriculum supported with quality instructional resources will go a long way in infusing the learning experience among learners to make them industry ready.

Prof. (Dr.) S. S.Pattnaik
Director
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2. ACKNOWLEDGEMENT

We gratefully acknowledge the assistance and guidance received from the following persons:

i) Principal Secretary Technical Education-cum-Chairman, Haryana State Board of Technical Education, Panchkula, Haryana for initiating this project on designing of AICTE/NSQF/NEP 2020 aligned curriculum.

ii) Director General, Technical Education, Haryana for taking keen interest in the design of this AICTE/NSQF/NEP 2020 aligned curriculum.

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v) Director, National Institute of Technical Teachers' Training and Research, Chandigarh for his support and academic freedom provided to Curriculum Development Centre.

vi) All the participants from Industry / field Organizations, Academic Institutions, State Technical Universities / Polytechnics for their professional & academic inputs during curriculum workshops.

vii) Head, Faculty and staff of Curriculum Development Centre, NITTTR, Chandigarh for their dedicated contribution and support in design of NSQF aligned curriculum.

viii) Faculty from different departments of NITTTR, Chandigarh for their valuable inputs in design of NSQF aligned curriculum.

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National Institute of Technical Teachers Training & Research, Chandigarh

3. SALIENT FEATURES

1.	Name	:	**Diploma in Civil Engineering**
2.	Duration	:	**03 Years**
3.	Hours per week	:	**35 -40**
4.	Entry Qualification	:	**10thPass**
5.	Student Intake	:	**As per sanctioned strength**
6.	Pattern	:	**Semester**
7.	Scheme	:	**Multi Pont Entry and Exit**
8.	NSQF Level	:	**5**
9.	Theory Practical Ratio	:	**40 : 60**
10.	Project Work	:	**Minor and Major Project**
11.	In-house/Industrial Training	:	**Mandatory after First and Second Year**

4. NSQF COMPLIANCE

National Skill Qualification Framework has defined total Ten Levels. Each level of the NSQF is associated with a set of descriptors made up of five outcome statements, which describe in general terms, the minimum knowledge, skills and attributes that a learner needs to acquire in order to be certified for that level.

Fig1: NSQF Domains

NSQF LEVEL - 3 COMPLIANCE

The NSQF level - 3 descriptor is as follows:

Process	• Person may carry out a job which may require limited range of activities routine and predictable.
Professional Knowledge	• Basic facts, process and principle applied in trade of employment.
Professional Skill	• Recall and demonstrate practical skill, routine and repetitive in narrow range of application.
Core Skill	• Communication written and oral, with minimum required clarity, skill of basic arithmetic and algebraic principles, personal banking, basic understanding of social and natural environment.
Responsibility	• Under close supervision. Some responsibility for own work within defined limit.

Fig 2: NSQF Level – 3 Descriptor

Work requiring knowledge, skills and aptitudes at level 3 will be routine and predictable. Job holders will be responsible for carrying out a limited range of jobs under close supervision. Their work may require the completion of a number of related tasks. People carrying out these job roles may be described as "Semi skilled workers". Individuals in jobs which require level 3 qualifications will normally be expected to be able to communicate clearly in speech and writing and may be required to use arithmetic and algebraic processes. They will be expected to have previous knowledge and skills in the occupation and should know the basic facts, processes and principles applied in the trade for which they are qualified and be able to apply the basic skills of the trade to a limited range of straightforward jobs in the occupation.

They will be expected to understand what constitutes quality in their job role and more widely in the sector or sub-sector and to distinguish between good and bad quality in the context of the jobs they are given. Job holders at this level will be expected to carry out the jobs they are given safely and securely. They will work hygienically and in ways which show an understanding of environmental issues. This means that they will be expected to take responsibility for their own health and safety and that of fellow workers and, where appropriate, customers and/or clients. In working with others, they will be expected to conduct themselves in ways which show a basic understanding of the social environment. They should be able to make a good contribution to team work.

NSQF LEVEL - 4 COMPLIANCE

The NSQF level-4 descriptor is given below:

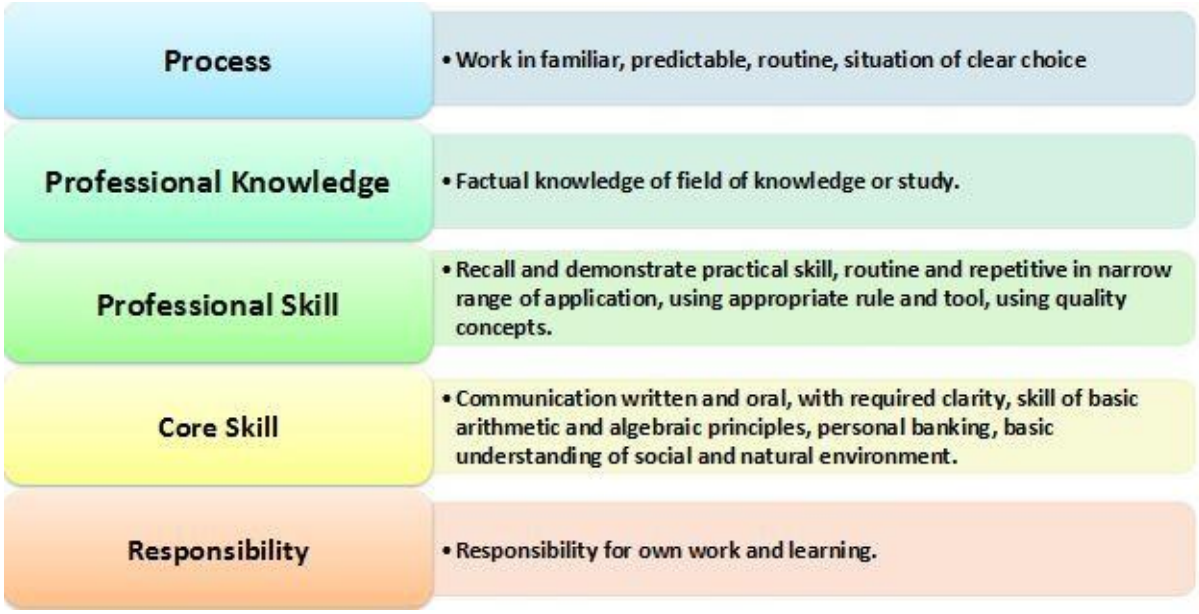

Fig 3: NSQF Level – 4 Descriptor

Work requiring knowledge, skills and aptitudes at level 4 will be carried out in familiar, predictable and routine situations. Job holders will be responsible for carrying out a range of jobs, some of which will require them to make choices about the approaches they adopt. They will be expected to learn and improve their practice on the job. People carrying out these jobs may be described as "skilled workers". Individuals in jobs which require level 4 qualifications should be able to communicate clearly in speech and writing and may be required to use arithmetic and algebraic processes. They will be expected to have previous knowledge and skills in the occupation in which they are employed, to appreciate the nature of the occupation and to understand and apply the rules which govern good practice. They will be able to make choices about the best way to carry out routine jobs where the choices are clear.

They will be expected to understand what constitutes quality in the occupation and will distinguish between good and bad quality in the context of their job roles. Job holders at this level will be expected to carry out their work safely and securely and take full account of the health and safety on colleagues and customers. They will work hygienically and in ways which show an understanding of environmental issues. In working with others, they will be expected to conduct themselves in ways which show a basic understanding of the social and political environment. They should be able to guide or lead teams on work within their capability.

NSQF LEVEL - 5 COMPLIANCE

The NSQF level-5 description is given below:

Process	• Job that requires well developed skill, with clear choice of procedures in familiar context.
Professional Knowledge	• Knowledge of facts, principles, processes and general concepts, in a field of work or study.
Professional Skill	• A range of cognitive and practical skills required to accomplish tasks and solve problems by selecting and applying basic methods, tools, materials and information.
Core Skill	• Desired mathematical skill; understanding of social, political; and some skill of collecting and organising information, communication.
Responsibility	• Responsibility for own work and learning and some responsibility for others' works and learning

Fig 4: NSQF Level – 5 Descriptor

Work requiring knowledge, skills and aptitudes at level 5 will also be carried out in familiar situations, but also ones where problems may arise. Job holders will be able to make choices about the best procedures to adopt to address problems where the choices are clear. Individuals in jobs which require level 5 qualifications will normally be responsible for the completion of their own work and expected to learn and improve their performance on the job. They will require well developed practical and cognitive skills to complete their work. They may also have some responsibility for others' work and learning. People carrying out these jobs may be described as "fully skilled workers" or "supervisors".

Individuals employed to carry out these jobs will be expected to be able to communicate clearly in speech and writing and may be required to apply mathematical processes. They should also be able to collect and organise information to communicate about the work. They will solve problems by selecting and applying methods, tools, materials and information. They will be expected to have previous knowledge and skills in the occupation, and to know and apply facts, principles, processes and general concepts in the occupation. They will be expected to understand what constitutes quality in the occupation and will distinguish between good and bad quality in the context of their work. They will be expected to operate hygienically and in ways which show an understanding of environmental issues. They will take account of health and safety issues as they affect the work they carry out or supervise.

In working with others, they will be expected to conduct themselves in ways which show an understanding of the social and political environment.

5. NATIONAL EDUCATION POLICY (NEP) -2020

NEP 2020 aims at a comprehensive holistic education to develop all capacities of human beings - intellectual, aesthetic, social, physical, emotional, and moral - in an integrated manner. A holistic arts education will help develop well-rounded individuals that possess: critical 21st century capacities in fields across the arts, humanities, languages, sciences, social sciences, and professional, technical, and vocational fields; an ethic of social engagement; soft skills, such as communication, discussion and debate; and rigorous specialization in a chosen field or fields. Such a holistic education shall be, in the long term, the approach of all undergraduate programmes, including those in professional, technical, and vocational disciplines.

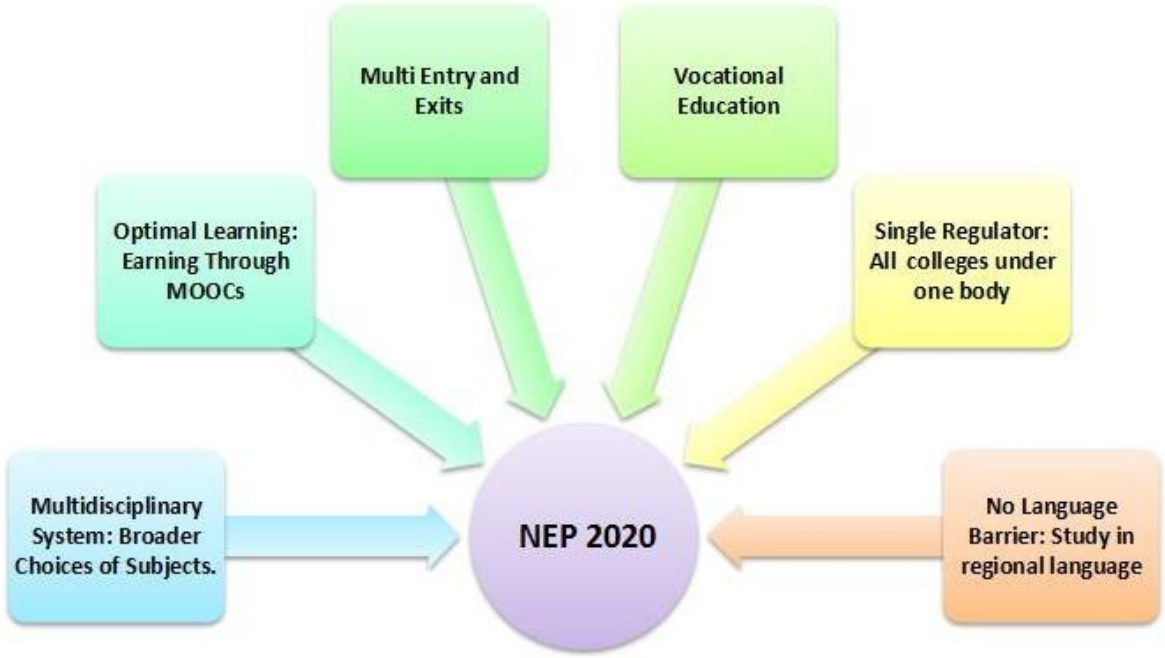

Fig 5: NEP 2020

Flexibility in curriculum and novel and engaging course options will be on offer to students, in addition to rigorous specialization in a subject or subjects. Pedagogy for courses will strive for significantly less rote learning and an increased emphasis on communication, discussion, debate, research, and opportunities for cross-disciplinary and interdisciplinary thinking. The flexible and innovative curriculum shall emphasize on offering credit-based courses and projects in the areas of community engagement and service, environmental education and

value-based education. as part of a holistic education, students will be provided with opportunities for internships with local industry, businesses, artists, crafts persons, villages and local communities etc. as well as research internships with faculty and researchers at their own or other HEIs or research institutions, so that students may actively engage with the practical side of their learning and, as a by-product, further improve their employability.

Effective learning requires relevant curriculum, engaging pedagogy, continuous formative assessment and adequate student support. The curriculum must be updated regularly aligning with the latest knowledge requirements and shall meet specified learning outcomes. High-quality pedagogy is then necessary to successfully impart the curricular material to students; pedagogical practices determine the learning experiences that are provided to students - thus directly influencing learning outcomes. The assessment methods have to be scientific and test the application of knowledge. Higher Education Institutes should move to a criterion-based grading system that assesses student achievement based on the learning goals for each programme, making the system fairer and outcomes more comparable. HEIs should also move away from high-stakes examinations towards more continuous and comprehensive evaluation.

6. DIPLOMA PROGRAMME OUTCOMES

The program outcomes are derived from five domains of NSQF Level namely Process, Professional Knowledge, Professional Skill, Core Skill, Responsibility. After completing this programme, the student will be able to:

PO1: Perform tasks in limited range of activities, familiar situation with clear choice of procedures.

PO2: Apply knowledge of principles and processes in the field of Civil Engineering.

PO3: Develop skills to accomplish quality tasks and solve problems using methods, tools, materials and information**.**

PO4: Demonstrate skill of communication, basic mathematics, collecting and organizing information along with knowledge of social, political and natural environment.

PO5: Take the responsibility of own works and supervises others work.

PO6: Select multidisciplinary and open subjects of own interest and perform self learning through Massive Open Online Courses.

7. DIPLOMA PROGRAMME STUDY AND EVALUATION SCHEME

FIRST SEMESTER

Sr. No.	SUBJECTS	STUDY SCHEME Periods/Week		Credits	MARKS IN EVALUATION SCHEME						Total Marks of Internal & External
					INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT			
		L	P		Th	Pr	Total	Th	Pr	Total	
1.1	*English & Communication Skills-1	2	2	2+1=3	40	40	80	60	60	120	200
1.2	*Applied Mathematics -1	4	-	4+0=4	40	-	40	60	-	60	100
1.3	*Applied Physics-I	2	2	2+1=3	40	40	80	60	60	120	200
1.4	* Applied Chemistry	3	2	3+1=4	40	40	80	60	60	120	200
1.5	*Engineering Graphics	-	6	0+3=3	-	40	40	60	-	60	100
1.6	Plumbing Services	2	-	2+0=2	40	-	40	60	-	60	100
1.7	*General Workshop Practice	-	6	0+3=3	-	40	40	-	60	60	100
	#Student Centered Activities	-	4	-	-	-	-	-	-	-	-
	Total	**13**	**22**	**13+9=22**	**200**	**200**	**400**	**360**	**240**	**600**	**1000**

* Common with other diploma courses.

\# Student Centered Activities will comprise of co-curricular activities like extension lectures on Constitution of India, Games, Yoga, Human Ethics, Knowledge of Indian System, Hobby clubs e.g. Photography etc., Seminars, Declamation contests, Educational field visits, N.C.C., NSS, Cultural Activities and self study etc.

SECOND SEMESTER

Sr. No.	SUBJECTS	STUDY SCHEME Periods/Week		Credits	MARKS IN EVALUATION SCHEME						Total Marks of Internal & External
					INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT			
		L	P		Th	Pr	Total	Th	Pr	Total	
2.1	* Fundamentals of IT	2	4	2+2=4	40	40	80	60	60	120	200
2.2	* Applied Physics-II	2	2	2+1=3	40	40	80	60	60	120	200
2.3	*Applied Mathematics-II	4	-	4+0=4	40	-	40	60	-	60	100
2.4	Civil Engineering Practices	-	6	0+3=3	-	40	40	60	-	60	100
2.5	Construction Material	2	4	2+2=4	40	40	80	60	60	120	200
2.6	***Applied Mechanics	3	2	3+1=4	40	40	80	60	60	120	200
2.7	*Environmental Studies & Disaster Management	2	-	2+0=2	40	40	80	60	60	120	200
	#Student Centred Activities	-	2	-	-	-	-	-	-	-	-
	Total	**15**	**20**	**15+9=24**	**240**	**240**	**480**	**420**	**300**	**720**	**1200**

*** Common with other diploma programmes**

*** Common with Mechanical Engineering.

Student Centered Activities will comprise of co-curricular activities like extension lectures on Constitution of India, Games, Yoga, Human Ethics, Knowledge of Indian System, Hobby clubs e.g. Photography etc., Seminars, Declamation contests, Educational field visits, N.C.C., NSS, Cultural Activities and self study etc.

Summer Internship/In-house Training: After 2nd semester, students shall undergo Summer Internship of 4 weeks.

THIRD SEMESTER

FOURTH SEMESTER

FIFTH SEMESTER

SIXTH SEMESTER

LIST OF ELECTIVES

8. DIPLOMA PROGRAMME HORIZONTAL AND VERTICAL ORGANISATION OF SUBJECTS

Sr. No.	Subjects/Areas	Hours Per Week	
		First Semester	Second Semester
1.	English & Communication Skills - I	4	-
2.	Applied Mathematics -I	4	-
3.	Applied Physics-I	4	-
4.	Applied Chemistry	5	-
5.	Engineering Graphics	6	-
6.	Plumbing Services	2	-
7.	General Workshop Practice	6	-
8.	Fundamentals of IT	-	6
9.	Applied Physics-II	-	4
10.	Applied Mathematics-II	-	4
11.	Civil Engineering Practices	-	6
12.	Construction Material	-	6
13.	Applied Mechanics	-	5
14.	Environmental Studies & Disaster Management	-	2
15	Student Centered Activities	4	2
	Total	**35**	**35**

9. DERIVING CURRICULUM SUBJECT AREAS FROM DIPLOMA PROGRAMME OUTCOMES

The following curriculum areas have been derived from Diploma Programme Outcomes:

Sr. No.	Programme Outcomes	Curriculum Subjects /Areas
1.	Perform tasks in limited range of activities, familiar situation with clear choice of procedures in Civil Engineering related field.	• Applied Physics –I • Applied Physics –II • Applied Chemistry • Construction Material • Applied Mechanics • Plumbing Services • Engineering Graphics
2.	Apply knowledge of principles and processes in Civil Engineering related field.	• Applied Physics –I • Applied Physics –II • Applied Chemistry • Construction Material • Applied Mechanics • Plumbing Services • Engineering Graphics
3.	Develop skills to accomplish quality tasks and solve problems using methods, tools, materials and information**.**	• Construction Material • Engineering Graphics • Civil Engineering Practices • General Workshop Practice • Summer Industrial/In-House Training.
4.	Demonstrate skill of communication, basic mathematics, collecting and organizing information along with knowledge of social, political and natural environment.	• English and Communication Skills -I • Applied Mathematics -I • Fundamentals of IT • Applied Mathematics -II • Environmental Studies & Disaster Management

5.	Take the responsibility of own works and supervises others work.	• Civil Engineering Practices • General Workshop Practice • Summer Industrial / In -house Training
6.	Select multidisciplinary and open subjects of own interest and perform self learning through Massive Open Online Courses.	• Multidisciplinary Elective • Open Elective

FIRST YEAR

NSQF LEVEL - 3

10. COMPETENCY PROFILE AND EMPLOYMENT OPPORTUNITIES

In government and private sectors related to Civil Engineering, **"Semi Skilled workers"** are required to carry out a limited range of predictable tasks under close supervision. They are normally expected to communicate clearly in speech and along with knowledge of arithmetic and algebraic processes. They should know the basic facts, processes and principles applied in limited area of Civil Engineering.

Civil Engineering NSQF Level – 3 pass out students are expected to recall and demonstrate practical routine and repetitive skills, in narrow range of related applications. They should have the basic knowledge of principles of Civil Engineering etc. They should demonstrate general manual and machining skills along with awareness of dignity of labour, safety at work place, team working and right attitude. They should have good knowledge of physical principles and analysis in various technical fields. They are expected to handle wide variety of equipments/instruments while testing, trouble shooting, calibration etc. along with the knowledge of working principles and operation of different civil engg instruments/equipments.

They will have scope of wage employment in organizations like

i) Public sector /private construction companies/Boards/ Corporation/Departments

ii) Service sector i.e. Estate Offices of Business organizations/ Universities/Colleges, Hotels, Hospitals etc. especially for repair and maintenance of buildings and their upkeep.

iii) Military Engineering Services/BRO/Defense/Railways/Power Projects/Banks/Municipal Corporations and Committees/Panchayati Raj etc.

iv) Installation of communication towers and framed structure.

v) Testing laboratories

11. PROGRAMME OUTCOMES

The program outcomes are derived from five domains of NSQF Level – 3 namely Process, Professional Knowledge, Professional Skill, Core Skill, Responsibility. After completing this level, the student will be able to:

PO1: Carry out a task which may require limited range of predictable activities.

PO2: Acquire knowledge of Basic facts, process and principles related to Civil Engineering for employment.

PO3: Demonstrate practical skill in narrow range of Civil Engineering

PO4: Demonstrate skill of communication, basic mathematics, collecting and organizing information along with knowledge of social, political and natural environment.

PO5: Perform task under close supervision with some responsibility for own work within defined limit.

FIRST YEAR
12. STUDY AND EVALUATION SCHEME

FIRST SEMESTER

Sr. No.	SUBJECTS	STUDY SCHEME Periods/Week		Credits	MARKS IN EVALUATION SCHEME						Total Marks of Internal & External
					INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT			
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1.6	Plumbing Services	2	-	2+0=2	40	-	40	60	-	60	100
1.7	*General Workshop Practice	-	6	0+3=3	-	40	40	-	60	60	100
	#Student Centered Activities	-	4	-	-	-	-	-	-	-	-
	Total	**13**	**22**	**13+9=22**	**200**	**200**	**400**	**360**	**240**	**600**	**1000**

* Common with other diploma courses.

\# Student Centered Activities will comprise of co-curricular activities like extension lectures on Constitution of India, Games, Yoga, Human Ethics, Knowledge of Indian System, Hobby clubs e.g. Photography etc., Seminars, Declamation contests, Educational field visits, N.C.C., NSS, Cultural Activities and self study etc.

SECOND SEMESTER

Sr. No.	SUBJECTS	STUDY SCHEME Periods/Week		Credits	MARKS IN EVALUATION SCHEME						Total Marks of Internal & External
					INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT			
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	#Student Centred Activities	-	2	-	-	-	-	-	-	-	-
	Total	**15**	**20**	**15+9=24**	**240**	**240**	**480**	**420**	**300**	**720**	**1200**

*** Common with other diploma programmes**

*** Common with Mechanical Engineering.

Student Centered Activities will comprise of co-curricular activities like extension lectures on Constitution of India, Games, Yoga, Human Ethics, Knowledge of Indian System, Hobby clubs e.g. Photography etc., Seminars, Declamation contests, Educational field visits, N.C.C., NSS, Cultural Activities and self study etc.

Summer Internship/In-house Training: After 2nd semester, students shall undergo Summer Internship of 4 weeks.

13. HORIZONTAL AND VERTICAL ORGANISATION OF SUBJECTS

Sr. No.	Subjects/Areas	Hours Per Week	
		First Semester	Second Semester
1.	English & Communication Skills - I	4	-
2.	Applied Mathematics -I	4	-
3.	Applied Physics-I	4	-
4.	Applied Chemistry	5	-
5.	Engineering Graphics	6	-
6.	Plumbing Services	2	-
7.	General Workshop Practice	6	-
8.	Fundamentals of IT	-	6
9.	Applied Physics-II	-	4
10.	Applied Mathematics-II	-	4
11.	Civil Engineering Practices	-	6
12.	Construction Material	-	6
13.	Applied Mechanics	-	5
14.	Environmental Studies & Disaster Management	-	2
15	Student Centered Activities	4	2
	Total	**35**	**35**

14. ASSESSMENT OF PROGRAMME AND COURSE OUTCOMES

Programme Outcomes to be assessed	Assessment criteria for the Course Outcomes
PO1: Carry out a task which may require limited range of predictable activities.	• Identify physical quantities, select their units for use in engineering solutions, and make measurements with accuracy. • Represent physical quantities as scalar and vector and identify type of motions, various forms of energy, their conversion and applications. • Understand the fundamental behavior of AC circuits and solve AC circuit problems. • Comprehend the concept of Electrostatics and magento statics and apply the knowledge. • Identify tools, equipments and their respective functions. • Prepare independently simple jobs and inspect the same. Select proper tools for a particular operation. • Handle safety equipment, follow safety procedures and measures. • Take measurements with basic measuring tools/equipment. • Draw Orthographic views of different objects viewed from different angles. • Draw and interpret sectional views of an object which are otherwise not visible in normal view. • Draw Isometric views of different solids and develop their surfaces. • Identify conventions for different engineering materials, symbols, sections of regular objects and general fittings used in Civil and Electrical household appliances/fittings. • Draw orthographic views of different objects by using basic commands of Auto CAD. • Identify and select proper tools and use them for the given plumbing work

	• Select appropriate pipes and carry out pipe fitting after carrying out operations like cutting, bending, threading, joining, aligning and other necessary operations • Erect simple water supply system. Trace leakage and repair water supply system • Plan, prepare and inspect domestic drainage system • Select and install sanitary appliances • Install heating appliances like geyser, etc.
PO2: Acquire knowledge of Basic facts, process and principles related to Civil Engineering for employment.	• Identify physical quantities, select their units for use in engineering solutions, and make measurements with accuracy. • Represent physical quantities as scalar and vector and identify type of motions, various forms of energy, their conversion and applications. • Acquire knowledge and understand the elements of electricity and DC circuits. • Explain the various batteries as storage devices and be aware of safe disposal of batteries. • Demonstrate competency in phenomena of electrostatics and electricity. • Characterize properties of material to prepare new materials for various engineering applications. • Classify the elements into metals, non-metals and metalloids. • Explain the extraction of metals from ores, their mechanical properties and modification of properties by alloy formation. • Classify fuels and lubricants and apply them in different engineering applications. • Identify the polymeric materials, assess their properties and design suitable polymeric materials for current and future applications. • Apply effective methods for corrosion prevention

	• Classify different types of organic compounds. • Apply IUPAC nomenclature rules for naming and structure of organic compounds. • Interpret different types of organic reactions. • Classify different constituents of paint. • Explain manufacturing process of paint and different paint defects. • Identify and select proper tools and use them for the given plumbing work • Select appropriate pipes and carry out pipe fitting after carrying out operations like cutting, bending, threading, joining, aligning and other necessary operations • Erect simple water supply system. Trace leakage and repair water supply system • Plan, prepare and inspect domestic drainage system • Select and install sanitary appliances • Install heating appliances like geyser, etc. • Draw free body diagrams by analyzing different types of forces acting on a body. • Determine the resultant of coplanar concurrent forces. • Solve problems by using principle of moment. • Calculate the least force required to maintain equilibrium on an inclined plane. • Determine the centroid/centre of gravity of plain and composite laminar and solid bodies. • Determine velocity ratio, mechanical advantage and efficiency of simple machines.
PO3: Demonstrate practical skill in narrow range of Civil Engineering applications.	• Elaborate scientific work, energy and power, forms of friction and solve problems related to them. • Comprehend properties of matter and effect of temperature on various matter and phenomenon. • Demonstrate the use of physical principles and analysis in various fields of engineering.

	• Prepare independently simple jobs and inspect the same. Select proper tools for a particular operation. • Handle safety equipment, follow safety procedures and measures. • Take measurements with basic measuring tools/equipment. • Characterize properties of material to prepare new materials for various engineering applications. • Identify tools, equipments and their respective functions. • Prepare independently simple jobs and inspect the same. • Select and handle tools for a particular operation. • Handle safety equipment, follow safety procedures and measures. • Take measurements with basic measuring tools/equipment. • Perform safety procedures to maintain good housekeeping practices. • Handle materials, sequence of operations, tools to make a given job based on interpretation of drawing as per given specification • Develop a job using resources of shops and compare the job with given specifications. Analyze a given job and identify various operations required to make it. Layout foundation plan of different types of foundations • Prepare details of brick courses in joints • Explain the drawing to craftsman • Draw the drawing of channel (L-section and cross-section) • Draw layout plan of a canal head works • Read and interpret the Building and Irrigation Engineering Drawings • Identify different types of rocks, bricks and tiles

	• Perform laboratory tests of cement to determine properties of cement, bricks, tiles. • Identify types of defects of timber • Select paints/varnishes for various types of surface • Identify and use different types of metals/alloys • Select different materials used for wall paneling and false ceiling, such PVC, POP etc.
PO4: Demonstrate skill of communication, basic mathematics, collecting and organizing information along with knowledge of social, political and natural environment.	• Identify the nuances of Communication, both oral and written. • Acquire knowledge of the meaning of communication, communication process and speaking skills. • Acquire enhanced vocabulary and in-depth understanding of Grammatical Structures and their usage in the communication. • Communicate effectively with an increased confidence to read, write and speak in English language fluently. • Understand the geometric shapes used in engineering problems by Co-ordinate Geometry and Trigonometry. • Formulate engineering problems into mathematical formats with the use matrices, coordinate geometry and trigonometry • Calculate the approximate value of roots of certain expressions in engineering problems by application of binomial theorem. • Explore the idea of location, graph, and linear relationships between two variables. • Explain the basic components of Computers, Internet and issues of abuses/ attacks on information and computers. • Handle the Computer/Laptop/Mobiles/Internet Utilities and Install/Configures. • Assemble a PC and connect it to external devices.

	• Manage and Use Office practiced Automation Tools. • Develop worksheets and Prepare presentations. • Formulate the engineering problems into mathematical format with the use of differential equations and differential • Use the differentiation and Integration in solving various Mathematical and Engineering problems. • Calculate the approximate area under a curve by applying integration and numerical methods. • Understand the purposes of measures of central tendency and calculate the measures of central tendency (mode, median, mean) for a set of data. • Learn about basic fundamentals about MATLAB/ Sci Lab and mathematical calculation with MATLAB/ Sci Lab software. • Comprehend the importance of sustainable ecosystem • Demonstrate interdisciplinary nature of environmental issues • Implement corrective measures for the abatement of pollution. • Identify the role of non-conventional energy resources in environmental protection. • Manage various types of disasters.
PO5: Perform task under close supervision with some responsibility for own work within defined limit.	• Identify tools, equipments and their respective functions. • Prepare independently simple jobs and inspect the same. • Select and Handle tools for a particular operation. • Handle safety equipment, follow safety procedures and measures. • Take measurements with basic measuring tools/equipment. • Perform safety procedures to maintain good housekeeping practices.

	• Handle materials, sequence of operations, tools to make a given job based on interpretation of drawing as per given specification • Develop a job using resources of shops and compare the job with given specifications. Analyze a given job and identify various operations required to make it.

15. SUBJECTS & DETAILED CONTENTS

FIRST SEMESTER

FIRST SEMESTER

1.1 ENGLISH & COMMUNICATION SKILLS – I

L	P
2	2

RATIONALE

Language as the most commonly used medium of self-expression remains indispensable in all spheres of human life –personal, social and professional. This course is intended to break fresh ground in teaching of Communicative English as per the requirements of National Skill Quality Framework. This course is designed to help students to acquire the concept of communication and develop an ability or skills to use them effectively to communicate with the individuals and community.

COURSE OUTCOMES

After undergoing this course, the students will be able to:

CO1: Identify the nuances of Communication, both Oral and Written.

CO2: Acquire knowledge of the meaning of communication, communication process and Speaking skills.

CO3: Acquire enhanced vocabulary and in-depth understanding of Grammatical Structures and their usage in the communication.

CO4: Communicate effectively with an increased confidence to read, write and speak in English language fluently.

DETAILED CONTENTS

UNIT I

Reading

1.1 Techniques of reading: Skimming and Scanning

1.2 Extensive and Intensive Reading: Textual Study

1.3 Homecoming – R.N. Tagore

1.4 Life Sketch of Sir Mokshagundam Visvesvarayya

1.5 Life Sketch of Dr. Abdul Kalam

1.6 Narayan Murthy's speech at LBSNA, Dehradun

UNIT II

Fundamentals of Communication

2.1 Concept and Process of Communication,

2.2 Types of Communication (Verbal Communication)

2.3 Barriers to Communication

2.4 Speaking Skill: Significance and essentials of Spoken Communication

2.5 Listening Skill: Significance and essentials of Listening

UNIT III

Grammar and Usage

3.1 Nouns

3.2 Pronouns

3.3 Articles

3.4 Verbs(Main and Auxiliary)

3.5 Tenses

UNIT IV

Writing Skills

4.1 Significance, essentials and effectiveness of Written Communication

4.2 Notice Writing

4.3 Official Letters and E-mails.

4.4 Frequently-used Abbreviations used in Letter-Writing

4.5 Paragraph Writing

4.6 Netiquettes

PRACTICAL EXERCISES

1 Reading

Reading Practice of lessons in the Lab Activity classes.

i. Comprehension exercises of unseen passages along with the lessons prescribed.

ii. Vocabulary enrichment and grammar exercises based on the selected readings.

iii. Reading aloud Newspaper headlines and important articles.

2 Fundamentals of Communication

i. Introducing oneself, others and leave- taking(talking about yourself)

ii. Just a minute (JAM) sessions: Speaking extempore for one minute on given topics

iii. Situational Conversation: Offering-Responding to offers; Congratulating; Apologising and Forgiving; Complaining; Talking about likes and dislikes, Self-introduction Mock Interviews.

3 Grammar and Usage

i. Written and Oral Drills will be undertaken in the class to facilitate holistic linguistic competency among learners.

ii. Exercises on the prescribed grammar topics.

4 Writing Skills

i. Students should be given Written Practice in groups so as to inculcate team-spirit and collaborative learning .

ii. Group exercises on writing paragraphs on given topics.

iii. Opening an e-mail account, receiving and sending emails

RECOMMENDED BOOKS

1. Alvinder Dhillon and Parmod Kumar Singla, "Text Book of English and Communication Skills Vol – 2", M/S Abhishek Publications, Chandigarh.
2. V Sasikumar & PV Dhamija, "Spoken English", Tata MC Graw Hills, New Delhi, Second Edition.
3. JK Gangal, "A Practical Course in Spoken English", PHI Learning Pvt. Ltd., New Delhi.
4. NK Aggarwal and FT Wood, "English Grammar, Composition and Usage", Macmillan Publishers India Ltd., New Delhi.
5. RC Sharma and Krishna Mohan, "Business Correspondence & Report writing", Tata MC Graw Hills, New Delhi, Fourth Edition.
6. Kavita Tyagi & Padma Misra, "Professional Communication", PHI Learning Pvt. Ltd., New Delhi.
7. Nira Konar, "Communication Skills for professionals", PHI Learning Pvt. Ltd., New Delhi.
8. Krishna Mohan & Meera Banerji, "Developing Communication Skills", Macmillan Publishers India Ltd., New Delhi, Second Edition
9. M. Ashraf Rizwi, "Effective Technical Communication", Tata MC Graw Hills, New Delhi.
10. Andrea J Rutherfoord, "Basic Communication Skills for Technology", Pearson Education, New Delhi.

INSTRUCTIONAL STRATEGY

This is practice based subject and topics taught in the class should be practiced in the Lab regularly for development of required communication skills in the students. This subject contains four units of equal weight age.

1.2 APPLIED MATHEMATICS – I

L	P
4	-

RATIONALE

Contents of this course provide fundamental base for understanding engineering problems and their solution algorithms. Contents of this course will enable students to use basic tools like logarithm, binomial theorem, matrices, t-ratios and co-ordinates for solving complex engineering problems with exact solutions in a way which involve less computational task. By understanding the logarithm, they will be able to make long calculations in short time and it is also a pre-requisite for understanding Calculus.

COURSE OUTCOMES

After undergoing this course, the students will be able to:

CO1: Understand the geometric shapes used in engineering problems by Co-ordinate Geometry and Trigonometry.

CO2: Formulate engineering problems into mathematical formats with the use matrices, co-ordinate geometry and trigonometry

CO3: Calculate the approximate value of roots of certain expressions in engineering problems by application of binomial theorem.

CO4: Explore the idea of location, graph, and linear relationships between two variables.

CO5: Learn about basic fundamentals about MATLAB/ SciLab and mathematical calculation with MATLAB/ SciLab software.

DETAILED CONTENTS

UNIT I

Algebra

1.1 Complex Numbers: definition of complex number, real and imaginary parts of a complex number, Polar and Cartesian Form and their inter conversion, Conjugate of a complex number, modulus and amplitude, addition subtraction, multiplication and division of complex numb

1.2 Logarithms and its basic properties

UNIT II

Binomial Theorem, Determinants and Matrices

2.1 Meaning of ${}^{n}p_{r}$ & ${}^{n}c_{r}$ (mathematical expression). Binomial theorem (without proof) for positive integral index (expansion and general form); binomial theorem for any index (expansion up to 3 terms - without proof), first binomial approximation with application to engineering problems.

2.2 Determinants and Matrices – Evaluation of determinants (upto 2^{nd}order), solution of equations (upto 2 unknowns) by Crammer's rule, definition of Matrices and its types, addition, subtraction and multiplication of matrices (upto 2^{nd} order).

UNIT III

Trigonometry

3.1 Concept of angle, measurement of angle in degrees, grades, radians and their conversions.

3.2 T-Ratios of Allied angles (without proof), Sum, Difference formulae and their applications (without proof). Product formulae (Transformation of product to sum, difference and vice versa

3.3 Applications of Trigonometric terms in engineering problems such as to find an angle of elevation, height, distance etc.

UNIT-IV

Co-ordinate Geometry

4.1 Cartesian and Polar co-ordinates (two dimensional), Distance between two points, mid-point, centroid of vertices of a triangle.

4.2 Slope of a line, equation of straight line in various standards forms (without proof); (slope intercept form, intercept form, one-point form, two-point form, symmetric form, normal form, general form), intersection of two straight lines, concurrency of lines, angle between straight lines, parallel and perpendicular lines, perpendicular distance formula, conversion of general form of equation to the various forms.

UNIT V

Geometry of Circle and Software

Circle

5.1 General equation of a circle and its characteristics. To find the equation of a circle, given:

i. Centre and radius

ii. Three points lying on it

iii. Coordinates of end points of a diameter

Software

5.2 **MATLAB Or SciLab software –** Theoretical Introduction, MATLAB or Scilabas Simple Calculator (Addition and subtraction of values –Trigonometric and Inverse Trigonometric functions) – General Practice

RECOMMENDED BOOKS

1. R. D. Sharma, "Applied Mathematics – I & II for Diploma Courses", Dhanpat Rai Publications.
2. "Mathematics for Class XI", NCERT Publication, New Delhi.
3. "Mathematics for Class XII", NCERT Publication, New Delhi.
4. H. K Dass, "Applied Mathematics for Polytechnics", CBS Publishers & Distributers.
5. A Ganesh and G Balasubramanian, "Textbook of Engineering Mathematics – I", CBS Publisher, New Delhi.
6. A Ganesh and G Balasubramanian, "Textbook of Engineering Mathematics –II", CBS Publisher, New Delhi.
7. G. B. Thomas, R. L. Finney, "Calculus and Analytic Geometry", Addison Wesley, Ninth Edition.
8. B S Grewal, "Elementary Engineering Mathematics", Khanna Publishers, Delhi, Thirty-fifth edition.
9. R.K. Jain and S.R.K. Iyengar, "Advanced Engineering Mathematics", Narosa Publishing House, New Delhi, Second Edition, 2003.
10. SS Sabharwal & Dr Sunita Jain, "Applied Mathematics Vol. I & II", Eagle Parkashan, Jalandhar.
11. S Kohli, "Engineering Mathematics Vol. I & II", IPH, Jalandhar.
12. Reena Garg & Chandrika Prasad, "Advanced Engineering Mathematics", Khanna Publishing House, New Delhi
13. R. Pratap, "Getting Started with MATLAB 7", Oxford University Press, Seventh Edition.
14. E-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

SUGGESTED WEBSITES

1. http://swayam.gov.in
2. https://www.scilab.org

INSTRUCTIONAL STATREGY

This is theoretical subject and contains five units of equal weightage. Basic elements of algebra, trigonometry and co-ordinate geometry can be taught in the light of their applications in the field of engineering and technology. By laying more emphasis on applied part, teacher can also help in providing a good continuing education base to the students. Students need to be taught the skills needed to use software tools built by experts through multiple problem solving based on the topics related to Algebra, Trigonometry and Coordinate Geometry that the industry requires. Examples to be used should be related to engineering. Useful software MATLAB or open source software SciLab can be taught theoretically by books/online literatures and basic operations can be shown practically with practical software laboratory or small mobile apps of these software or authentic Trial version of MATLAB/ SciLab software. Students should be able to relate to the actual use of these examples and the way mathematical calculations will help them in doing their job.

1.3 APPLIED PHYSICS-I

L	P
2	2

RATIONALE

Applied physics includes the study of a large number of diverse topics all related to things that go on in the world around us. It aims to give an understanding of this world both by observation and by prediction of the way in which objects will behave. Concrete use of physical principles and analysis in various technical fields are given prominence in the course content.

COURSE OUTCOMES

After completing this course, student should be able to:

CO1: Identify physical quantities, select their units and make measurements with accuracy.

CO2: Represent physical quantities as scalar and vector and identify type of motions, various forms of energy, their conversion and applications.

CO3: Elaborate scientific work, energy and power, forms of friction and solve problems related to them.

CO4: Comprehend properties of matter and effect of temperature on various matter and phenomenon.

CO5: Demonstrate the use of physical principles and analysis in various technical fields.

DETAILED CONTENTS

UNIT I

Unit and Dimensions

1.1 Definition of Physics, physical quantities- fundamental and derived

1.2 Units: fundamental and derived

1.3 System of units: CGS, FPS, MKS, SI

1.4 Dimension, dimensional formulae and SI units of physical quantities-distance, displacement, area, volume, density, velocity, acceleration, linear momentum, force, impulse, work, power, energy, pressure, surface tension, stress, strain)

1.5 Dimensional equations, principle of homogeneity of dimensional equation

1.6 Application of dimensional analysis: checking the correctness of physical equation, conversion of system of unit (force, work, acceleration)

UNIT II

Force and Motion

2.1 Scalar and vector quantities– definition and examples, representation of vector, types of vector (unit vector, position vector, co-initial vector, collinear vector, co-planar vector)

2.2 Vector algebra- addition of vectors, Triangle &Parallelogram law (statement and formula only),

2.3 Scalar and vector product (statement and formula only)

2.4 Force and its units, resolution of force (statement and formula only)

2.5 Newton's laws of motion (statement and examples)

2.6 Linear momentum, Law of conservation of linear momentum (statement and examples), Impulse

2.7 Circular motion: definition of angular displacement, angular velocity, angular acceleration, frequency, time period; Relation between linear and angular velocity, centripetal and centrifugal forces (definition and formula only), application of centripetal force in banking of road

2.8 Rotational motion: definition with examples

2.9 Definition of torque, angular momentum, moment of inertia and its physical significance

UNIT III

Work, Power and Energy

3.1 Work- definition, symbol, formula and SI unit, types of work (zero work, positive work and negative work) with example

3.2 Friction– definition and its simple daily life applications

3.3 Power- definition, formula and units

3.4 Energy- definition and its SI unit, examples of transformation of energy.

3.5 Kinetic energy- definition, examples, formulaand its derivation

3.6 Potential energy- definition, examples, formulaand its derivation

3.7 Law of conservation of mechanical energy for freely falling bodies (with derivation)

3.8 Simple numerical problems based on formula of Power and Energy

UNIT IV

Properties of Matter

4.1 Elasticity and plasticity- definition, deforming force, restoring force, example of elastic and plastic body

4.2 Definition of stress and strain, Hooke's law, modulus of elasticity

4.3 Pressure- definition, atmospheric pressure, gauge pressure, absolute pressure, Pascal's law

4.4 Surface tension- definition, SI unit, applications of surface tension, effect of temperature on surface tension

4.5 Viscosity: definition, unit, examples, effect of temperature on viscosity

UNIT V

Heat and Temperature

5.1 Definition of heat and temperature (on the basis of kinetic theory)

5.2 Difference between heat and temperature

5.3 Principle and working of mercury thermometer

5.4 Modes of transfer of heat- conduction, convection and radiation with examples.

5.5 Properties of heat radiation

5.6 Different scales of temperature and their relationship

PRACTICAL EXCERCISES

1. Familiarization of measurement instruments and their parts (for example – Vernier caliper, screw gauge, sphere meter, travelling microscope etc.), and taking a reading. (compulsory to all students)
2. To find diameter of solid cylinder using a Vernier caliper
3. To find internal dia meter and depth of a beaker using a Vernier caliper and hence find its volume.
4. To find the diameter of wire using screw gauge
5. To find thickness of paper using screw gauge.
6. To determine the thickness of glass strip using a sphero meter
7. To determine radius of curvature of a given spherical surface by a sphero meter.
8. To verify parallelgram law of force
9. To determine the atmospheric pressure at a place using Fortin's Barometer
10. To determine force constant of spring using Hooke's law
11. Measuring room temperature with the help of thermometer and its conversion in different scale.

RECOMMENDED BOOKS

1. "Text Book ofPhysics for Class XI (Part-I, Part-II)", N.C.E.R.T., Delhi.
2. Dr.HH Lal, "Applied Physics, Vol.I and Vol.II", TTTI Publications, Tata McGraw Hill, Delhi.

3. AS Vasudeva, "Applied Physics – I", Modern Publishers, Jalandhar.
4. R A Banwait, "Applied Physics – I", Eagle Prakashan, Jalandhar.
5. E-books/e-tools/relevant software to be used as recommended by AICTE/ HSBTE/ NITTTR.
6. C. L. Arora, "Practical Physics", S Chand Publication.

SUGGESTED WEBSITES

1. http://swayam.gov.in
2. The Physics Classroom
3. https://www.khanacademy.org/science/physics

INSTRUCTIONAL STATREGY

This is hands-on practice based subject and topics taught in the class should be practiced in the Lab regularly for development of required skills in the students. This subject contains five units of equal weightage.

Teacher may use various teaching aids like models, charts, graphs and experimental kits etc. for imparting effective instructions in the subject. Students need to be exposed to use of different sets of units and conversion from one unit type to another. Software may be used to solve problems involving conversion of units. The teacher should explain about field applications before teaching the basics of mechanics, work, power and energy, rotational motion, properties of matter etc. to develop proper understanding of the physical phenomenon. Use of demonstration can make the subject interesting and develop scientific temper in the students. Teachers should give examples of engineering/technology applications of various concepts and principles in each topic so that students are able to appreciate learning of these concepts and principles. In all contents, SI units should be followed. Working in different sets of units can be taught through relevant software.

1.4 APPLIED CHEMISTRY

L	P
3	2

RATIONALE

The regular use of a variety of chemistry based materials and processes in diverse technical and engineering fields have repeatedly proven the importance of Applied Chemistry and its role in current and future technological advancements. Ever increasing use of chemical materials in the emerging engineering applications demands engineers and technocrats to acquire an in-depth knowledge of Applied Chemistry to be able to choose the best suited materials to meet their needs while maintaining the environment sustainability. An understanding of the principles of Applied Chemistry will develop scientific attitude in the budding engineers to understand the physical and chemical properties of the available materials for engineering applications as well as an ability to design new and effective materials.

COURSE OUTCOMES

After studying this course, students will be able to:

CO1: Classify the elements into metals, non-metals and metalloids.

CO2: Explain the extraction of metals from ores, their mechanical properties and modification of properties by alloy formation.

CO3: Classify fuels and lubricants and apply them in different engineering applications.

CO4: Identify the polymeric materials, assess their properties and design suitable polymeric materials for current and future applications.

CO5: Apply effective methods for corrosion prevention

DETAILED CONTENTS

UNIT 1

Atomic Structure, Periodic Table and Chemical Bonding.

1.1 Bohr's model of atom (qualitative treatment only), dual character of matter: derivation of de-Broglie's equation, Heisenberg's Principle of Uncertainty, modern concept of atomic structure: definition of orbitals, shapes of s, p and d-orbitals, quantum numbers and their significance. Electronic configuration: Aufbau and Pauli's exclusion principles and Hund's rule, electronic configuration of elements up to atomic number 30.

1.2 Modern Periodic law and Periodic table, classification of elements into s, p, d and f-blocks, metals, non-metals and metalloids (periodicity in properties excluded).

1.3 Chemical bonding: cause of bonding, ionic bond, covalent bond, and metallic bond (electron sea or gas model), Physical properties of ionic, covalent and metallic substances.

UNIT II

Metals and Alloys

2.1 Metals: mechanical properties of metals such as conductivity, elasticity, strength and stiffness, luster, hardness, toughness, ductility, malleability, brittleness, and impact resistance and their uses.

2.2 Definition of a mineral, ore, gangue, flux and slag. Metallurgy of iron from haematite using a blast furnace. Commercial varieties of iron.

2.3 Alloys: definition, necessity of making alloys, composition, properties and uses of duralumin and steel. Heat treatment of steel- normalizing, annealing, quenching, tempering.

UNIT III

Water, Solutions, Acids and Bases

3.1 Solutions: definition, expression of the concentration of a solution in percentage (w/w, w/v and v/v), normality, molarity and molality and ppm. Simple problems on solution preparation.

3.2 Arrhenius concept of acids and bases, strong and weak acids and bases, pH value of a solution and its significance, pH scale. Simple numerical problems on pH of acids and bases.

3.4 Hard and soft water, causes of hardness of water, types of hardness – temporary and permanent hardness, expression of hardness of water, ppm unit of hardness; disadvantages of hard water; removal of hardness: removal of temporary hardness by boiling and Clark's method; removal of permanent hardness of water by Ion-Exchange method; boiler problems caused by hard water: scale and sludge formation, priming and foaming, caustic embrittlement; water sterilization by chlorine, UV radiation and RO.

UNIT IV

Fuels and Lubricants

4.1 Fuels: definition and classification of higher and lower calorific values, units of calorific value, characteristics of an ideal fuel. Petroleum: composition and refining of petroleum; gaseous fuels: composition, properties and uses of CNG, PNG, LNG, LPG; relative advantages of liquid and gaseous fuels over solid fuels. Scope of hydrogen as future fuel.

4.2 Lubricants- Functions and qualities of a good lubricant, classification of lubricants with examples; lubrication mechanism (brief idea only); physical properties (brief idea only) of a lubricant: oiliness, viscosity, viscosity index, flash and fire point, ignition temperature, pour point.

UNIT V

Polymers and Electrochemistry

5.1 Polymers and Plastics: definition of polymer, classification, addition and condensation polymerization; preparation properties and uses of polythene, PVC, Nylon-66, Bakelite; definition of plastic, thermoplastics and thermosetting polymers; natural rubber and neoprene, other synthetic rubbers (names only).

5.2 Corrosion: definition, dry and wet corrosion, factors affecting rate of corrosion, methods of prevention of corrosion—hot dipping, metal cladding, cementation, quenching, cathodic protection methods

5.3 Introduction and application of nanotechnology: nano-materials and their classification, applications of nanotechnology in various engineering applications (brief).

PRACTICAL EXERCISES

1. To prepare standard solution of oxalic acid.
2. To dilute the given $KMnO_4$ solution
3. To find out the strength in grams per litre of an unknown solution of sodium hydroxide using a standard (N/10) oxalic acid solution.
4. To find out the total alkalinity in parts per million (ppm) of a water sample with the help of a standard sulphuric acid solution.
5. To determine the total hardness of given water sample by EDTA method
6. To determine the amount of total dissolved solids(TDS) in ppm in a given sample of water gravimetrically
7. To determine the pH of different solutions using a digital pH meter.
8. To determine the calorific value of a solid/liquid fuel using a Bomb calorimeter.
9. To determine the viscosity of a lubricating oil using a Redwood viscometer
10. To prepare a sample of Phenol-formaldehyde resin (Bakelite)/Nylon-66 in the lab.

RECOMMENDED BOOKS

1. Textbook of Chemistry for class XI and XII (part I & II) NCERT, Delhi, 2017-18.

2. C.N. R. Rao, Understanding Chemistry, Universities Press (India) Pvt. Ltd, 2011.
3. Jain & Jain, Engineering Chemistry, Dhanpat Rai and Sons; New Delhi, 2015.
4. Dr. G. H. Hugar& Prof A. N. Pathak, Applied Chemistry Laboratory Practices, Vol. I and Vol. II, NITTTR, Chandigarh, Publications, 2013-14.
5. Agnihotri, Rajesh, Chemistry for Engineers, Wiley India Pvt. Ltd, 2014.
6. Applied Chemistry by Usha Raju.

SUGGESTED WEBSITES

1.www.chemguide.co.uk/atommenu.html (Atomic structure and chemical bonding)
2.www.visionlearning.com (Atomic structure and chemical bonding)
3. www.cheml.com (Atomic structure and chemical bonding)
4. https://www.wastewaterelearning.com/elearning/ (Water treatment)
5. www.capital-refractories.com (Metals, Alloys, Cement, and Refractory Materials) 6.www.em-ea.org/guide%20books/book-2/2.1%20fuels%20and%20combustion.pdf(Fuel and combustion)

INSTRUCTIONAL STRATEGY

Teachers may take help of various models and charts while imparting instructions to make the concept clear. More emphasis should be laid on discussing and explaining practical applications of various chemical process and reactions. In addition, students should be encouraged or motivated to study those processes in more details, which may find practical application in their future professional career. This subject contains five units of equal weightage.

1.5 ENGINEERING GRAPHICS

L	P
-	6

RATIONALE

Drawing is the language of engineers and technicians. Reading and interpreting engineering drawings is their day to day responsibility. The subject is aimed at developing basic graphic skills in the students so as to enable them to use these skills in preparation of engineering drawings, their reading and interpretation. The emphasis, while imparting instructions, should be to develop conceptual skills in the students following BIS SP 46 – 1988.

COURSE OUTCOMES

After undergoing the subject, the students will be able to:

CO1: Draw Orthographic views of different objects viewed from different angles.

CO2: Draw and interpret sectional views of an object which are otherwise not visible in normal view.

CO3: Draw Isometric views of different solids and develop their surfaces.

CO4: Identify conventions for different engineering materials, symbols, sections of regular objects and general fittings used in Civil and Electrical household appliances /fittings.

CO5: Draw orthographic views of different objects by using basic commands of AutoCAD.

DETAILED CONTENTS

UNIT I

1. Introduction to Engineering Drawing and Graphics

1.1 Introduction to use and care of drawing instruments, drawing materials, layout and sizes of drawing sheets and drawing boards.

1.2 Symbols and conventions-

a) Conventions of Engineering Materials, Sectional Breaks and Conventional lines.
b) Civil Engineering Sanitary fitting symbols
c) Electrical fitting symbols for domestic interior installations.

1.3 Geometrical construction-geometrical figures such as triangles, rectangles, circles, ellipses and curves, hexagons, pentagons bisecting a line and arc , division of line and circle with the help of drawing instruments.

2. Technical Lettering of Alphabet and Numerals

Definition and classification of lettering, Free hand (of height of 5,8,12 mm) and instrumental lettering (of height 20 to 35 mm): upper case and lower case, single and double stroke, vertical and inclined (Gothic lettering) at 75 degree to horizontal and with suitable height to width ratio 7:4.

3. Dimensioning

3.1 Necessity of dimensioning, method and principles of dimensioning (mainly theoretical instructions).

3.2 Dimensioning of overall sizes, circles, threaded holes, chamfered surfaces, angles, tapered surfaces, holes, equally spaced on P.C.D., countersunk holes, counter bored holes, cylindrical parts, narrow spaces and gaps, radii, curves and arches.

4. Scales

4.1 Scales –Needs and importance (theoretical instructions), Type of scales, Definition of Representative Fraction (R.F.) and Length of Scale.

4.2 To draw/construct plain and diagonal scales.

UNIT II

1 Orthographic Projections

1.1 Theory of orthographic projections (Elaborate theoretical instructions).

1.2 Three views of orthographic projections of different objects of given pictorial view of a block in 1st and 3rd angle.

1.3 Projection of Points in different quadrant

1.4 Projection of Straight Line (1^{st} angle)

i. Line parallel to both the planes.
ii. Line perpendicular to any one of the reference plane and parallel to others
iii. Line inclined to any one of the references and parallel to another plane.

1.5Projection of Plane – Different lamina like square rectangular, triangular, circle and Hexagonal pentagon. Trace of planes (HT and VT).

1.6 Identification of surfaces.

2. Sectioning

2.1 Importance and salient features

2.2 Drawing of full section, half section, partial or broken out sections, Offset sections, revolved sections and removed sections (theoretical only).

2.3 Orthographic sectional views of different objects.

UNIT III

1. Introduction of projection of right solids such as prism & pyramid (square, Pentagon, Hexagonal) cube, cone & cylinder (Axes perpendicular to H.P and parallel to V.P.)
2. Introduction of sections of right solids - Section planes, Sections of Hexagonal prism, pentagon pyramid, cylinder and cone (Section plane parallel to anyone reference planes and perpendicular to V.P. and inclined to H.P.)
3. Development of Surfaces – Development of lateral surfaces of right solids like cone, cylinder, pentagonal prism, pyramid and hexagonal pyramid (Simple problems)

UNIT IV

Isometric Views

1. Fundamentals of isometric projections and isometric scale.
2. Isometric views of different laminas like circle, pentagon and hexagon.
3. Isometric views of different regular solids like cylinder, cone, cube, cuboid, pyramid and prism.
4. Isometric views from given different orthographic projections(front, side and top view)

UNIT V

Introduction to AutoCAD

Basic introduction and operational instructions of various commands in AutoCAD. At least two sheets of different objects on AutoCAD (given pictorial/isometric view of a block). AutoCAD skill of student is evaluated in internal assessment only not in external exam.

RECOMMENDED BOOKS

1. A Text Book of Engineering Drawing by Surjit Singh; Dhanpat Rai & Co. Delhi
2. Engineering Drawing by PS Gill; SK Kataria & Sons, New Delhi
3. Elementary Engineering Drawing in First Angle Projection by ND Bhatt; Charotar Publishing House Pvt. Ltd.,Anands
4. Engineering Drawing and Graphics using AutoCAD by T. Jeyapoovan,Vikas Publishing House Pvt, Ltd Noida.
5. A Text Book of Engineering Drawing by S.R.Singhal and O.P.Saxena, Asian Publisher, Delhi
6. Engineering Drawing by RB Gupta, Satya Prakashan, New Delhi

INSTRUCTIONAL STRATEGY

Teacher should show model of regalia of the component/part whose drawing is to be made. Emphasis should be given on cleanliness, dimensioning and layout of sheet. Focus should be on proper selection of drawing instruments and their proper use. First angle projection is to be followed. Minimum of 20 sheets to be prepared and at least 2 sheets on AutoCAD**.** Instructions relevant to various drawings may be given along with appropriate demonstrations, before assigning drawing practice to students. This subject contains five units of equal weight age.

1.6 PLUMBING SERVICES

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RATIONALE

Plumbing is said to be the system of pipes, tanks, fittings, and other apparatus required for water supply, heating, and sanitation in a building. Plumbers install, repair, and maintain piping systems in residential, commercial and industrial buildings. These systems traditionally included water distribution and wastewater disposal, but because of new technology that combines water and gas pipes, plumbers can work with vent, residential fire, irrigation, and chemical systems as well. The duties of a plumber include: installing, repairing and maintaining pipes, fixtures, and other plumbing equipment; opening walls and floors to accommodate pipes and pipe fittings; welding, connecting, and testing pipes for leaks; preparing cost estimates; interpreting blueprints and designs. Plumbers must also be aware of safety procedures and follow them at all times.

Diploma holders in Civil Engineering who normally work in supervisory positions, must not only be well versed with plumbing procedures, processes, equipment, safety requirements etc. but also be able to demonstrate all practical aspects of plumbing to as to effectively lead team of plumbers and ensure execution of quality work and excellent end results.

This subject is therefore, aimed at instilling theoretical and practical knowledge among students studying civil engineering at diploma level.

COURSE OUTCOMES

After undergoing this course, the students will be able to:

CO1: Identify and select proper tools and use them for the given plumbing work

CO2: Select appropriate pipes and carry out pipe fitting after carrying out operations like cutting, bending, threading, joining, aligning and other necessary operations

CO3: Erect simple water supply system. Trace leakage and repair water supply system

CO4: Plan, prepare and inspect domestic drainage system

CO5: Select and install sanitary appliances

CO6: Install heating appliances like geyser, etc.

DETAILED CONTENTS

UNIT I

1. Plumber's Tools

Selection, use and care of tools required for plumbing work, such as threading die, bit brace, ratchet brace, pipe wrench, spanner set, pipe cutter, pipe vice, hacksaw, chisel, files and other common hand tools, bench drilling machine, soldering iron

UNIT II

2. Pipes and Pipe Fitting

Selection and use of different pipes like GI Pipes, Plastic pipes, PVC pipes, HDPE pipes, Cast iron pipes, Plumbing symbols; Bends, Elbows, Sockets, Tees, Unions, Pipe cutting, Pipe bending, Pipe Threading, Pipe joints, Pipe fitting, Alignment of pipes, Branching of pipes, Safety precautions.

UNIT III

3. Water Supply System

Sources of water; Rainwater harvesting; Water supply systems in a town; Water distribution systems; Distribution reservoirs; Pumps; Valves; Fire hydrants; Storage of water in buildings; Types of tanks; Laying water supply pipe lines

UNIT IV

4. Domestic Drainage

Drainage system (two pipe, one pipe, single stack and other systems), Trap, Cesspool, Sceptic tank, Cleaning blocked pipes and drains, Laying sanitary and sewer pipes, Manholes, Inspection and testing (pressure & leakage test, testing straightness of pipes, ball test etc.); Fixing accessories, Problems in drainage and their solution

UNIT V

5. Sanitary Appliances

Flush toilet, Squat toilet, Wash basin, Sink, Floor traps, Urinal, Bathtub, Shower, Bidet, Mixing tap, Popup waste

Heating System

Heat transfer, Water heater, Geyser, Domestic hot water supply system, Central heating, Solar water heater

RECOMMENDED BOOKS

1. Plumber by G. S. Sethi; Computech Publications Ltd, New Delhi (Available in English and Hindi)
2. e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

SUGGESTED WEBSITES

1. http://swayam.gov.in

INSTRUCTIONAL STRATEGY

During instructions, teacher should explain the use of various plumbing tools and demonstrate how to handle them properly. Liberal use of audio-visual aids may be made. Students may be asked to prepare models of different piping systems. Visit may be arranged for students to see how town water supply is arranged and managed. Detailed explanation with the help of actual sanitary appliances may be given about their use and method of installing them. This subject contains five units of equal weightage.

1.7 GENERAL WORKSHOP PRACTICE

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RATIONALE

In order to have a balanced overall development of diploma engineers, it is necessary to integrate theory with practice. General Workshop Practice is included in the curriculum in order to provide hands-on experience about use of different tools and basic manufacturing practices. This subject aims at developing general manual and machining skills in the students. In addition, the development of dignity of labour, safety at work place, team working and development of right attitude are the other objectives.

COURSE OUTCOMES

After completing the course, the students will be able to:

CO1: Identify tools, equipment and materials used in preparing jobs.
CO2: Take measurements with the help of basic measuring tools/equipment.
CO3: Select materials, tools, and sequence of operations to make a job as per given specifications/drawing.
CO4: Prepare simple jobs independently and inspect the same.
CO5: Use safety equipment and Personal Protection Equipment (PPE).
CO6: Maintain good housekeeping practices.

DETAILED CONTENTS (PRACTICAL EXERCISES)

Note: The students are supposed to come in proper workshop dress prescribed by the institute. Wearing shoes in the workshop(s) is compulsory. Importance of safety and cleanliness, safety measures and upkeep of tools, equipment and environment in each of the following shops should be explained and practiced. The students should prepare sketches of various tools/jobs in their practical Notebook.

The following shops are included in the syllabus:

1. Welding Shop I
2. Fitting and Plumbing Shop I
3. Sheet Metal Shop I

4. Carpentry Shop I
5. Painting Shop I
6. Electric and Electronics Shop I

1. Welding Shop – I

1.1 Safety Precautions of concerned shop and use of personal protective equipment (PPE), demonstration of tools, equipment, sample jobs, best practices in the concerned shop.

1.2Introduction and importance of welding process as compared to other material joining processes. Specifications and type of ARC welding machines, parts identification, classification, selection and coding of electrodes, welding parameters, welding joints and welding positions. Common weldable materials, safety precautions in welding shop, use of Personal Protective Equipment, Use of welding screens, Hazards and remedies during welding, Elementary symbolic representations, demo of tools, equipment, sample jobs prepared, set up of Gas welding apparatus, and welding defects.

1.3 Jobs to be prepared

Job I Practice of striking arc and depositing uniform and straight beads on flat at different current levels. (Minimum 4 beads on M.S. flat at four setting of current level using shielded metal arc welding and differentiating their characteristics).

Job II Edge Preparation and welding lap joint using shielded metal arc welding (SMAW) process.

Job III Edge Preparation and welding butt joint using shielded metal arc welding process.

Job IV Edge Preparation and welding T Joint using shielded metal arc welding (100mm x 6 mm M.S. Flat).

Job V To make a simple job using oxy acetylene gas welding.

2. Fitting and Plumbing Shop – I

2.1 Safety Precautions of concerned shop and use of personal protective equipment (PPE), demonstration of tools, equipment, sample jobs, best practices in the concerned shop.

2.2 Introduction and Function of holding/ clamping devices, hand tools and cutting tools,

2.3 Practical applications of fitting and plumbing

2.4 Introduction, function and types of marking and measuring tools and instruments (surface plate, try square, caliper, steel rule, scriber and Vernier caliper)

2.5 Identification of materials. (Iron, Copper, Stainless Steel, Aluminum etc.) and identification of various steel sections (flat, angle, channel, bar etc.).

2.6 Introduction to various types of pipes (eg water, steam, gas etc.) and functions of various pipe fitting items (GI pipe fittings, CPVC pipe fittings), Methods of pipe joints

2.7 Introduction to various types of threads (internal and external)

2.8 Description and demonstration of various types of drills, taps and dies.

2.9 Jobs to be prepared:

Job I To fit hacksaw blade in its frame and perform hacksawing operation by using marking media and marking tool and straight sawing practice.

Job II To perform filing on MS workpiece (75 * 50 * 6 mm) for giving it a perfect rectangular shape and drilling, tapping operation.

Job III To perform step filing operation at right angle on MS workpiece.

Job IV Making external threads on a pipe by using die and to make a PVC/GI pipe connection using nipple and socket.

Job V Fitting of all components of wash basin and ball valve in a tank.

3. Sheet Metal Shop I

3.1. Safety Precautions of concerned shop and use of personal protective equipment (PPE), demonstration of tools, equipment, sample jobs, best practices in the concerned shop.

3.2 Demonstration of various power tools, apparatus, equipment, hand tools used in sheet metal shop.

3.5 Jobs to be prepared

Job I Prepare a seam joint by using hand tools on GI sheet.

Job II To prepare riveted lap joint (single/double) on GI sheet.

Job III To fabricate a funnel of GI sheet using operations of shearing, flattening and bending.

Job IV To fabricate a conduit joint using various sheet metal operations.

Job V To fabricate a utility job (eg soap case/file tray/canister box) of thin GI sheet.

4. Carpentry Shop - I

4.1 Safety Precautions of concerned shop and use of personal protective equipment (PPE), demonstration of tools, equipment, sample jobs, best practices in the concerned shop.

4.2 Introduction and industrial applications of carpentry jobs.

4.2.1 Name and use of raw materials used in carpentry shop: wood & alternative materials (board, plywood)

4.2.2 Introduction to wood, timber and their identification, shapes and specifications, their properties, applications & defects. Study of the joints in roofs, doors, windows and furniture, seasoning of wood

4.2.3 Names, uses, and types of hand tools such as Saws, C-Clamp, Chisels, Mallets, Carpenter's vices, Marking gauges, Try-squares, Rulers and other commonly used tools and materials used in carpentry shop by segregating as cutting tools, supporting tools, holding tools, measuring tools etc.

4.2.4 Specification of iron jack plane used in carpentry shop.

4.3 Practice

4.3.1 Practices for Basic Carpentry Work

4.3.2 Sawing practice using different types of saws

4.3.3 Assembling jack plane — planning practice including sharpening and blade adjustment of jack plane cutter

4.3.4 Chiselling practice using different types of chisels including sharpening of chisel

4.3.5 Making of different types of wooden pin and fixing methods. Marking measuring and inspection of jobs.

4.3.6 Housekeeping practices and instructions.

4.4 Jobs to be Prepared

Job 1 Prepare a rectangular wooden block involving operations like Marking, sawing, planning to size, chiseling.

Job II Prepare a Half Lap Joint (cross, L or T – any one).

Job III Prepare a Mortise and Tenon joint (T-Joint).

Job IV Prepare a Dove tail Joint (Half lap dovetail joint.

Job V Prepare a Bridle Joint.

5. Painting Shop

5.1 Safety Precautions of concerned shop and use of personal protective equipment (PPE), demonstration of tools, equipment, sample jobs, best practices in the concerned shop.

5.2 Introduction to paints, varnishes, primers and their types, General properties of paints, Constituents of paints, polishes, their advantages and applications.

5.3 Introduction of powder coating and spray painting with their uses. Different types of tools and equipment used in polishing and painting.

5.4 Preparation of different colours of the paints by using prime colours, Practical demonstration of powder coating and spray painting on a utility object

5.5 Jobs to be Prepared

Job I Prepare wooden surface for painting such as cleaning, sanding, applying putty, filling procedure and application of primer coat and brush paint the same.

Job II Painting on wooden and metallic surfaces by spray gun.

Job III Practice of lettering: name plates / sign board.

Job IV Practice of dip painting/powder coating.

Job V Prepare wooden surface for polishing, apply French polish on wooden surface.

6. Electrical and Electronics Shop - I

6.1 Safety Precautions of concerned shop and use of personal protective equipment (PPE), demonstration of tools, equipment, sample jobs, best practices in the concerned shop.

6.2 Demonstration and identification of common electrical materials with standard ratings and specifications such as wires, cables, switches, MCB & ELCB, fuses, cleats, clamps and allied items, tools and accessories.

6.3 Identification of phase, Neutral and Earth wires for connection to domestic electrical appliances and their connections to three pin plugs. Difference between series and parallel wiring.

6.4 Jobs to be performed

Job I Carrying out house wiring circuits using fuse, switches, sockets, ceiling rose etc. in batten or P.V.C. casing-caping. Demo of conduit wiring through junctions.

Job II To prepare a three level Godown wiring circuit with PVC conduit wiring system.

Job III Installation of Solar Panel, inverter and batteries.

6.5 Identification and familiarization with the following tools used in electronic shop such as Tweezers, Screw drivers (different sizes), Insulated Pliers, Cutter, Sniper, Philips Screw Driver (Star Screw Driver), L- Keys, Soldering Iron, soldering wire, flux and their demonstration and uses. Identification and familiarization with multimeter (analog and digital). Various types of protective devices such as wire fuse, cartridge fuse etc. Identification and familiarization with ear phone speaker connector, telephone jacks and similar male and female connectors (audio, video).

6.6 Jobs to be performed

Job IV Practice in the use of tools and instruments used in electronic shop. For this a small experimental set up may be done.

Job V Cut, strip, join an insulated wire with the help of soldering iron (repeat with different types of wires).

RECOMMENDED BOOKS

1. SK Hajra Choudhary and AK Choudhary, “Workshop Technology I, II, III”, Media Promoters and Publishers Pvt. Ltd., Mumbai, Fifteenth Edition, 2016.
2. RK Jain, “Workshop Technology Vol I& II’’, Khanna Publishers, New Delhi, First Edition, 2021.
3. Manchanda, “Workshop Technology Vol. I, II, III”, India Publishing House, Jalandhar.
4. S.S. Ubhi, “Workshop Training Manual Vol. I, II’’, Katson Publishers, Ludhiana.
5. K Venkata Reddy, “Manual on Workshop Practice”, MacMillan India Ltd., New Delhi, Sixth Edition, 2020.
6. “General Workshop Manual (Diploma Jobs)”, Khanna Publishers, First Edition, 2021.
7. T Jeyapoovan, “Basic Workshop Practice Manual”, Vikas Publishing House (P) Ltd., New Delhi.

8. B. S. Raghuvanshi, “Workshop Technology, Vol. I”, Dhanpat Rai and Sons, Delhi, Eleventh Edition, 2017.
9. Kannaiah K L, Narayana, “Workshop Manual”, Scitech Publications, Chennai, Second Edition 1998.
10. H S Bawa, “Workshop Practice”, Tata McGraw Hill Publication, First Edition, 2004

INSTRUCTIONAL STRATEGY

This is hands-on practice based workshop for development of required skills in the students.

SECOND SEMESTER

SECOND SEMESTER

2.1 FUNDAMENTALS OF IT

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RATIONALE

Information technology has great influence on all aspects of life. Almost all work places and living environment are being computerized. In order to prepare diploma holders to work in these environments, it is essential that they are exposed to various aspects of information technology such as understanding the concepts of information technology and its scope, operating a computer: use of various office management tools, using internet and mobile applications etc. This course is intended to make new students comfortable with computing environment - Learning basic computer skills, learning basic application software tools, Understanding Computer Hardware, Cyber security awareness.

COURSE OUTCOMES

At the end of the course, student will be able to

CO1: Explain the basic components of Computers, Internet and issues of abuses/attacks on information and computers

CO2: Handle the computer/laptop/mobiles/Internet Utilities and Install/Configure OS

CO3: Assemble a PC and connect it to external devices

CO4: Manage and Use Office practiced Automation Tools

CO5: Develop worksheets and Prepare presentations

DETAILED CONTENTS

UNIT I

Basics of Computer

Brief history of development of computers, Definition of Computer, Block diagram of a Computer, Hardware, Software, Booting: Cold and Hot Booting, Interaction between the CPU and Memory with Input/output devices, Function of CPU and major functional parts of CPU.

Memory, Bit, Nibble, Byte, KB, MB, GB, TB, PB, Functions of memory, Use of storage devices in a Computer, List types of memory used in a Computer, Importance of cache memory, CPU speed and CPU word length

UNIT II

Basic Internet Skills

Understanding browser, Introduction to WWW, efficient use of search engines, awareness about Digital India portals (state and national portals) and college portals. Advantages of Email, Various email service providers, Creation of email id, sending and receiving emails, attaching documents with email and drive.

Effective use of Gmail, G-Drive, Google Calendar, Google Sites, Google Sheets, Online mode of communication using Google Meet & WebEx.

Unit III

Basic Logic building

Introduction to Programming, Steps involved in problem solving, Definition of Algorithm, Definition of Flowchart, Steps involved in algorithm development, differentiate algorithm and flowchart, symbols used in flowcharts, algorithms for simple problems, flowcharts for simple problems, Practice logic building using flowchart/algorithms

Unit IV

Office Tools

Office Tools like Libre Office/Open Office/MSOffice.

Open Office Writer – Typesetting Text and Basic Formatting, Inserting Images, Hyperlinks, Bookmarks, Tables and Table Properties in Writer

Introducing Libre Office/Open Office *Calc*, Working with Cells, Sheets, data, tables, using formulae and functions, using charts and graphics.

Open Office Impress – Creating and Viewing Presentations, Inserting Pictures and Tables, Slide Master and Slide Design, Custom Animation.

Unit V

Use of Social Media

Introduction to Digital Marketing – Why Digital Marketing, Characteristics of Digital Marketing, Tools for Digital Marketing, , Effective use of Social Media like LinkedIn, Google+, Facebook, Twitter, etc.: Features of Social media, Advantages and Disadvantages of Social Media.

PRACTICAL EXERCISES

1. Browser features, browsing, using various search engines, writing search queries
2. Visit various e-governance/Digital India portals, understand their features, services offered

3. Read Wikipedia pages on computer hardware components, look at those components in lab, identify them, recognize various ports/interfaces and related cables, etc.
4. Using Administrative Tools/Control Panel Settings of Operating Systems
5. Connect various peripherals (printer, scanner, etc.) to computer, explore various features of peripheral and their device driver software.
6. Explore features of Open Office tools and MS-Office, create documents, create presentation, create spread sheet, using these features, do it multiple times
7. Working with Conversion Software like pdfToWord, WordToPPT, etc.
8. Working with Mobile Applications – Searching for Authentic Mobile app, Installation and Settings, Govt. of India Mobile Applications
9. Creating email id, sending and receiving mails with attachments.
10. Using Google drive, Google calendar
11. Create Flow chart and Algorithm for the following

a. Addition of n numbers and display result
b. To convert temperature from Celsius to Fahrenheit
c. To find Area and Perimeter of Square
d. Swap Two Numbers
e. find the smallest of two numbers
f. Find whether given number is Even or Odd
g. To print first n even Numbers
h. find sum of series 1+2+3+…..+N
i. print multiplication Table of a number
j. generate first n Fibonacci terms 0,1,1,2,3,5…n (n>2)
k. sum and average of given series of numbers
l. Factorial of number n (n!=1x2x3x…n)
m. Armstrong Number
n. Find whether given number is Prime or not

RECOMMENDED BOOKS

1. R.S. Salaria, “Computer Fundamentals” Khanna Publishing House
2. Ramesh Bangia, “PC Software Made Easy – The PC Course Kit” Khanna Publishing House
3. Online Resources, Linux man pages, Wikipedia
4. Mastering Linux Shell Scripting: A practical guide to Linux command-line, Bash scripting, and Shell programming, by Mokhtar Ebrahim, Andrew Mallett
5. Vikas Gupta, “Comdex Hardware and Networking Course Kit” Dream Tech press, New Delhi, 2008

6. SumitabhaDas,"UNIX concepts and applications" Tata McGraw Hill, New Delhi, 4th Edition, 2008

SUGGESTED WEBSITES

1. https://nptel.ac.in/courses/106/106/106106222/ - NPTEL Course on Modern Application Development
2. https://onlinecourses.swayam2.ac.in/aic19_de01/preview -
3. https://spoken-tutorial.org/ - Tutorials on Introduction to Computers, HTML, Libre Office Tools, etc.
4. NOTEPAD++
5. https://tms-outsource.com/blog/posts/web-development-ide/

INSTRUCTIONAL STRATEGY

This is a skill based subject and topics taught in the class should be practiced in the Lab regularly for development of required skills in the students. This subject contains five units of equal weightage.

2.2 APPLIED PHYSICS-II

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RATIONALE

Applied physics includes the study of a large number of diverse topics all related to things that go on in the world around us. It aims to give an understanding of this world both by observation and by prediction of the way in which objects will behave. Concrete use of physical principles and analysis in various technical fields are given prominence in the course content to prepare students for various technical applications.

COURSE OUTCOMES

At the end of this course, the students will be able to:

CO1: Differentiate between types of waves and their motion.

CO2: Illustrate laws of reflection and refraction of light.

CO3: Demonstrate competency in phenomena of electrostatics and electricity.

CO4: Characterize properties of material to prepare new materials for various technical applications.

CO5: Demonstrate a strong foundation on Modern Physics to use at various technical applications.

DETAILED CONTENTS

UNIT I

Wave Motion and its Applications

1.1 Waves: definition, types (mechanical and electromagnetic wave)

1.2 Wave motion- transverse and longitudinal with examples, terms used in wave motion like displacement, amplitude, time period, frequency, wavelength, wave velocity; relationship among wave velocity, frequency and wave length

1.3 Simple harmonic motion (SHM): definition, examples

1.4 Cantilever: definition, formula of time period (without derivation)

1.5 Free, forced and resonant vibrations with examples

1.6 Sound waves: types (infrasonic, audible, ultrasonic) on the basis of frequency, noise, coefficient of absorption of sound, echo

UNIT II

Optics

2.1 Reflection and refraction of light with laws, refractive index

2.2 Lens: introduction, lens formulae (no derivation), power of lens and simple numerical problems

2.3 Total internal reflection and its applications, critical angle and conditions for total internal reflection

2.4 Superposition of waves (concept only), definition of Interference, Diffraction and Polarization of waves

2.5 Introduction to Microscope, Telescope and their applications

UNIT III

Electrostatics and Electricity

3.1 Electric charge, unit of charge, conservation of charge

3.2 Coulomb's law of electrostatics

3.3 Electric field, electric lines of force (definition and properties), electric field intensity due to a point charge

3.4 Definition of electric flux, Gauss law (statement and formula)

3.5 Capacitor and capacitance (with formula and unit)

3.6 Electric current and its SI Unit, direct and alternating current

3.7 Resistance, conductance (definition and unit)

3.8 Series and parallel combination of resistances

3.9 Ohm's law (statement and formula)

UNIT IV

Classification of Materials and their Properties

4.1 Definition of energy level, energy bands

4.2 Types of materials (conductor, semiconductor, insulator and dielectric) with examples, intrinsic and extrinsic semiconductors (introduction only)

4.3 Introduction to magnetism, type of magnetic materials: diamagnetic, paramagnetic and ferromagnetic materials with examples

4.4 Magnetic field, magnetic lines of force, magnetic flux

4.5 Electromagnetic induction (definition)

UNIT V

Modern Physics

5.1 Laser: introduction, principle, absorption, spontaneous emission, stimulated emission, population inversion

5.2 Engineering and medical applications of laser

5.3 Fibre optics**:** introduction to optical fibers (definition, principle and parts), light propagation, fiber types (mono-mode, multi-mode), applications in medical, telecommunication and sensors

5.4 Nanotechnology: introduction, definition of nanomaterials with examples, properties at nano scale, applications of nanotechnology (brief)

PRACTICAL EXERCISES

1. Familiarization with apparatus (resistor, rheostat, key, ammeter, voltmeter, telescope, microscope etc.)
2. To find the time period of a simple pendulum.
3. To study variation of time period of a simple pendulum with change in length of pendulum.
4. To determine and verify the time period of Cantilever.
5. To verify Ohm's laws by plotting a graph between voltage and current.
6. To study colour coding scheme of resistance.
7. To verify laws of resistances in series combination.
8. To verify laws of resistance in parallel combination.
9. To find resistance of galvanometer by half deflection method.
10. To verify laws of reflection of light using mirror.
11. To verify laws of refraction using glass slab.
12. To find the focal length of a concave lens, using a convex lens.

RECOMMENDED BOOKS

1. "Text Book ofPhysics forClass XII(Part-I, Part-II)", N.C.E.R.T., Delhi.
2. Dr.HHLal, "Applied Physics,Vol. I &II",TTTI Publications,TataMcGraw Hill, Delhi.
3. AS Vasudeva, "Applied Physics –II", Modern Publishers, Jalandhar.
4. R A Banwait, "Applied Physics – II", Eagle Prakashan, Jalandhar.
5. N Subrahmanyam, BrijLal and Avadhanulu, "A text book of OPTICS", S Chand Publishing, New Delhi.
6. E-books/e-tools/relevant software to be used as recommended by AICTE/ HSBTE/

NITTTR.
7. M H Fulekar, "Nanotechnology: Importance and Applications", IK International Publishing House (P) Ltd., New Delhi.
8. C. L. Arora, "Practical Physics", S Chand Publication.

SUGGESTED WEBSITES

1. http://swayam.gov.in

INSTRUCTIONAL STATREGY

This is hands-on practice based subject and topics taught in the class should be practiced in the Lab regularly for development of required skills in the students. This subject contains five units of equal weightage. Teacher may use various teaching aids like models, charts, graphs and experimental kits etc. for imparting effective instructions in the subject. Students need to be exposed to use of different sets of units and conversion from one unit type to another. Software may be used to solve problems involving conversion of units. The teacher should explain about field applications before teaching the basics of mechanics, work, power and energy, rotational motion, properties of matter etc. to develop proper understanding of the physical phenomenon. Use of demonstration can make the subject interesting and develop scientific temper in the students.

Teachers should give examples of engineering/technology applications of various concepts and principles in each topic so that students are able to appreciate learning of these concepts and principles. In all contents, SI units should be followed. Working in different sets of units can be taught through relevant software.

2.3 APPLIED MATHEMATICS – II

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RATIONALE

Applied mathematics forms the backbone of engineering students. Basic elements of Differential calculus, Integral calculus and Differential Equations have been included in this course. This will develop analytical abilities to apply in engineering field and will provide continuing educational base to the students.

COURSE OUTCOMES

After undergoing the subject, the students will be able to:

CO1: Formulate the engineering problems into mathematical format with the use of differential equations and differential

C02: Use the differentiation and Integration in solving various Mathematical and Engineering problems.

CO3: Calculate the approximate area under a curve by applying integration and numerical methods.

CO4: Understand the purposes of measures of central tendency and calculate the measures of central tendency (mode, median, mean) for a set of data.

CO5: Learn about basic fundamentals about MATLAB/ SciLab and mathematical calculation with MATLAB/ SciLab software.

DETAILED CONTENTS

UNIT I

Differential Calculus

1.1 Definition of function; Concept of limits (Introduction only) and problems related to four standard limits only.

1.2 Differentiation of x^n, sin x, cos x, e^x by first principle.

1.3 Differentiation of sum, product and quotient of functions.

UNIT II

Differential Calculus and Its Applications

2.1 Differentiation of trigonometric functions, inverse trigonometric functions. Logarithmic differentiation, successive differentiation (upto 2nd order)

2.2 Application of differential calculus in:

(a) Rate measures (b) Maxima and minima

UNIT III

Integral Calculus

3.1 Integration as inverse operation of differentiation with simple examples.

3.2 Simple standard integrals and related problems, Integration by Substitution method and Integration by parts.

3.3 Evaluation of definite integrals with given limits.

Evaluation of $\int_0^{\pi/2} \sin^n x.\, dx$, $\int_0^{\pi/2} \cos^n x\, dx$, $\int_0^{\pi/2} \sin^m x\, \cos^n x\, dx$

using formulae without proof (m and n being positive integers only) using pre-existing mathematical models.

UNIT IV

Application of Integration, Numerical Integration and Differential Equations

4.1 Applications of integration: for evaluation of area under a curve and axes (Simple problems).

4.2 Numerical integration by Trapezoidal Rule and Simpson's $1/3^{rd}$ Rule using pre-existing mathematical models.

Differential Equations

4.3 Definition, order, degree, Type of differential Equations, linearity, Formulation of ordinary differential equation (up to 1^{st} order), solution of ODE (1^{st} order) by variable separation method.

UNIT V

Statistics and Software

Statistics

5.1 Measures of Central Tendency: Mean, Median, Mode

5.2 Measures of Dispersion: Mean deviation, Standard deviation

Software

5.3 SciLab software – Theoretical Introduction.

5.4 Basic difference between MATLAB and SciLab software,

5.5 Calculations with MATLAB or ScilLab - (a) Representation of matrix (2×2 order), (b) Addition, Subtraction of matrices (2×2 order) in MATLAB or SciLab

RECOMMENDED BOOKS

1. R. D. Sharma, "Applied Mathematics – I & II for Diploma Courses", DhanpatRai Publications.
2. "Mathematics for Class XI", NCERT Publication, New Delhi.
3. "Mathematics for Class XII", NCERT Publication, New Delhi.
4. H. K Dass, "Applied Mathematics for Polytechnics", CBS Publishers & Distributers.
5. A Ganesh and G Balasubramanian, "Textbook of Engineering Mathematics –I", CBS Publisher, New Delhi.
6. A Ganesh and G Balasubramanian, "Textbook of Engineering Mathematics –II", CBS Publisher, New Delhi.
7. G. B. Thomas, R. L. Finney, "Calculus and Analytic Geometry", Addison Wesley, Ninth Edition.
8. B S Grewal, "Elementary Engineering Mathematics", Khanna Publishers, Delhi, Thirty-fifth Edition.
9. R.K. Jain and S.R.K. Iyengar, "Advanced Engineering Mathematics" Narosa Publishing House, New Delhi, Second Edition, 2003.
10. SS Sabharwal & Dr Sunita Jain, "Applied Mathematics Vol. I & II", Eagle Parkashan, Jalandhar.
11. S Kohli, "Engineering Mathematics Vol. I & II", IPH, Jalandhar.
12. Reena Garg & Chandrika Prasad, "Advanced Engineering Mathematics", Khanna Publishing House, New Delhi.
13. R. Pratap, "Getting Started with MATLAB 7", Oxford University Press, Seventh Edition.
14. E-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

SUGGESTED WEBSITES

1. https://www.scilab.org
2. http://swayam.gov.in

INSTRUCTIONAL STRATEGY

This is theoretical subject and contains five units of 20% equal weightage.Basic elements of Differential Calculus, Integral Calculus, and Differential Equations can be taught in the light of their applications in the field of engineering and technology. By laying more stress on applied part, teachers can also help in providing continuing education base to the students. Students need to be taught the skills needed to use software tools built by experts through multiple problem solving based on the topics that the industry requires. For example they need to know how to use mathematical models that use integration as opposed to learning how integration can be used. Useful authenticated software MATLAB or open source software SciLab can be taught theoretically by books/online literatures and basic operations can be shown practically with practical software laboratory or small mobile apps of these software or authentic Trial version of MATLAB/ SciLab software. Diploma students need to know which tools to use and how to do the job.

2.4 CIVIL ENGINEERING PRACTICES

L	P
-	6

RATIONALE

Diploma holders in Civil Engineering are expected to supervise construction of buildings and irrigation structures. This subject aims at imparting skills for preparing constructional drawing of various components of building and irrigation engineering drawings to develop competencies for reading and interpreting the drawings, and their execution in their field.

COURSE OUTCOMES

After undergoing the subject, students will be able to:

CO1: Layout foundation plan of different types of foundations
CO2: Prepare details of brick courses in joints
CO3: Explain the drawing to craftsman
CO4: Draw the drawing of channel (L-section and cross-section)
CO5: Draw layout plan of a canal head works
CO6: Read and interpret the Building and Irrigation Engineering Drawings

DETAILED CONTENTS CUM PRACTICALS

BUILDING DRAWING(Part A)

Drawing No. 1

Details of spread footing foundations, load bearing and non-load bearing wall for given thickness of walls with the help of given data or rule of the thumb, showing offsets, position of DPC. The details of the concrete and brick apron have to be shown in the drawing.

Drawing No. 2

Plans of 'T' and Corner junction of walls of 1 Brick, 1-1/2 Brick and 2 brick thick in English bond.

Drawing No. 3

Drawing plan, elevation of arches: circular arch, segmental arch (one sheet)

Drawing No. 4

Elevation, sectional plan and sectional side elevation of flush door, glazed door, panelled door with wire gauge shutter.

Drawing No. 5

Drawing details of damp proofing arrangement of roofs and walls as per BIS Code. Show the rain water drainage arrangement also.

Drawing No. 6

Drawing Damp Proofing details in basement of buildings

IRRIGATION ENGINEERING DRAWING (Part B)

Drawing No. 7

Typical cross-section of a channel

- L-section of a channel for given data
- Typical cross section of an unlined and lined channel in cutting, partly cutting, and partly filling and fully in filling with given design data.

Drawing No. 8

Layout plan of a canal head works

Drawing No. 9

Draw the typical L-section of a weir

Drawing No. 10

Draw the X-section of an Earthen Dam

i) Homogeneous

ii) Zoned type

iii) Diaphragm type

Drawing No. 11

Cross section of a tube well

Drawing No. 12

Layout and cross section of rain water harvesting system.

RECOMMENDED BOOKS

1. "Civil Engineering Drawing" by Layal JS ; SatyaParkashan, New Delhi
2. " Civil Engineering Drawings" by Chandel RP
3. " Civil Engineering Drawing by Kumar NS; IPH, New Delhi
4. "Civil Engineering Drawing" by Malik RS and Meo GA ; Asian Publishing House, New Delhi
5. "Civil Engineering Drawing" by S.K. Garg; Khanna Publishers.
6. E-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

SUGGESTED WEBSITES

1. http://swayam.gov.in

INSTRUCTIONAL STRATEGY

Teachers are expected to develop skills in preparation and interpretation of building construction and irrigation engineering drawings as per BIS codes of practice. Attention must be paid towards line work, specifications writing, dimensioning, proportioning and accuracy for industrial unit at different intervals of time. Reading and interpreting actual field drawings should also be practiced so as to develop necessary competency in the students.

Important Note:

i) Paper should be set from Part A of 30 marks and Part B of 30 marks

2.5 CONSTRUCTION MATERIALS

L	P
2	4

RATIONALE

Civil Engineering diploma holders have to supervise construction of various types of civil works involving use of various materials like stones, bricks and tiles, cement and cement based products, lime, timber and wood based products, paints and varnishes, metals and other miscellaneous materials. The students should have requisite knowledge regarding characteristics, uses and availability of various building materials and skills in conducting tests to determine suitability of materials for various construction purposes. In addition, specifications of various materials should also be known (PWD/BIS) for effective quality control.

COURSE OUTCOMES

After undergoing the subject, the students will be able to:

CO1: Identify different types of rocks, bricks and tiles
CO2: Perform laboratory tests of cement to determine properties of cement, bricks, tiles.
CO3: Identify types of defects of timber
CO4: Select paints/varnishes for various types of surfaces
CO5: Identify and use different types of metals/alloys
CO6: Select different materials used for wall paneling and false ceiling, such PVC, POP etc.

DETAILED CONTENTS

UNIT I

1. Building Stones

1.1 Sources of Stones
1.2 Quarrying of stones by blasting and its effect on environment
1.3 Dressing of stones
1.4 Requirements of good building stones
1.5 Various uses of stones in construction
1.6Artificial Stones: Procedure of making an artificial stone, forms of artificial stones, advantages of artificial stones.

2. Bricks

2.1 Introduction to bricks

2.2 Raw materials for brick manufacturing and properties of good brick making earth

2.3 Manufacturing of bricks

2.3.1 Preparation of clay (Manual and Mechanically)

**2.3.2 Moulding: Hand moulding and machine moulding brick table; drying of bricks,

2.4 Burning of bricks: Bull's Trench Kiln, Hoffman's Kiln and Zig- Zag Kiln (only line diagram of kilns)

2.5 Sun dried bricks, Traditional bricks, Refractory bricks, Fly ash bricks, Hollow bricks,

2.6 Size and weight of standard brick

2.7 Classification and specifications of bricks as per BIS: 1077

2.8 Stacking of bricks and tiles at site

UNIT II

3. Tiles

3.1 Brick tiles and their uses

3.2 Ceramic tiles and their uses

3.3 Vitrified tiles and their uses

3.4 PVC Tiles and uses,

3.5 Paver blocks, interlocking tiles

4. Cement

**4.1 Introduction, raw materials, flow diagram of manufacturing of cement

4.2 Various types of cements, their uses and testing: Ordinary portland cement, rapid hardening cement, White cement, Portland pozzolana cement

4.3 Properties of cement

4.4 Storage of Cement at site

UNIT III

5. Timber and Wood Based Products

5.1 Identification and uses of different types of timber: Teak, Deodar, Shisham, Sal, Mango, Kail, Chir, Fir, Hollock, Champ

** 5.2 Seasoning of timber: Purpose, methods of seasoning as per BIS Code

5.3 Properties of timber and specifications of structural timber

5.4 Preservation of timber and methods of treatment as per BIS

5.5 Other wood based products, their brief description of manufacture and uses: Laminated Board, Block Board, Fibre Board, Hard board, Sunmica, Plywood, and Veneers

6. Paints, Varnishes and Distempers:

6.1 Paints

6.1.1 Purpose and use of paints

6.1.2 Characteristics of an ideal paint

6.1.3 Types of paints: Oil paints, Water paints, Cement paints and Enamel paint**

6.1.4 Covering capacity of paints

6.2 Varnishes

6.2.1 Purpose and use of varnishes

6.2.2 Characteristics of an ideal varnish

6.2.3 Types of varnishes

6.3 Distemper

6.3.1 Properties of distemper and process of distempering.

UNIT IV

7. Metals and Non Metals

7.1 Ferrous metals: Composition, properties and uses of cast iron, mild steel, HYSD steel, high tension steel as per BIS.

7.2 Commercial forms of ferrous, metals.

7.3 Properties and use of Aluminium

7.4 Properties and use of Stainless Steel.

8. Plastics

8.1 FRP: Introduction, Properties of FRP and Applications of FRP in Building Industry

8.2 PVC wall paneling

8.3 ACP and HPL Sheets

UNIT V

9. Miscellaneous Materials

9.1 Asbestos: Introduction, properties and use of asbestos.

9.2 Types and uses of insulating materials for sound and thermal insulation

9.3 Construction chemicals like water proofing compound, epoxies, polymers

9.4 Water proofing and termite proofing materials – types and uses

9.5 Materials used in interior decoration works like POP, methods of doing POP

9.6 Eco friendly materials for construction of buildings.

NOTE: **A field visit may be planned to explain and show the relevant things

PRACTICAL EXERCISES

1. To identify the stones used in building works by visual examination
2. To determine the crushing strength of bricks
3. To determine the water absorption of bricks
4. To determine the efflorescence of bricks
5. To conduct a practical for dimensional tolerances of a brick.
6. To perform the following field tests on cement to judge the quality of cement:
7. Date of Packing, Colour, Hand Insertion, Float Test, Smell Test, and Presence of lumps.
8. To identify various types of timbers such as: Teak, Sal, Chir, Shisham, Deodar, Kail&Hollock by visual examination only
9. The students should submit a report work on the construction materials **(at least one per week)** as mentioned below. They will also show the competitive study based upon the **Cost, Brand Name and Sizes** available in the local market.

a) Plywwod, Veneers, Sunmica
b) Paints, Varnishes and Distempers
c) Aluminium and Stainless steels
d) Water proofing material
e) PVC Panels and FRPs
f) POP and Asbestos sheets
g) Termites, Polymers and Epoxies

RECOMMENDED BOOKS

1) "Engineering Materials" by D Sharma, SK and Mathur GC; S. Chand and Co. Jalandhar
2) "Engineering Materials" by Surendra Singh; Vikas Publishing House Pvt. Ltd. New Delhi
3) "Engineering Materials" by Bahl, SK; , Rainbow Book Co., Delhi
4) "Civil Engineering Materials" by TTTI, Chandigarh; Tata McGraw Hill Publication, New Delhi.
5) "Engineering Materials" by Shahane; Allied Book Stall, Poona,
6) "Engineering materials" by Gurcharan Singh; Standard Publishers Distributors, Delhi..
7) "Construction Materials" by SC Rangawala; Charoter Publishers
8) "Construction Materials" by Alam Singh
9) "Lab Manual in Testing of Engineering Materials" by Dr. HemantSood; New Age International (P) Ltd., New Delhi
10) Handbook of Civil Engineering by PN Khanna.
11) e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

SUGGESTED WEBSITES

1. http://swayam.gov.in

INSTRUCTIONAL STRATEGY

Teachers are expected to physically show various materials while imparting instructions. Field-visits should also be organized to show manufacturing processes and use of various materials in Civil engineering works. Students should be encouraged to collect sample of various building materials so as to create a museum of materials in the polytechnic. This subject contains five units of equal weightage.

2.6 APPLIED MECHANICS

L	P
3	2

RATIONALE

This course Applied Mechanics deals with basic concepts of mechanics like laws of forces, moments, friction, centre of gravity, laws of motion and simple machines which are required by the students for further understanding of other allied subjects. The subject enhances the analytical ability of the students.

COURSE OUTCOMES

After undergoing this subject, the students will be able to:

CO1: Draw free body diagrams.by analyzing different types of forces acting on a body.
CO2: Determine the resultant of coplanar concurrent forces.
CO3: Solve problems by using principle of moment.
CO4: Calculate the least force required to maintain equilibrium on an inclined plane.
CO5: Determine the centroid/centre of gravity of plain and composite laminar and solid bodies.
CO6: Determine velocity ratio, mechanical advantage and efficiency of simple machines.

DETAILED CONTENTS

UNIT 1

1. Introduction

Concept of mechanics, Classification of mechanics, utility of mechanics in engineering field, Concept of rigid body, scalar and vector quantities.

2. **Laws of forces**

Definition of force, measurement of force in SI units, its representation, types of force: Point force/concentrated force & Uniformly distributed force, effects of force, characteristics of a force, Different force systems (coplanar and non-coplanar), principle of transmissibility of forces, law of superposition, Free body diagram, Composition and resolution of coplanar concurrent forces, resultant force, method of composition of forces, laws of forces, parallelogram law of forces (with derivation), triangle law of forces, polygon law of forces - graphically, analytically, resolution of forces, resolving a force into two rectangular components, Lami's theorem, Simple numericals, Equilibrium of forces and its determination.

UNIT II

3. Moment

Concept of moment, Moment of a force and units of moment, Varignon's theorem (definition only), Principle of moment and its applications (Levers – simple and compound, steel yard, safety valve), Simple numericals. Parallel forces (like and unlike parallel force), calculating their resultant, Concept of couple, its properties and effects, General conditions of equilibrium of bodies under coplanar forces, Position of resultant force by moment.

UNIT III

4. Friction

Definition and concept of friction, types of friction, force of friction, Laws of static friction, coefficient of friction, angle of friction, angle of repose, cone of friction, Equilibrium of a body lying on a horizontal plane, equilibrium of a body lying on a rough inclined plane. Calculation of least force required to maintain equilibrium of a body on a rough inclined plane subjected to a force acting along the inclined plane and subjected to a force acting at some angle with the inclined plane, Simple numericals.

UNIT IV

5. Centre of Gravity and Centroid

Concept, definition of centroid of plain figures and centre of gravity of symmetrical solid bodies. Axis of symmetry, Reference axis. Determination of centroid of plain and composite lamina (T, L, C and I shape) using moment method only, centroid of bodies with removed portion. Determination of center of gravity of solid bodies - cone, cylinder, hemisphere and sphere; composite bodies and bodies with portion removed.

6. Laws of Motion

Newton’s laws of motion and their applications, Concept of momentum. Derivation of force equation from second law of motion, numerical problems on second law of motion. Bodies tied with string, Newton’s third law of motion, numerical problems, conservation of momentum, impulse and impulsive force.

UNIT V

7. Simple Machines

Definition of effort, velocity ratio, mechanical advantage and efficiency of a machine and their relationship, law of machines, Simple and compound machine (Examples). Definition of ideal machine, reversible and self-locking machine. Effort lost in friction, Load lost in friction, determination of maximum mechanical advantage and maximum efficiency, Simple numerical.

System of pulleys (first, second, third system of pulleys), determination of velocity ratio, mechanical advantage and efficiency. Working principle and application of wheel and axle, Weston's Differential Pulley Block, simple screw jack, worm and worm wheel, single and double winch crab. Expression for their velocity ratio and field of their application.

PRACTICAL EXERCISES

1. Verification of polygon law of forces using universal force table/Gravesend apparatus.
2. Verification of Lami's theorem.
3 To verify law of moments by using Bell crank lever.
4. To verify the forces in different members of jib crane.
5. To determine coefficient of friction between three pairs of given surface.
6. To find out center of gravity of regular lamina.
7. To find out center of gravity of irregular lamina.
8. To find the mechanical advantage, velocity ratio and efficiency of a screw jack.
9. To find the mechanical advantage, velocity ratio and efficiency of worm andworm wheel.
10. To find mechanical advantage, velocity ratio and efficiency of single purchase crab.

RECOMMENDED BOOKS

1. Birinder Singh,"Text Book of Applied Mechanics", Katson Publishing House, New Delhi.
2. A. K. Upadhyay, "Text Book of Applied Mechanics", SK Kataria & Sons, New Delhi.
3. S. Ramamurtham, "A Text Book of Applied Mechanics", Dhanpat Rai Publishing Company Pvt. Ltd, Delhi.
4. R. S. Khurmi, "A Text Book of Engineering Mechanics (Applied Mechanics)", S Chand and Co. Ltd., New Delhi.
5. R. K. Rajput, "A Text Book of Applied Mechanics", Laxmi Publications, New Delhi.
6. D. S. Bedi, "Engineering Mechanics", Khanna Publishing House, New Delhi.

INSTRUCTIONAL STRATEGY

This is hands-on practice based subject and topics taught in the class should be practiced in the lab regularly for development of required skills in the students. This subject contains five units of equal weightage.

2.7 ENVIRONMENTAL STUDIES AND DISASTER MANAGEMENT

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2	-

RATIONALE

A diploma holder must have knowledge of different types of pollution caused due to industrial and construction activitiesso that he/she may help in balancing the ecosystem and controlling pollution by various control measures. The course is intended to provide a general concept in the dimensions of environmental pollution and disasters caused by nature beyond the human control as well as the disasters and environmental hazards induced by human activities with emphasis on disaster preparedness, response and recovery.

COURSE OUTCOMES

After undergoing the subject, the student will be able to:

CO1: Comprehend the importance of sustainable ecosystem
CO2: Demonstrate interdisciplinary nature of environmental issues
CO3: Implement corrective measures for the abatement of pollution.
CO4: Identify the role of non-conventional energy resources in environmental protection.
CO5: Manage various types of disasters

DETAILED CONTENTS

UNIT I

Introduction

1.1 Basics of ecology, eco system- concept, and sustainable development, Sources, advantages, disadvantages of renewable and nonrenewable energy.
1.2 Rain water harvesting
1.3 Deforestation – its effects & control measures

UNIT II

Air and Noise Pollution

2.1 Air Pollution: Source of air pollution. Effect of air pollution on human health, economy, Air pollution control methods.

2.2 Noise Pollution: Source of noise pollution, Unit of noise, Effect of noise pollution, Acceptable noise level, Different method of minimizing noise pollution.

UNIT III

Water and Soil Pollution

3.1 Water Pollution: Impurities in water, Cause of water pollution, Source of water pollution. Effect of water pollution on human health, Concept of DO, BOD, COD. Prevention of water pollution- Water treatment processes, Sewage treatment. Water quality standard.

3.2 Soil Pollution :Sources of soil pollution, Effects and Control of soil pollution, Types of Solid waste- House hold, Industrial, Agricultural, Biomedical, Disposal of solid waste, Solid waste management E-waste, E – waste management

UNIT IV

Impact of Energy Usage on Environment

Global Warming, Green House Effect, Depletion of Ozone Layer, Acid Rain. Eco-friendly Material, Recycling of Material, Concept of Green Buildings, Concept of Carbon Credit & Carbon footprint.

UNIT V

Disaster Management

A. Different Types of Disaster:

Natural Disaster: such as Flood, Cyclone, Earthquakes and Landslides etc.

Man-made Disaster: such as Fire, Industrial Pollution, Nuclear Disaster, Biological Disasters, Accidents (Air, Sea Rail & Road), Structural failures(Building and Bridge), War & Terrorism etc.

B.Disaster Preparedness:

Disaster Preparedness Plan

Prediction, Early Warnings and Safety Measures of Disaster

Psychological response and Management (Trauma, Stress, Rumour and Panic)

RECOMMENDED BOOKS

1. Environmental Studies by S.C. Sharma & M.P. Poonia, Khanna Publishing House, New Delhi
2. Environmental and Pollution Awareness by Sharma BR; SatyaPrakashan, New Delhi.
3. Environmental Pollution by Dr. RK Khitoliya; S Chand Publishing, New Delhi

4. Environmental Studies by ErachBharucha; University Press (India) Private Ltd., Hyderabad.
5. Environmental Engineering and Management by Suresh K Dhamija; S K Katariaand Sons, New Delhi.
6. E-books/e-tools/relevant software to be used as recommended by AICTE/BTE/NITTTR, Chandigarh.
7. Disaster Management by Dr. Mrinalini Pandey, Wiley India Pvt. Ltd.
8. Disaster Science and Management by Tushar Bhattacharya, McGraw Hill Education (India) Pvt. Ltd.

INSTRUCTIONAL STRATEGY

In addition to theoretical instructions, different activities pertaining to Environmental Studies and Disaster Management like expert lectures, seminars, visits etc. may also be organized This subject contains five units of equal weightage.

EFFECTIVE IMPLEMENTATION
&
EVALUATION TOOLS

28. ASSESSMENT TOOLS AND CRITERION

The assessment is carried out by conducting:

1. Formative assessments
2. Summative assessments

1. FORMATIVE ASSESSEMENT

The formative assessment will be evaluated on the basis of the internal assessments for theory subjects and practical by the concerned teachers for evaluating the knowledge and skill acquired by students and the behavioral transformation of the students. This internal assessment is primarily carried out by collecting evidence of competence gained by the students by evaluating them at work based on assessment criteria, asking questions and initiating formative discussions to assess understanding and by evaluating records and reports, and sessional marks are awarded to them.

2. SUMMATIVE ASSESSMENT

The summative assessment will include end semester examination for theory part for each candidate and practical examination with viva voice. Each Performance Criteria will be assigned marks proportional to its importance and proportion of marks for Theory and Skills Practical for each subject should be laid down. The following assessment tools are used for effective student evaluation:

1. Theory
2. Practical
3. Minor &Major Project
4. Massive Open Online Courses(MOOCs)
5. VivaVoce
6. Summer Industrial / In House Training
7. Professional Industrial Training

1. Theory Assessment

Evaluation in theory aims at assessing students' understanding of concepts, principles and procedures related to a course/subject, and their ability to apply learnt principles and solve problems.

The formative evaluation for theory subjects may be caused through

i. Sessional/class-tests,
ii. Quizzes,
iii. Assignments,
iv. Seminars /Presentations
v. Attendance
vi. Case Studies

For Summative evaluation of theory, the question paper may comprise of three sections.

i. It should contain objective type question and multiple choice questions. The objective type items should be used to evaluate students' performance in knowledge, comprehension and at the most application domains only.

ii. It should contain short answer questions.

iii. Descriptive type questions, with some internal choice of the questions set may be given in this section

2. Practical Assessment

Evaluation of students performance in practical work (Laboratory experiments, Workshop practical /field exercises) aims at assessing students ability to apply or practice the concepts, principles and procedures, manipulative skills, ability to observe and record, ability to interpret and draw conclusions and work related attitudes. This will comprise of a creation of mock environment, wherever applicable in the skill lab which is equipped withall required equipment for development of desired skills. Candidate's soft skills, communication, aptitude, safety consciousness, quality consciousness etc. will be ascertained by observation and will be marked in observation checklist along with the assessment of Job carried out in labs and maintenance of Lab Record Files.

Formative and summative evaluation may comprise of weight ages to performance on task, quality of product, general behavior and it should be followed by viva-voce of the relevant subject. The end product will be measured against the specified dimensions and standards to gauge the level of skill achievements

3. Minor and Major Project Assessment

The purpose of evaluation of project work is to assess student's ability to apply, in an integrated manner, knowledge and skills in solving real life problems, manipulative skills, ability to observe, record, creativity and communication skills. The project work assigned should be of relevance to the core skill, state of the art topics and the project areas that are pertaining to enhance job skill and enhance occupational opportunities. For both, minor and major project, Formative and summative evaluation may comprise of weight ages to performance on task, quality of product, nature and relevance of project and general behavior.

The formative assessment should include the continuous assessment based on the work allocated and mid semester viva voice or presentation. The final assessment will be the combination of the project undertaken, report submission and should be followed by viva- voce of the relevant subject.

In case of the assessment of this component, the team of examiners should be constituted and half of the examiners in the team should be invited from outside of the institute as expert for conducting the examination.

4. Massive Open Online Courses (MOOCs) Assessment

Open Elective and Multi-Disciplinary Elective may be covered through Massive Open Online Courses (MOOCs) to promote self-learning. These platforms promise open, online courses to massive numbers of students as they are free to join; they provide a wide range of courses. They allow for space and time flexibility and their participants can benefit from various online communication tools and access to quality content.

The coordinating Department/Centre/Office shall monitor every student to adopt the courses online of their choice and preference on Swayam portal. The duration of courses will vary depending on the level and credit points. Courses offered in the duration of 4-10 weeks for 2 to 3 credits at diploma level are to be opted. Students can get a certificate after registering and attending the classes and submitting the assignments/quizzes and qualifying nationwide conducted written exam

.

On successful completion of each course, the institution offering the MOOCs course would issue the certificate, along with the number of credits and grades, through which the student can get credits transferred into his marks certificate issued by the parent institution. There may be standard norms for the host Institution to conduct the course that may include continuous evaluation through assignments, online quizzes, case studies, online writing exercises, term examinations, student feedback, online forum management, etc. The coordinating Department/Centre/Office of the respective department shall monitor every student and submit to the Office of Examinations, a score sheet before the close of the even semester.

5. Viva Voce Assessment

This tool will be used to assess the conceptual understanding and the behavioral aspects as regards the job role and the specific task at hand. It will also include questions on safety, quality, environment and equipment's etc. Ask questions on non-prescribed tasks to ensure that the learners have complete knowledge on the assessment

6. Summer / In-house Training Assessment

The two mandatory internships after First and Second Year of are to be assessed in 3rd and 5th semester subsequently. The training should be preferably done in the industry but can also be in house depending upon the stream and availability of resources in and around the institute. Faculty should be assigned each student and made responsible for the evaluation and assessment of the training. Formative assessment should be taken from the industry/institute/ department on the basis of performance, behavior and learning capabilities. Summative evaluation may comprise of weight ages on the basis of report submission / presentation followed by viva-voce of the relevant subject.

7. Professional Industrial Training Assessment

Evaluation of professional industrial training report and viva-voce/ presentation aims at assessing students' understanding of industrial processes, practices in the industry/field and their ability to engage in activities related to problem-solving in industrial setting as well as understanding of application of learnt knowledge and skills in real life situation. Formative and summative evaluation may comprise of weight ages to performance on task, quality of product, general behavior and it should be followed by viva-voce of the relevant subject.

The formative assessment should include the evaluation from the employer where the student is doing his training in the ratio of 40:60. The final assessment will be the combination of the employer assessment and evaluation by the faculty of the institute which shall include report submission/ presentation/ seminar followed by viva-voce of the relevant subject.

SGPA AND CGPA ASSESSMENT

The UGC recommends the following procedure to compute the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

i. The SGPA is the ratio of sum of the product of the number of credits with the marks scored by a student in all the courses taken by a student and the sum of the number of credits of all

the courses undergone by a student, i.e

SGPA (Si) = ∑(Ci x Gi) / ∑Ci

where Ci is the number of credits of the ith course and Gi is the marks scored by the student in the its course.

ii. The CGPA is also calculated in the same manner taking into account all the courses undergone by a student over all the semesters of a programme,i.e.

CGPA = ∑(Ci x Si) / ∑ Ci

where Si is the SGPA of the ith semester and Ci is the total number of credits in that semester.

iii. The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

29. TEACHING LEARNING TOOLS FOR EFFECTIVE IMPLEMENTATION

For effective implementation of curriculum, the faculty and staff of institutions have to play a vital role in planning instructional experiences for the courses in four different environments viz. class-room, laboratory, library and field and execute them in right perspective. It is emphasized that only a proper mix of different teaching methods in all these places of instruction can bring the changes in students behaviour as stipulated in the curriculum document. It is important to understand curriculum document holistically and further be aware of intricacies of Teaching- Learning Tools for achieving curriculum objectives. Given below are certain recommendations which may help in carrying out teaching-learning effectively:

PROGRAMME LEVEL RECOMMENDATIONS

1. Curriculum implementation takes place at programme, course and class-room level respectively and synchronization among them is required for its success. The first step towards achieving synchronization is to read curriculum document holistically and understand its rationale and philosophy.

2. An academic plan needs to be prepared at institute level. The Head of the institute has a great role to play in its dissemination and percolation up to grass-root level.

3. Heads of Department are required to prepare academic plan at department level referring to institutional academic plan.

COURSE LEVEL RECOMMENDATIONS

Teachers are educational managers at class room level and their success in achieving course level objectives lies in using course plan and their judicious execution which is very important for the success of programme by achieving its objectives. Teachers are required to plan various instructional experiences viz. theory lecture, expert lectures, lab/workshop practical's, guided library exercises, field visits, study tours, camps etc. In addition, they have to carry out progressive assessment of theory, assignments, library, practical's and field experiences. Teachers are also required to do all these activities within a stipulated period which is made available to them in the academic plan at Board level. With the amount of time to their credit, it is essential for them to use it judiciously by planning all above activities properly and ensure execution of the plan effectively.

Following is the gist of suggestions for subject teachers for effective utilization of Teaching Learning Tools to achieve the course objectives:

1. Teachers need to ensure attainment of course outcomes so as to help the students achieve program outcomes and also meet the desired learning outcomes in five domains of NSQF i.e. Process, Professional knowledge, Professional skills, Core skills and Responsibility.

2. Teachers are required to prepare a course plan, taking into account number of weeks available and courses to be taught.

3. Teachers are required to prepare lesson plan for every theory class. This plan may comprise of contents to be covered, learning material for execution of a lesson plan.

4. Teachers are required to plan for expert lectures from field/industry. For this, necessary steps need to be taken such as planning in advance, identifying field experts, making correspondence to invite them, taking necessary budgetary approvaletc.

5. Teachers are required to plan for guided library exercises by identification of course specific experience requirement, setting time, assessment, etc. The assignments and seminars can be thought of as terminal outcome of library experiences.

6. Concept based industrial/field visits may be planned and executed for such contents of course which are abstract in nature and no other requisite resources are readily available in institute to impart them effectively.

7. Lot of focus needs to be laid on skill development. There is need for planning practical experiences in right perspective. These slots in a course are the avenues to use problem based learning and experiential learning effectively. The development and use of lab manuals will enable the institutes to provide lab experiences effectively.

8. Emphasis should to laid on developing soft skills like communication skills, personality Development, self-learning, inter personal skills, problem solving, and creativities.

9. Where ever possible, it is essential to use activity based learning rather than relying on delivery based conventional teaching all the time. While teaching, the teacher should make extensive use of audio visual aids such as video films, power point presentations and ITtools.

10. Teachers may take an initiative in establishing liaison with industries and field organizations for imparting field experiences to the students.

11. To enhance digital learning, open electives and multi-disciplinary electives have been provided in the curriculum to be taken up in the form of MOOCs. For Open electives, some courses may be identified out of the prescribed list given in the curriculum keeping in mind the interest of students. Similarly, for multi-disciplinary electives, courses to be offered may be identified by considering their relevance and utility. Every year SWAYAM is notifying the list of courses which are going to be offered in forthcoming even and odd semester. The institute needs to select the courses that are offered on SWAYAM platform or any other online platform.

12. For effective implementation of Massive Open Online Courses (MOOCs), a faculty member in the department may be identified and given the responsibility to coordinate various activities related to MOOCs. The concerned faculty member will facilitate in registration of students for MOOCs. The faculty member will also be responsible for compiling the result of students on the completion of MOOCs and pass on the information to the concerned authority.

13. Flexibility has been provided in the curriculum for the students to choose a course related to the discipline as per their interest. For effective implementation of discipline-specific electives, the institute should identify some courses from the list of courses prescribed in the curriculum. The courses should be selected and offered keeping in mind the interest of students, infrastructure and expertise available in and around the institute related to the courses. Option for discipline-specific elective may be taken from students through a form and a course, with more than 10 students opting for it, may be run.

14. Students should be made aware about issues related to ecology and environment, safety, concern for wastage of energy and other resources etc.

15. Any relevant contents beyond the syllabus may be covered by the teacher or experts in extra time.

16. Minor project should be identified and allocated taking into consideration the inputs from industry stake-holders, and departmental faculty. The minor project work should be such

that it enhances the fundamental skill-sets of the students from industry perspective and subsequently helps them to handle major project.

17. For major project work, students may be given relevant and well thought out problems, which are purposeful and develop practical skills. This will help the students in developing creativity and confidence for their gainful employment.

18. A Project bank may be developed in consultation with related industry, research institutes and other relevant field organizations. It may be ensured that that the students take up some live problems being faced by industry as part of project work.

30. LIST OF EXPERTS AND REVIEWERS

1. Mr. Subhash Dahiya, HOD, Department of Civil Engineering, CR Polytechnic, Rohtak.

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6. Prof. HS Rai, Professor & Head, Department of Civil Engineering, Guru Nanak Dev University, Ludhiana.

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15. Dr. Ashok Kumar, Associate Professor, Applied Science Department, NITTTR, Chandigarh.

16. Smt. Pushpa Rani, Senior Lecturer, Applied Science Department, Government Polytechnic, Sonipat, Haryana.

17. Smt. Krishna Bhoria, Lecturer, Applied Science Department, Government Polytechnic, Ambala, Haryana.

18. Smt. Preetpal Kaur, Guest Faculty, Applied Science Department, Government Polytechnic, Ambala, Haryana.

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32. Sh. Dinesh Mor, Workshop Superintendent, Workshop Department, Government Polytechnic, Sonipat, Haryana.

33. Sh. Balwan Singh, Workshop In-charge, Mechanical Engineering Department, Aryabhatt Institute of Technology, Delhi.

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COMPETENCY BASED CURRICULUM

DIPLOMA
IN
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(Duration 03 Years)
NSQF Level – 4

Under
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Developed By

Curriculum Development Center

National Institute of Technical Teachers Training & Research
(Ministry of Education, Government of India)

Sector - 26, Chandigarh, UT, India

TABLE OF CONTENTS

12. STUDY AND EVALUATION SCHEME

THIRD SEMESTER

Sr. No.	SUBJECTS	STUDY SCHEME Periods/Week		Credits (C) L+P = C	MARKS IN EVALUATION SCHEME						Total Marks of Internal & External
					INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT			
		L	P		Th	Pr	Tot	Th	Pr	Tot	
3.1	Industrial/In-House Training - I	-	2	0+1=1	-	40	40	-	60	60	100
3.2	Concrete Technology	2	2	2+1=3	40	40	80	60	60	120	200
3.3	Structural Mechanics	2	4	2+2=4	40	40	80	60	60	120	200
3.4	Surveying-I	2	6	2+3=5	40	40	80	60	60	120	200
3.5	Building Construction	2	4	2+2=4	40	40	80	60	60	120	200
3.6	Fluid Mechanics	2	2	2+1=3	40	40	80	60	60	120	200
3.7	Multidisciplinary Elective (MOOCs^{+}/Offline)	2	-	2+0=2	40	-	40	60	-	60	100
# Student Centered Activities(SCA)			3	-	-	-	-	-	-	-	-
	Total	**12**	**23**	**22**	**240**	**240**	**480**	**360**	**360**	**720**	**1200**

\+ Assessment of Multidisciplinary Elective through MOOCs shall be based on assignments out of 100 marks.

\# Student Centered Activities will comprise of co-curricular activities like extension lectures on Constitution of India, Electoral Literacy, Motor Vehicles (Driving) Regulations 2017 etc., games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities and self-study etc.

FOURTH SEMESTER :

Sr. No.	SUBJECTS	STUDY SCHEME Periods/Week		Credits (C) L+P = C	MARKS IN EVALUATION SCHEME						Total Marks of Internal & External
					INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT			
		L	P		Th	Pr	Tot	Th	Pr	Tot	
4.1	*English & Communication Skills – II	2	2	2+1=3	40	40	80	60	60	120	200
4.2	Surveying -II	2	4	2+2=4	40	40	80	60	60	120	200
4.3	Water Supply & Waste Water Engineering	2	4	2+2=4	40	40	80	60	60	120	200
4.4	Soil Mechanics & Foundation Engineering	3	2	3+1=4	40	40	80	60	60	120	200
4.5	Irrigation Engineering	2	-	2+0=2	40	-	40	60	-	60	100
4.6	Open Elective (MOOCs^{+}/Offline)	2	-	2+0=2	40	-	40	60	-	60	100
4.7	Minor Project	-	6	0+3=3	-	40	40	-	60	60	100
# Student Centered Activities(SCA)		-	4	-	-	-	-	-	-	-	-
	Total	**13**	**22**	**22**	**240**	**200**	**440**	**360**	**300**	**660**	**1100**

* Common with other Diploma Courses

\+ Assessment of Open Elective through MOOCs shall be based on assignments out of 100 marks.

\# Student Centered Activities will comprise of co-curricular activities like extension lectures on Constitution of India, Electoral Literacy, Motor Vehicles (Driving) Regulations 2017 etc., games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities and self-study etc.

Industrial/In-house Training: After 4th Semester, students shall undergo Summer Training of minimum 4 Weeks.

Survey Camp will be held after 4th Semester or in the beginning of 5th Semester for minimum 10 days in a sub mountainous area away from polytechnic preferably in camp conditions. Details are in 5th Semester.

13. HORIZONTAL AND VERTICAL SUBJECTS ORGANISATION

Sr. No.	Subjects/Areas	Hours Per Week	
		Third Semester	Fourth Semester
1.	Industrial/In-house Training - I	2	-
2.	Concrete Technology	4	-
3.	Structural Mechanics	6	-
4.	Surveying-I	8	-
5.	Building Construction	6	-
6.	Fluid Mechanics	4	-
7.	Multidisciplinary Elective (MOOCs /Offline)	2	-
8.	English & Communication Skills – II	-	4
9.	Surveying -II	-	6
10.	Water Supply & Waste Water Engineering	-	6
11.	Soil Mechanics & Foundation Engineering	-	5
12.	Irrigation Engineering	-	2
13.	Open Elective (MOOCs/Offline)	-	2
14.	Minor Project	-	6
15.	Student Centered Activities	3	4
	Total	**35**	**35**

14. COMPETENCY PROFILE & EMPLOYMENT OPPORTUNITIES

Government and private sectors related to Civil Engineering require **skilled workers** to work in familiar, predictable, routine situations of clear choice. They are expected to have factual knowledge of automation and robotics field. They shall be able to write and speak with required clarity. Students after passing level 4 shall have understanding of basic arithmetic, algebraic principles along with basic understanding of social and natural environment. They are expected to recall and demonstrate quality skill in narrow range of applications using appropriate rules and tools.

Skilled workers will be responsible for carrying out a range of jobs, some of which will require them to make choices about the approaches they adopt. They will be expected to learn and improve their practice on the job. They should know what constitutes quality in the occupation and should distinguish between good and bad quality in the context of their job roles. Skilled worker at this level will be expected to carry out their work safely and securely and take full account of the health and safety on colleagues and customers. They should work hygienically and in ways which show an understanding of environmental issues. In working with others, they will be expected to conduct themselves in ways which show a basic understanding of the social and political environment. They might find work with various construction organizations.

They will have scope of wage employment in organizations like:

i) Public sector /private construction companies/Boards/ Corporation/Departments
ii) Service sector i.e. Estate Offices of Business organizations/ Universities/Colleges, Hotels, Hospitals etc. especially for repair and maintenance of buildings and their upkeep.
iii) Military Engineering Services/BRO/Defense/Railways/Power Projects/Banks/Municipal Corporations and Committees/Panchayati Raj etc.
iv) Installation of communication towers and framed structure.
v) Testing laboratories

15. PROGRAMME OUTCOMES

The program outcomes are derived from five domains of NSQF Level – 4 namely Process, Professional Knowledge, Professional Skill, Core Skill, Responsibility. After completing this level, the student will be able to:

PO1: Work in familiar, predictable, routine situation of clear choice.

PO2: Acquire factual knowledge in the field of Civil Engineering for employment.

PO3: Recall and demonstrate quality skills in routine and repetitive in narrow range of applications using appropriate rules and tools.

PO4: Write and speak with required clarity and show basic understanding of social and natural environment.

PO5: Perform tasks with responsibility for own work and learning.

PO6: Select multidisciplinary and open elective of own interest to develop self-learning through MOOCs.

16. ASSESSMENT OF PROGRAMME AND COURSE OUTCOMES

Programme Outcomes to be Assessed	Assessment Criteria for the Course Outcomes
PO1: Work in familiar, predictable, routine situation of clear choice.	• Conduct various tests on aggregate in laboratory to evaluate their characteristics • Interpret the grading charts of different aggregates and evaluate fineness modulus of aggregates • Evaluate workability and strength of concrete • Recognise bleeding, segregation, harshness defects in fresh concrete • Explain hydration process of cement, water to cement (w/c) ratio and analyse relationship between compressive strength and w/c ratio • Conduct various destructive and non-destructive (NDT) test • Conduct different tests on mild steel • Analyse and explain stress-strain diagram of mild and HYSD steel • Calculate various forces used in design of structures • Calculate shear force, bending moment for simply supported, cantilever and overhanging beams with concentrated and uniformly distributed loads • Calculate moment of inertia, second moments of inertia, radius of gyration, section modulus for L, T, channel and I sections • Calculate the bending stresses, moment of resistance of simply supported beams

PO2: Acquire factual knowledge in the field of Civil Engineering for employment	• Select a foundation for particular type of building • Explain different types of walls, scaffolding, shoring, underpinning and their constructional methodology • Carry out the construction of brick wall. • Supervise rubble and ashlar types of stone masonry construction • Select different types of doors, windows, floors and stairs cases in building • Recognise different parts of roof trusses and drainage system of roofs • Identify and select application procedure for different types of surfaces finishes in building i.e. plastering, pointing, painting, white washing and distempering • Interpret the different terms related to fluids. • Calculate the pressure exerted by fluids on the walls of containers. • Calculate discharge through pipes, irrigation channels, water supply pipe lines. • Use different flow measurement devices like venturimeter, mouthpiece, notches, weir, orificemeter. • Calculate size of the pipe for carrying a particular discharge. • Differentiate between different type of water pumps used in the field. • Measure the loss of head in pipes and channels.

PO3: Recall and demonstrate quality skills in routine and repetitive in narrow range of applications using appropriate rules and tools	• Understand the working environment of industries. • Take necessary safety precautions and measures. • Work in team for solving industrial problems. • Develop competencies and skills required by relevant industries • Calculate the water requirement for a particular population • Check and improve the quality of water by giving required treatment to water • Calculate the size of different pipes to carry water • Lay the network of pipes for water supply as well as sewerage in a building • Draw the location of different appurtenances • Carry out the disposal of sewage
PO4: Write and speak with required clarity and show basic understanding of social and natural environment.	• Develop writing, speaking and presentations skills • Communicate effectively with an increased confidence; read, write and speak in English language fluently. • Comprehend special features of format and style of formal communication through various modes. • Write a Report, Resume, make a Presentation, Participate in GDs and Face Interviews • Illustrate use of communication to build a positive self-image through self-expression and develop more productive interpersonalrelationships. • Create writing and communication skills. • Develop Presentation skills.

PO5: Perform tasks with responsibility for own work and learning.	• Prepare maps for closed traverse and open traverse with survey instruments • Measure bearing of line • Perform leveling with digital level • Perform temporary adjustments of leveling instruments • Draw a contour plan of an area. • Identify and classify various types of soils • Select particular type of foundation according to loading of structure • Determine shear strength of soil • Carry out compaction of soils as per density • Calculate bearing capacity of soil • Calculate liquid limit and plastic limit of soil • Calculate maximum dry density of soil and optimum moisture content of soil • Perform various tests of the soil • Recognise different crops and their water requirements • Supervise maintenance and construction work of canal head works and cross Regulators • Supervise constructions of various river training works • Monitor installation of water harvesting techniques • Prepare maps for closed traverse and open traverse with Total Station • Draw a contour plan of an area with Total station and DGPS • Calculate earth work for a road with Total station and DGPS

PO6: Select multidisciplinary and open elective of own interest to develop self-learning through MOOCs	• State the basic concepts and principles of multidisciplinary and open elective subject. • Perform in a better way in the professional world. • Learn the subject related to own interest. • Explore latest developments in the multidisciplinary and open elective field. • Develop the habit of self-learning. • Display analytical and research abilities. • Integrate multiple knowledge domains. • Enhance the scope and depth of learning.

17. SUBJECTS & CONTENTS

(SECOND YEAR)

THIRD SEMESTER

3.1 INDUSTRIAL / IN–HOUSE TRAINING-I

L	P
-	2

RATIONALE

Industrial training / In – house training will help the students to understand the working environment of relevant industries. The student will learn to work in team to solve the industrial problems. It will also give exposure about the present and future requirements of the relevant industries. This training is very important for development of required competencies and skills for employment and start– ups.

COURSE OUTCOMES

After undergoing the training, the students will be able to:

CO1: Understand the working environment of industries
CO2: Take necessary safety precautions and measures.
CO3: Learn about present and future requirement of industries.
CO4: Work in team for solving industrial problems
CO5: Develop competencies and skills required by relevant industries.
CO6: Develop writing, speaking and presentations skills.

PRACTICAL EXERCISES

1. Report writing based on industrial training.
2. Preparation of Power Point Slides based on industrial training and presentation by the candidate.
3. Internal Evaluation based on quality of Report, PPT preparation, PPT presentation and answer to queries.
4. External Evaluation based on quality of Report, PPT preparation, PPT presentation and answer to queries.

GUIDELINES

Students will be evaluated based on Industrial training / In – house training report and their presentation using Power Point about the knowledge and skills gained during the training. The Head of the Department will depute faculty coordinators by assigning a group of students to each. The coordinators will mentor and guide the students in preparing the PPTs for final presentation.

The following performance parameters are to be considered for assessment of the students out of 100 marks:

	Parameter	**Weightage**
i	Industrial / In-house assessment of the candidate by the trainer	40%
ii	Report Writing	20%
iii	Power Point Presentation	20%
iv	Viva-voce	20%

3.2 CONCRETE TECHNOLOGY

L	P
2	2

RATIONALE

Diploma holders in Civil Engineering are supposed to supervise concreting operations involving proportioning, mixing, transporting, placing, compacting, finishing and curing of concrete. To perform above functions, it is essential to impart knowledge and skills regarding ingredients of concrete and their properties; properties of concrete in plastic and hardened stage, water cement ratio and workability; proportioning for ordinary concrete; concreting operations and joints in concrete.

COURSE OUTCOMES

After undergoing the subject, the students will be able to:

CO1: Conduct various tests on aggregate in laboratory to evaluate their characteristics

CO2: Interpret the grading charts of different aggregates and evaluate fineness modulus of aggregates

CO3: Evaluate workability and strength of concrete

CO4: Recognise bleeding, segregation, harshness defects in fresh concrete

CO5: Explain hydration process of cement, water to cement (w/s) ratio and analyze relationship between compressive strength and w/c ratio

CO6: Conduct various destructive and non-destructive (NDT) test

DETAILED CONTENTS

UNIT I

1. Introduction to Concrete

1.1 Definition of concrete, properties of concrete. Advantages and disadvantages of concrete.

2. Ingredients of Concrete

2.1 Cement: Introduction only

2.2 Aggregates:

2.2.1 Classification of aggregates according to size and shape

2.2.2 Characteristics of aggregates: Particle size and shape, surface texture, specific gravity of aggregate; bulk density, water absorption, surface moisture, bulking of sand, deleterious materials soundness

2.2.3 Grading of aggregates: coarse aggregate, fine aggregate; All-in- aggregate; fineness modulus; interpretation of grading charts

2.3 Water: Water Quality requirements as per IS:456-2000

UNIT II

3. Water Cement Ratio

3.1 Hydration of cement principle of water-cement ratio, Duff Abram's Water-cement ratio law: Limitations of water-cement ratio law and its effects on strength of concrete

4. Properties of Concrete

4.1 Properties in plastic state: Workability, Segregation, Bleeding and Harshness

4.1.1 Factors affecting workability, Measurement of workability: slump test, compacting factor; Recommended slumps for placement in various conditions as per IS:456-2000/SP-23

4.2 Properties in hardened state: Strength, Durability, Impermeability, Dimensional changes.

4.3 Concrete mix design (Introduction only)

4.4 Introduction to Admixtures (chemicals and minerals) for improving performance of concrete

UNIT III

5. Concreting Operations

5.1 Storing of Cement:

5.1.1 Storing of cement in a warehouse

5.1.2 Storing of cement at site

5.1.3 Effect of storage on strength of cement

5.1.4 Determination of warehouse capacity for storage of Cement

**5.2 Storing of Aggregate: Storing of aggregate at site

**5.3 Batching (to be shown during site visit

5.3.1 Batching of Cement

5.3.2 Batching of aggregate by:

- Volume, using gauge box (farma) selection of proper gauge box
- Weight spring balances and batching machines

5.3.3 Measurement of water

**5.4 Mixing:

5.4.1 Hand mixing

5.4.2 Machine mixing - types of mixers, capacities of mixers, choosing appropriate size of mixers, operation of mixers.

5.4.3 Maintenance and care of mixers

UNIT IV

**6.1 Transportation of concrete: Transportation of concrete using: wheel barrows, transit mixers, chutes, belt conveyors, pumps, tower crane and hoists etc.

**6.2 Placement of concrete: Checking of form work, shuttering and precautions to be taken during placement

6.3 Compaction:

6.3.1 Hand compaction

6.3.2 Machine compaction - types of vibrators, internal screed vibrators and form vibrators

6.3.3 Selection of suitable vibrators for different situations

6.4 Finishing concrete slabs - screeding, floating and trowelling

6.5 Curing:

6.5.1 Objective of curing, methods of curing like ponding, membrane curing, steam curing, chemical curing

6.5.2 Duration for curing and removal of form work

6.6 Jointing: Location of construction joints, treatment of construction joints, expansion joints in buildings - their importance and location

6.7 Defects in concrete: Identification of defects and methods of removing defects.

UNIT V

7. Special Concretes (only features)

7.1 Concreting under special conditions, difficulties, and precautions before, during and after concreting

7.1.1 Cold weather concreting

7.1.2 Under water concreting

7.1.3 Hot weather concreting

7.2 Ready mix concrete

7.3 Fly ash concrete

8. Importance and methods of non-destructive tests (introduction only)

8.1. Rebound Hammer Test

8.2. Pulse Velocity method

NOTE: ** A field visit may be planned to explain and show the relevant things

PRACTICAL EXERCISES

1. To determine the physical properties of cement such as fineness, consistency, setting time, soundness, and compressive strength of cement as per IS Codes
2. To determine flakiness at elongation Index of coarse aggregate
3. To determine silt content 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 bulking of fine aggregates
8. To determine workability by slump test and to verify the effect of water, fine aggregate/coarse aggregate ratio and aggregate/Cement ratio on slump
9. Compaction factor test for workability
10. Non destructive test on concrete by:
    a) Rebound Hammer Test
    b) Ultrasonic Pulse Velocity Test
11. To determine compressive strength of concrete cubes for different grades of concrete
12. To determine flexural strength of concrete beam

RECOMMENDED BOOKS

1. KT Rao, A Kasundra and Khandekar, "Concrete Technology by Krishnamurthy, AA. Dhanpat Rai and Sons, Delhi.
2. BL Gupta and Amit Gupta, "Textbook of Concrete Technology", Standard Publishers Distributors, Delhi.
3. BL Handoo, LD Puri, and Sanjay Mahajan, “Concrete Technology”, Satya Prakashan, New Delhi.
4. Hemant Sood, LN Mittal and PD Kulkarni, "Laboratory Manual on Concrete Technology" by; CBS Publishers, New Delhi.
5. Birinder Singh, “Concrete Technology”, Kaption Publications, Ludhiana.
6. Dr. Hemant Sood, Module on “Special Concretes”, NITTTR Chandigarh.

7. "Video programme on different experiments in 'Concrete Technology'", NITTTR, Chandigarh.
8. e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

INSTRUCTIONAL STRATEGY

This subject is of practical nature. While imparting instructions, teachers are expected to organize demonstrations and field visits to show various stages of concreting operations. While working in the laboratory, efforts should be made to provide extensive practical training to students to make them confident in the preparation and testing of concrete. Teachers should also organize viva examination to develop understanding about concepts and principles involved. The experiments may also be demonstrated to students Periods through video programmes developed in the field of 'concrete technology' by NITTTR, Chandigarh. This subject contains five units of equal weightage.

3.3 STRUCTURAL MECHANICS

L	P
2	4

RATIONALE

This is a basic engineering subject. The purpose of the subject is to impart basic knowledge and skill regarding properties of materials, concept of stresses and strains, bending moment and shear force diagrams, second moment of area, bending and shear stresses, slope and deflection and analysis of trusses. The above knowledge will be useful for designing simple structural components. This subject is very important to develop basic concepts and principles related to strength of materials. This subject will also enable the students to continue their further education.

COURSE OUTCOMES

After undergoing the subject, the students will be able to:

CO1: Conduct different tests on mild steel

CO2: Analyse and explain stress-strain diagram of mild and HYSD steel

CO3: Calculate various forces used in design of structures

CO4: Calculate shear force, bending moment for simply supported, cantilever and overhanging beams with concentrated and uniformly distributed loads

CO5: Calculate moment of inertia, second moments of inertia, radius of gyration, section modulus for L, T, channel and I sections

CO6: Calculate the bending stresses, moment of resistance of simply supported beams

DETAILED CONTENTS

UNIT I

1. Properties of Materials

1.1 Classification of materials, elastic materials, plastic materials, ductile materials, brittle materials.

1.2 Introduction to tensile test, compressive test, impact test, fatigue test, torsion test on metals.

2. Simple Stresses and Strains

2.1 Concept of stress, normal and shear stresses,

2.2 Concept of strain and deformation, longitudinal and transverse strain, poisson's ratio, volumetric strain

2.3 Hooke's law, modulii of elasticity and rigidity, Bulk modulus of elasticity, relationship between the elastic constants.

2.4 Stresses and strains in bars subjected to tension and compression. Extension of uniform bar under its own weight, stress produced in compound bars due to axial load (two or three bars)

2.5 Stress-strain diagram for mild steel and HYSD steel, mechanical properties, factor of safety.

2.6 Temperature stresses and strains

UNIT II

3. Shear Force and Bending Moment

3.1 Concept of a beam and supports (Hinges, Roller and Fixed), types of beams: simply supported, cantilever, propped, over hang, cantilever and continuous beams (only concept).

3.2 Types of loads (dead load, live load, snow load, wind load seismic load as per IS Codes etc.) and types of loading (point, uniformly distributed and uniformly varying loads)

3.3 Concept of bending moment and shear force, sign conventions

3.4 Bending Moment and shear force diagrams for cantilever and simply supported subjected to concentrated, uniformly distributed

3.5 Relationship between load, shear force and bending moment, point of maximum bending moment, and point of contraflexure.

UNIT III

4. Moment of Inertia

Concept of moment of inertia and second moment of area and radius of gyration, theorems of parallel and perpendicular axis, second moment of area of common geometrical sections: rectangle, triangle, circle (without derivations). Second moment of area for L, T and I sections, section modulus.

UNIT IV

5. Bending Stresses in Beams

5.1 Concept of pure/simple bending

5.2 Assumptions made in the theory of simple bending, derivation and application of bending equation to circular cross-section, I section, T&L sections only
5.3 Moment of resistance
5.4 Calculations of bending stresses in simply supported beam
5.5 Concept of shear stresses in beams, shear stress (introduction only)

6. Slope and Deflection

Determination of slope and deflection using Moment Area Theorem for simply supported beam for pointed load and U.D.L numerical problems. (no derivation,)

UNIT V

7. Columns

7.1 Theory of columns
7.2 Problem solving using Euler's and Rankine Formula

8. Analysis of Trusses

8.1 Concept of a perfect, redundant, and deficient frames
8.2 Assumptions and analysis of trusses by:
a) Method of joints
b) Method of sections

PRACTICAL EXERCISES

1. Determination of yield stress, ultimate stress, percentage elongation and plot the stress strain diagram and compute the value of young's modulus on mild steel
2. Testing of HYSD Steel
3. Determination of Young's modulus of elasticity for steel wire with searl's apparatus
4. Determination of modulus of rupture of a concrete beam
5. Determination of maximum deflection and young's modulus of elasticity in simply supported beam with load at middle third point
6. Verification of forces in a framed structure

RECOMMENDED BOOKS

1. S Ramamrutham, "Strength of Materials", Dhanpat Rai and Sons, New Delhi.
2. Ram Chandra, "Applied Mechanics and Strength of Materials", Standard Publishers, Delhi.

3. BC Punmia, "Strength of Materials", Standard Publishers, Delhi.
4. Sadhu Singh, “Strengths of Materials”, Standard Publishers, New Delhi.
5. Birinder Singh, “Structural Mechanics”, Kaption Publishers, Ludhiana.
6. e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

SUGGESTED WEBSITES

1. http://swayam.gov.in

INSTRUCTIONAL STRATEGY

Teachers are expected to give simple exercises involving the applications of various concepts and principles being taught in the subject. Efforts should be made to prepare tutorial sheets on various topics and students should be encouraged/guided to solve tutorial sheets independently. In the practical works, individual students should be given opportunities to do practical work, make observations and draw conclusions. Teachers should also conduct viva examination in which stress should be given on the understanding of basic concepts and principles. This subject contains five units of equal weightage.

3.4 SURVEYING - I

L	P
2	6

RATIONALE

The important functions of a diploma civil engineer includes the jobs of detailed surveying, plotting of survey data, preparation of survey maps and setting out works
While framing the curriculum for the subject of surveying, stress has been given to the development of the skill in each type of survey like chain surveying, compass surveying leveling, that the Civil Engineering diploma holder will normally be called upon to perform and plane table surveying.
Field work should be a selected one so that student can check his work and have an idea of the results the extent of error in the work done by him. As far as possible, the surveys done should be got plotted, as this will also reveal errors in the work and develop skill in plotting.

COURSE OUTCOMES

After undergoing the subject, the students will be able to:
CO1: Prepare maps for closed traverse and open traverse with survey instruments
CO2: Measure bearing of line
CO3: Perform leveling with digital level
CO4: Perform temporary adjustments of leveling instruments
CO5: Draw a contour plan of an area.

DETAILED CONTENTS

UNIT I

Introduction and Basic Concepts

1.1 Definition and Purpose of Surveying
1.2 Primary Division of Surveying
1.3 Basic principles of surveying
1.4 Measurements-linear and angular
1.5 Units of measurements

1.6 Instruments used for taking these measurements
1.7 Classification of surveying

UNIT-II

Chain and Compass Surveying

2.1 Purpose and principles of chain surveying
2.2 Operations in Chain Surveying (Ranging, Measurement, Offsetting)
2.3 Purpose of compass surveying
2.4 Use of prismatic compass: Setting and taking observations
2.5 Concept of following with simple numerical problems:
  a) Meridian - Magnetic and true, Arbitrary
  b) Bearing - Magnetic, True and Arbitrary
  c) Whole circle bearing and reduced bearing
  d) Fore and back bearing
  e) Magnetic dip and declination
2.6 Local attraction – Problems, causes, detection, errors and corrections,

UNIT-III

Levelling

3.1 Definition and Purpose of levelling
3.2 Various technical terms used in levelling (level surface, horizontal surface, vertical surface, datum, reduced level, bench marks, line of collimation, axis of the bubble tube, axis of the telescope and vertical axis)
3.3 Identification of various parts of Auto level, leveling staff types, uses and least count of leveling staff
3.4 Temporary adjustment and permanent adjustment of Auto level
3.5 Concept of back sight, foresight, intermediate sight, change point, to determine reduce levels
3.6 Level book and reduction of levels by
  3.7.1 Height of collimation method and
  3.7.2 Rise and fall method (Numerical problems)
3.7 Methods of Leveling (Simple levelling, differential levelling, fly levelling, check leveling and profile levelling (L-section and X-section) only (Numerical problems)
3.8 Problem on reduction of levels, Errors in levelling

UNIT-IV

Plane Table Surveying

4.1 Introduction and Definition of plane table surveying

4.2 Advantages & Disadvantages of plane table surveying

4.3 Equipment used in plane table survey

4.4 Setting of a plane table:

- (a) Centering
- (b) Levelling
- (c) Orientation

4.5 Methods of plane table surveying

- (a) Radiation,
- (b) Traversing

4.6 Errors in plane table survey

UNIT-V

Contouring

5.1 Definition and Purpose of contours

5.2 Contour interval and horizontal equivalent

5.3 Factors effecting contour interval

5.4 Characteristics of contours

5.5 Methods of contouring: Direct and indirect

5.6 Use of stadia measurements in contour survey

5.7 Interpolation of contours; use of contour map

5.8 Drawing cross section from a contour map; marking alignment of a road, railway line and a canal on a contour map

PRACTICAL EXERCISES

I Demonstration of chain surveying

II Compass Surveying

i)
- a) Study of prismatic compass
- b) Setting the compass and taking observations
- c) Measuring angles between the lines meeting at a point

III Levelling

i)
- a) Study of Auto level and levelling staff
- b) Temporary adjustments of Auto levels

c) Taking staff readings on different stations from the single setting and finding differences of level between them

ii) To find out difference of level between two distant points by shifting the instrument

iii) Longitudinal and cross sectioning of a road/railway/canal

iv) Setting a gradient by auto-level.

IV Plane Table Surveying

i) a) Study of the plane table survey equipment

b) Setting the plane table

c) Marking the North direction

d) Plotting a few points by radiation method

ii) a) Orientation by

- Trough compass
- Back sighting

b) Plotting few points by intersection, radiation and resection method

iii) Traversing an area with a plane table (at least five lines)

V Layout of Buildings (from given drawing of two room residential building) by use of surveying instruments.

VI Contouring:

i) Preparing a contour plan by radial line method by the use of a Auto level.

ii) Preparing a contour plan by method of squares

iii) Preparing a contour plan of a Road/Railway track/Canal by taking cross sections.

iv) Computation of earth work and reservoir capacity from a contour map

RECOMMENDED BOOKS

1. CL Kochar, "A Text Book of Surveying", Katson Publishing House, Ludhiana.
2. TP Kanetkar and SV Kulkarni, "Surveying and Leveling", AVG Parkashan, Poona.
3. Sanjay Mahajan, "Surveying –I", Tech. Publication, Delhi.
4. BC Punmia, "Surveying and Leveling", Standard Publishers Distributors, Delhi.
5. e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

SUGGESTED WEBSITES

1. http://swayam.gov.in

INSTRUCTIONAL STRATEGY

This is highly practice-oriented course. While imparting theoretical instructions, teachers are expected to demonstrate the use of various instruments in surveying, stress should be laid on correct use of various instruments to avoid/minimize errors during surveying. It is further recommended that more emphasis should be laid in conducting practical work by individual students. Technical visit to Survey of India, Northern Region and Great Trigonometrical Survey (GTS), Dehradun. This subject contains five units of equal weightage.

3.5 BUILDING CONSTRUCTION

L	P
2	4

RATIONALE

Diploma holders in Civil Engineering are supposed to effectively supervise construction of buildings. Effective supervision is essential to obtain/provide a fault free service from contractors to users. To perform above task, it is essential that students should have knowledge of various sub components of buildings like foundations, walls, roofs, staircases, floors etc., and their constructional details as well as preventive, remedial and corrective methods of common construction faults. Therefore, the subject of Building Construction is very important for Civil Engineering diploma holders.

COURSE OUTCOMES

After undergoing the subject, the students will be able to:

CO1: Explain different types of walls, scaffolding, shoring, underpinning and their constructional methodology
CO2: Carry out the construction of brick wall.
CO3: Supervise rubble and ashlar types of stone masonry construction
CO4: Select different types of doors, windows, floors and stairs cases in building
CO5: Recognize different parts of roof trusses and drainage system of roofs
CO6: Evaluate the possible reason of dampness at various level in building and remedial means

DETAILED CONTENTS

UNIT I

1. Foundation

1.1 Introduction: Definition of a building, Different parts of a building, classification of buildings

1.2 Types of foundation – Shallow foundation (thumb rules for depth and width of foundation) and Deep foundation

1.3 Excavation of foundation – Trenches, Shoring, Underpinning, Timbering and De-watering

2. Walls

2.1 Classification of walls based on load - Load bearing, non-load bearing, retaining walls

2.2 Classification of walls as per materials of construction

2.3 Partition walls: Constructional details, suitability and uses of brick and wooden partition walls

2.4 Scaffolding, construction details and suitability of mason's brick layers and tubular scaffolding.

UNIT II

3. Masonry Work

3.1 Glossary of terms used in brick masonry - Header, Stretcher, Queen closer, King closer etc.

3.2 Brick Masonry Bonds – English and Flemish Bonds

3.3 Construction of brick walls – New wall Construction, Methods of bonding new brick work with old (Toothing and Raking Methods)

3.4 Mortars: types, selection of mortar and its preparation

4. Arches and Lintels

4.1 Glossary of terms used in arches -Intrados, Extrados, Crown, Key stone etc.

4.2 Types of Arches – Semi-circular, Segmental and Parabolic arches

4.3 Lintels – Cast-in-situ and pre-cast lintels

UNIT III

5 Doors and Windows

5.1 Glossary of terms used – Door Frame, Door Shutter, Hold fast, Horns, Jamb, Reveal, Soffit, Styles, Rails: Top, Bottom and Lock rails etc.

5.2 Doors and window frames – Materials and Sections, Fixtures and Fasteners

5.3 Doors – Framed and Panelled door, Glazed or sash door, Flush door, Sliding door, Rolling steel shutter doors

5.4 Windows – Fixed window, Sliding window, Glazed or sash window, Corner window

5.5 Ventilators

6. Damp Proofing and Water Proofing

6.1 Dampness and its ill effects in buildings

6.2 Sources of dampness in building

6.3 Damp proofing of basement, Plinth and walls, Kitchen, Washroom, Roof

UNIT IV

7. Floors

7.1 Glossary of terms used – Floor finish, Topping, Under layer, Base course, Rubble filling and their purpose

7.2 Types of floor finishes – Concrete flooring, Ceramic tile flooring, Stone (marble and kota) flooring, Wooden flooring

7.3 Special emphasis on level / slope / reverse slope in bathrooms, toilets, kitchen, balcony

8. Roofs

8.1 Types of roofs, concept of flat and pitched roofs

8.2 Glossary of terms for pitched roofs – Batten, Eaves, Facia board, Gable, Hip, Lap, Purlin, Rafter, Rag bolt, Ridge, Rain water gutter, Anchoring bolts

8.3 False ceilings – Gypsum false ceiling, POP false Ceiling, PVC false ceiling, Wooden false ceiling, Cellotex false ceiling

UNIT V

9. Stairs

9.1 Glossary of terms used in stairs: Landing, Stringer, Newel, Baluster, Riser, Tread, Width of staircase, Hand-rail, Nosing

9.2 Types of stairs on the basis of materials used: RCC and Steel stairs

9.3 Various types of layout – Straight flight, Dog legged, Quarter turn, Half turn

9.4 Ramps and Elevators – Excavation and construction

9.5 Escalators pits and landings – Excavation and construction

10. Surface Finishes

10.1 Plastering – Plain plaster, Stone cladding and Tile work

10.2 Pointing – Different types of pointing and their methods

10.3 Painting – Preparation of surface, Primer coat and application of paints on wooden, steel and plastered wall surfaces

10.4 Selection of appropriate paints/finishes for interior and exterior surfaces

PRACTICAL EXERCISES

1. Demonstration of tools and plants used in building construction
2. To prepare Layout of a building: 2BHK with front verandah
3. To construct brick bonds (English Bond) in One, One & half and Two brick thick:
   (a) Walls for L, T and Cross Junction
   (b) Columns

4. To construct brick bonds (Flemish Bond) in One, One & half and Two brick thick:
   (a) Walls for L, T and Cross Junction
   (b) Columns
5. Demonstration of "Timbering of Excavated Trenching" through a model and visit at construction site
6. Demonstration of "Laying Damp Proof Courses" through a model and visit at construction site
7. Demonstration of "Construction of Masonry Walls" through a model and visit at construction site
8. Demonstration of "Brick Layers Scaffolding" through a model and visit at construction site
9. Demonstration of "Steel Scaffolding" through a model and visit at construction site
10. Demonstration of "Laying of Vitrified Tile Flooring" through visit at construction site
11. Demonstration of "Plastering and Pointing Exercise" through visit at construction site
12. Demonstration of "Constructing RCC work – Foundations, Columns, Beams and Slabs" through visit at construction site
13. Demonstration of "Pre-construction and post construction termite treatment of building and woodwork" through visit at construction site
14. Demonstration of "False Ceiling" through visit at construction site
15. Demonstration of "Interlocking Tiles" through visit at construction site

RECOMMENDED BOOKS

1. SC Rangwala, "Building Construction", Charotar Book Stall, Anand.
2. GJ Kulkarni, "A Text Book of Building Construction", Ahmedabad Book Depot.
3. SP Arora, and SP Bindra, "A Text Book of Building Construction", Dhanpat Rai and Sons, New Delhi.
4. Sushil Kumar, "Building Construction", Standard Publishers Distributors, Delhi.
5 SP – 62 "Hand Book of BIS".
6 B.I.S. – 6313 Part 1, 2, 3
7 National Building Code
8. PN Khanna, "Handbook of Civil Engineering".
9. Video films on Damp proofing, water proofing, surface finishes
10. e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR

SUGGESTED WEBSITES

1. http://swayam.gov.in

INSTRUCTIONAL STRATEGY

While imparting instructions in this subject, teachers are expected to take students to work site and explain constructional process and special details for various sub-components of a buildings. It is also important to make use of audio visual aids/video films (if available) to show specialised operations. The practical work should be given due importance and efforts should be made that each student should perform practical work independently. For carrying out practical works, polytechnics should have construction yard where enough raw materials is made available for students to perform practical work. This subject contains five units of equal weightage.

3.6 FLUID MECHANICS

L	P
2	2

RATIONALE

Subject of Fluid Mechanics is a basic engineering subject and helps in solving fluid flow problems in the field of Civil Engineering. The subject deals with basic concepts and principles in hydrostatics, hydro kinematics and hydrodynamics and their application in solving fluid - mechanics problems.

COURSE OUTCOMES

After undergoing the subject, the students will be able to:

CO1: Calculate the pressure exerted by fluids on the walls of containers.
CO2: Calculate discharge through pipes, irrigation channels, water supply pipe lines.
CO3: Use different flow measurement devices like Venturimeter, Orificemeter, Notches and Weir.
CO4: Calculate size of the pipe for carrying a particular discharge.
CO5: Differentiate between different types of water pumps used in the field.
CO6: Measure the loss of head in pipes and channels.

DETAILED CONTENTS

UNIT I

1. Properties of Fluids

1.1 Introduction: Fluid Mechanics, Hydrostatics, Hydrodynamics, Hydraulics
1.2 Density or Mass Density, Specific Weight or Weight Density, Specific Volume, Specific Gravity
1.3 Viscosity: Units of viscosity, Kinematic Viscosity, Newton's Law of viscosity, Variation of viscosity with temperature.
1.4 Types of Fluids: Ideal, Real, Newtonian, Non-Newtonian and ideal Plastic fluids.
1.5 Compressibility, Bulk Modulus, Surface Tension, Capillarity, Vapour Pressure and Cavitation

2. Pressure and its Measurement

2.1 Pascal's Law, Fluid pressure at a point and Pressure variation in a fluid at rest.

2.2 Types of Pressure: Absolute Pressure, Gauge Pressure, Vacuum Pressure and Atmospheric Pressure

2.3 Measurement of Pressure: Simple and Differential Manometer (with Numerical Problems)

UNIT II

3. Hydrostatic Force on Surfaces

3.1 Total Pressure and Centre of Pressure

3.2 Vertical, Horizontal Plane surfaces (Rectangular and Trapezoidal) submerged in liquid (No derivation - Simple Numerical Problems)

4. Buoyancy and Floatation

4.1 Buoyancy and Centre of Buoyancy

4.2 Meta-centre and Meta-centric Height

4.3 Analytic Method for Meta-centric Height (Concept only – Simple Numerical Problems)

4.4 Conditions of equilibrium of a floating and sub-merged bodies (Concept only)

UNIT III

5. Flow of Fluids

5.1 Types of Flow: Steady and Unsteady Flow, Uniform and Non-Uniform Flow, Laminar and Turbulent Flow, Compressible and Incompressible Flow

5.2 Discharge and Continuity Equation (No derivation - Simple Numerical Problems)

5.3 Types of hydraulic energy: Potential energy, kinetic energy, pressure energy

5.4 Bernoulli's Theorem: Statement and Description (without Proof of Theorem - Simple Numerical Problems)

6. Flow Measurements

6.1 Venturimeter and Orificemeter (without Proof)

6.2 Pitot-tube and Current meter

6.3 Orifices, Hydraulic Co-Efficient (C_v, C_c and C_d) and their relationship

6.4 Discharge over a Rectangular and Trapezoidal Notch (No Derivation)

6.5 Discharge over a Rectangular and Trapezoidal Weir (No Derivation)

UNIT IV

7. Flow Through Pipes

7.1 Reynold's number, laminar and turbulent flow - explained through Reynold's experiment

7.2 Loss of Energy in Pipes: Major and Minor Energy Losses (No derivation of formula)

7.3 Loss of Energy in Pipes: Simple Numerical Problems

7.4 Hydraulic gradient line and total energy line

7.5 Pipes in series and parallel: Simple Numerical Problems

8. Dimensional Homogeneity

8.1 Secondary and Derived Quantities

8.2 Dimensional Homogeneity

8.3 Dimensional Numbers: Reynold's Number, Froude's Number, Euler's Number, Weber's Number, Mach's Number (Only concept)

UNIT V

9. Flow in Open Channel

9.1 Definition and classification of flow in open channels

9.2 Discharge through open channel by Chezy's formula

9.3 Most economical section of channels (No Derivation - Simple Numerical Problems)

i) Rectangular Channel Section

ii) Trapezoidal Channel Section

10. Hydraulic Pumps

Reciprocating Pump, Centrifugal Pump, Differences between Reciprocating Pump and Centrifugal Pump (No Derivations and Numerical)

PRACTICAL EXERCISES

1. To verify Bernoulli's Theorem
2. To find out Venturimeter Coefficient
3. To determine Coefficient of Velocity (C_v), Coefficient of Discharge (C_d) Coefficient of Contraction (C_c) of an orifice and verify the relation between them
4. To perform Reynold's experiment
5. To verify loss of head in pipe flow due to

a. Sudden enlargement

b. Sudden contraction

c. Sudden bend

6. Demonstration of use of current meter and pitot tube

7. To determine coefficient of discharge of a rectangular notch and triangular notch.

RECOMMENDED BOOKS

1. Jagdish Lal, "Fluid Mechanics and Hyraulics", Delhi Metropolitan Book Co. Pvt Ltd.
2. PN Modi, and SM Seth, "Hydraulics and Fluid Mechanics"; Delhi Standard Publishers Distributors.
3. RS Khurmi, "Hydraulics and Hydraulics Machines", S Chand and Co., Delhi.
4. MP Poonia, and OP Jakhar, "Laboratory Manual for Fluid Mechanics", Standard Publishers Distributors, Delhi.
5. Birinder Singh, "Fluid Mechanics", Kaption Publishing, New Delhi.
6. A.S Sarao, "Fluid Mechanics", Tech. India Publication, New Delhi.
7 e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

SUGGESTED WEBSITES

1. http://swayam.gov.in

INSTRUCTIONAL STRATEGY

Fluid Mechanics being a fundamental subject, teachers are expected to lay considerable stress on understanding the basic concepts, principles and their applications. For this purpose, teachers are expected to give simple problems in the class room and provide tutorial exercises so as to develop necessary knowledge for comprehending the basic concepts and principles. As far as possible, the teaching of the subject be supplemented by demonstrations and practical work in the laboratory. Visit to hydraulic research stations must be carried out. This subject contains five units of equal weightage.

3.7 MULTIDISCIPLINARY ELECTIVE

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2	-

RATIONALE

Multidisciplinary electives are very important and play major role in implementation of National Education Policy. Multidisciplinary is a subject which is useful for two or more disciplines in which students are asked to understand the concept of multidisciplinary or interdisciplinary. It will help the students to gain an arsenal of skills that are easily transferable across work environments.

COURSE OUTCOMES

At the end of the open elective, the students will be able to:

CO1: Apply critical thinking problem solving.
CO2: Demonstrate self and time management.
CO3: Display analytical and research abilities.
CO4: Integrate multiple knowledge domains.
CO5: Enhance the scope and depth of learning.

LIST OF MULTIDISCIPLINARY ELECTIVES

(The list is indicative and not exhaustive)

1. Introduction to Internet of Things
2. Introduction to Robotics
3. Introduction to Embedded System Design
4. Fundamentals of Artificial Intelligence
5. Digital Image Processing
6. Introduction to Machine Learning
7. Fundamentals of Artificial Intelligence
8. The Joy of Computing Using Python
9. Cloud Computing
10. Introduction to Industry 4.0
11. Industrial Internet of Things

12. Object Oriented System Development using UML, Java and Patterns

GUIDELINES

Multidisciplinary Elective shall be offered preferably in online mode. Online mode multidisciplinary elective shall preferably be through Massive Open Online Courses (MOOCs) from Swayam, NPTEL, Upgrad, Udemy, KhanAcademy or any other online portal to promote self-learning. A flexible basket of large number of multidisciplinary electives is suggested which can be modified depending upon the availability of courses at suggested portals and requirements. For online multidisciplinary electives, department coordinators shall be assigned to monitor and guide the group of students for selection of minimum 20 hours duration online course of their choice. For offline multidisciplinary electives, a suitable relevant subject shall be offered by the respective department to the students with minimum 40% of the total class strength as per present and future requirements.

Assessment of MOOCs multidisciplinary elective shall be based on continuous evaluation by the respective coordinator. The coordinator shall consider the submitted assignments by the students from time to time during the conduct of MOOCs. The MOOCs assessment shall be conducted by the coordinator along with one external expert by considering submitted assignments out of 100 marks.

In case, no suitable open elective is available online, only then the course may be conducted in offline mode. The assessment of offline multidisciplinary elective shall be internal and external. The offline multidisciplinary elective internal assessment of 40 marks shall be based on internal sessional tests, assignments etc. and external assessment of 60 marks shall be based on external examination at institute level.

SUGGESTED WEBSITES

1. https://swayam.gov.in/
2. https://www.udemy.com/
3. https://www.upgrad.com/
4. https://www.khanacademy.org/

FOURTH SEMESTER

4.1 ENGLISH AND COMMUNICATION SKILLS - II

L	P
2	2

RATIONALE

Communication II moves a step further from Communication Skills I and is aimed at enhancing the linguistic competency of the students. Language as the most commonly used medium of self-expression remains indispensable in all spheres of human life – personal, social and professional. This course is intended to make fresh ground in teaching of Communicative English as per the requirements of National Skill Quality Framework.

COURSE OUTCOMES

After undergoing this course, the learners will be able to:

CO1: Communicate effectively with an increased confidence; read, write and speak in English language fluently.

CO2: Comprehend special features of format and style of formal communication through various modes.

CO3: Write a Report, Resume, make a Presentation, Participate in GDs and Face Interviews

CO4: Illustrate use of communication to build a positive self-image through self-expression and develop more productive interpersonal relationships.

DETAILED CONTENTS

UNIT I

Reading

1.1 All The World's A Stage – W. Shakespeare

1.2 Life Sketch of Dr. Abdul Kalam

1.3 The Portrait of a Lady - Khushwant Singh

1.4 The Doctor's Word by R K Narayan

1.5 Speech by Dr Kiran Bedi at IIM Indore2007 Leadership Concepts

1.6 The Bet - by Anton Chekov

UNIT II

Effective Communication Skills

2.1 Modern means of Communication (Video Conferencing, e- mail, Teleconferencing)

2.2 Effective Communication Skills: 7 C's of Communication

2.3 Non-verbal Communication – Significance, Types and Techniques for Effective Communication

2.4 Barriers and Effectiveness in Listening Skills

2.5 Barriers and Effectiveness in Speaking Skills

UNIT III

Professional Writing

3.1 Correspondence: Enquiry letters, placing orders, complaint letters

3.2 Report Writing

3.3 Memos

3.4 Circulars

3.5 Press Release

3.6 Inspection Notes and tips for Note-taking

3.7 Corrigendum writing

3.8 Cover Letter

3.9 Drawing inferences

UNIT IV

Grammar and Vocabulary

4.1 Prepositions

4.2 Conjunctions

4.3 Punctuation

4.4 Idioms and Phrases

4.5 Pairs of words (Words commonly misused and confused)

4.6 Translation of Administrative and Technical Terms in Hindi or Mother tongue

UNIT V

Employability Skills

5.1 Presentation Skills: How to prepare and deliver a good presentation

5.2 Telephone Etiquettes

5.3 Importance of developing employable and soft skills

5.4 Resume Writing: Definition, Kinds of Resume, Difference between Bio-data and Curriculum Vitae and Preparing a Resume for Job/ Internship

5.5 Group discussions: Concept and fundamentals of GD, and learning Group Dynamics.

5.6 Case Studies and Role Plays

PRACTICAL EXERCISES

1. Reading Practice of the above lessons in the Lab Activity classes.
2. Comprehension exercises of unseen passages along with the given lessons.
3. Vocabulary enrichment and grammar exercises based on the above selective readings.
4. Situational Conversation: Requesting and responding to requests; Expressing sympathy and condolence.
5. Warning; Asking and giving information.
6. Getting and giving permission.
7. Asking for and giving opinions.
8. A small formal and informal speech.
9. Seminar.
10. Debate.
11. Unseen Comprehension Passages and vocabulary enhancement.
12. Interview Skills: Preparing for the Interview and guidelines for success in the Interview and significance of acceptable body-language during the Interview.
13. Written and Oral Drills will be undertaken in the class to facilitate a holistic linguistic competency among learners.
14. Participation in a GD, Functional and Non-functional roles in GD, Case studies and Role plays.
15. Presentations, using audio-visual aids (including power-point).
16. Telephonic interviews, face to face interviews.
17. Presentations as Mode of Communication: Persuasive Presentations using multi-media aids.

RECOMMENDED BOOKS

1. J Sethi, Kamlesh Sadanand & DV Jindal, “Course in English Pronunciation”, PHI Learning Pvt. Ltd., New Delhi.
2. Wren and Martin, “High School English Grammar and Composition”.

3. NK Aggarwal and FT Wood, "English Grammar, Composition and Usage", Macmillan Publishers India Ltd., New Delhi.
4. RC Sharma, and Krishna Mohan, "Business Correspondence & Report Writing", (4th Edition), by Tata MC Graw Hills, New Delhi.
5. Varinder Kumar, Bodh Raj & NP Manocha, "Business Communication Skills", Kalyani Publisher, New Delhi.
6. Kavita Tyagi & Padma Misra, "Professional Communication", PHI Learning Pvt. Ltd., New Delhi.
7. Nira Konar, "Communication Skills for Professionals", PHI Learning Pvt. Ltd., New Delhi.
8. Krishna Mohan & Meera Banerji, "Developing Communication Skills", (2nd Edition), Macmillan Publishers India Ltd., New Delhi.
9. M. Ashraf Rizwi, "Effective Technical Communication", Tata MC Graw Hills, New Delhi.
10. Andrea J Rutherfoord, "Basic Communication Skills for Technology", Pearson Education, New Delhi.

INSTRUCTIONAL STRATEGY

This is practice based subject and topics taught in the class should be practiced in the Lab regularly for development of required communication skills in the students. Emphasis should be given on practicing of communication skills. This subject contains five unit of equal weightage.

4.2 SURVEYING – II

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RATIONALE

The important functions of a civil engineer includes the jobs of detailed surveying, plotting of survey data, preparation of survey maps and setting out works. While framing the curriculum for the subject of surveying, stress has been given to the development of knowledge and skill in theodolite surveying, tachometry surveying, curves and use of minor and modern instruments have been included in this subject. Field work should be a selected one so that student can check his work and have an idea of the results the extent of error in the work done by him. As far as possible, the surveys done should be got plotted, as this will also reveal errors in the work and develop skill in plotting.

COURSE OUTCOMES

After undergoing the subject, students will be able to:

CO1: Prolong a line with theodolite.
CO2: Conduct closed traversing
CO3: Measure horizontal and vertical angles.
CO4: Set out simple circular curve
CO5: Prepare maps for closed traverse and open traverse with Total Station
CO6: Draw a contour plan of an area with Total station and DGPS
CO7: Calculate earth work for a road with Total station and DGPS

DETAILED CONTENTS

UNIT I

Electronic Digital Theodolite and Tachometric surveying

1.1 Concept/Difference of Transit Theodolite and Electronic Digital Theodolite
1.2 Temporary adjustments of an Electronic Digital Theodolite, Concept of transiting, swinging, face left, face right and changing face.
1.3 Prolonging a line (forward and backward)
1.4 Traversing by included angles and deflection angle method.

1.5 Plotting a traverse; concept of coordinate and solution of omitted measurements (one side affected)
1.6 Errors in theodolite survey and precautions taken to minimize them
1.7 Height of objects with and without accessible bases
1.8 Concept, general principles of stadia tachometry and methods of tachometry and (with numerical problems)
1.9 Instruments to be used in tachometry

UNIT II

Curves: (Horizontal, Vertical and Transition Curve)

2.1 Definition and types of horizontal curve
**2.1.1 Elements of simple circular curve - Degree of the curve, radius of the curve, tangent length, point of intersection (Apex point), tangent point, length of curve, long chord deflection angle, Apex distance and Mid-ordinate. (With numerical problems)
2.2 Transition Curve:
2.2.1 Definition of transition curve
2.2.2 Requirements of transition curve
2.2.3 Length of transition curve for roads; by cubic parabola
2.2.4 Need (centrifugal force and super elevation).
2.2.5 Calculation of offsets for a transition curve
2.3 Definition and types of vertical curve
2.3.1 Types of vertical curves
2.3.2 Setting out of a vertical curve

UNIT III

Introduction of Advanced Surveying Equipment and Techniques.

3.1 Principle of EDM, its component parts and their functions
3.2 Uses of EDM
3.3 Distomat
3.4 Remote sensing system
3.5 Application of remote sensing system in civil engineering, land uses/land cover, mapping, and disaster management
3.6 GPS, DGPS and GIS applications and software used (introduction only)
3.7 Planimeter (Digital)
3.8 Introduction of Drones Survey

UNIT IV

Total Station (TS)

4.1 Concept and uses of TS

4.2 Uses of function keys, various parts of TS

4.3 Accessories used in TS survey

4.4 Applications of TS in various engineering area.

4.5 Temporary adjustments of TS

4.6 Measurement of horizontal angle, vertical angle distance and coordinates using Total station, Traversing, profile survey and contouring with TS

4.7 Errors in TS

**4.8 Layout of any building, school, college, factory etc. with total station showing topographic map also

UNIT V

DGPS (Differential Global Positioning System)

5.1 Concept of DGPS, various parts, applications and software used for DGPS

5.2 Comparison between DGPS and TS

5.3 Temporary adjustments of a DGPS

5.4 How does DGPS work

5.5 Errors in DGPS

**5.6 Periodic field visits to Survey of India and other government agencies.

**5.7 Layout of drain, canal, road with DGPS.

**5.8 Demarcation of roads, plots, commercial spaces and agricultural land etc. with DGPS

NOTE: ** A field visit may be planned to explain and show the relevant things

PRACTICAL EXERCISES

I. Digital Theodolite:

i) Study of a transit vernier theodolite; temporary adjustments of theodolite

ii) Reading the Vernier and working out the least count, measurement of horizontal angles by repetition and reiteration methods

iii) Measurement of vertical angles and use of tachometric tables

iv) Measurement of magnetic bearing of a line

vi) Running a closed traverse with a theodolite (at least five sides) and its plotting

v) Height of objects with and without accessible bases

II. Curves
- i) Setting out of a simple circular curve with given data by the following methods
  - a) Offsets from the chords produced by Digital Theodolite
  - b) One theodolite method
- ii) Setting out of simple circular curve by tangential angles using a Digital Theodolite.
- iii) Setting out of a transition curve by tangential offsets using a Digital Theodolite.

III Total Station
- i) Temporary adjustments of a Total station
- ii) Measurement of distance, horizontal angle and vertical angle.
- iii) To plot an area with the help of Total Station
- iv) Layout of any building, school, college, factory etc. with total station showing topographic map also
  (Draw at least one sheet using AutoCAD software)

IV DGPS (Differential Global Positioning System)
- i) Computation of earth work and reservoir capacity with DGPS
- ii) Layout of drain, canal, road with DGPS.
- iii) Demarcation of roads, plots, commercial spaces and agricultural land etc. with DGPS
  (Draw at least one sheet using AutoCAD software)
- iv) Periodic field visits to Survey of India and other government agencies.

RECOMMENDED BOOKS

1. SK Hussain, and MS Nagraj, "Text Book of Surveying", S Chand and Co Ltd., New Delhi.
2. RS Deshpande, "A Text Book Surveying and Levelling", United Book Corporation, Pune.
3. CL Kocher, "A Text Book of Surveying", Katson Publishing House Ludhiana.
4. TP Kanetkar, and SV Kulkarni, "Surveying and Leveling-Vol.2", AVG Prakashan, Pune.
5. BC Punima, "Surveying and Leveling", Standard Publishers Distributors, Delhi.
6. Sanjay Mahajan, “Surveying-II”, Satya Prakashan, Delhi.

SUGGESTED WEBSITES

1. http://swayam.gov.in

INSTRUCTIONAL STRATEGY

This is highly practice-oriented course. While imparting theoretical instructions, teachers are expected to demonstrate the use of various instruments in surveying, stress should be laid on correct use of various instruments so as to avoid/minimize errors during surveying. It is further recommended that more emphasis should be laid in conducting practical work by individual students. Extract data from Total Station and DGPS all civil engineering students train to use AutoCAD software. If a student aspires to be successful in the civil engineering, design, field surveyor etc. then AutoCAD may be an essential tool to learn. This subject contains five units of equal weightage.

4.3 WATER SUPPLY AND WASTE WATER ENGINEERING

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RATIONALE

One of the basic necessities of life is water which is not easily available to a lot of people. Providing potable water at the first place then collection and disposal of waste solids and liquids are important activities of civil engineering field. This subject provides basic knowledge and skills in the field of water supply system and waste disposal system. Classroom instructions should be supplemented by field visits to show functional details of water supply and waste disposal systems. It will also be advantageous to invite professionals from field to deliver extension lectures on specialized operations.

COURSE OUTCOMES

After undergoing the subject, students will be able to:

CO1: Calculate the water requirement for a particular population
CO2: Check and improve the quality of water by giving required treatment to water
CO3: Calculate the size of different pipes to carry water
CO4: Lay the network of pipes for water supply as well as sewerage in a building
CO5: Supervise the water supply and waste water schemes

DETAILED CONTENTS

A. WATER SUPPLY

UNIT I

Quantity and Quality of Water

1.1 Necessity and brief description of planned water supply system.
1.2 Sources of water – surface/sub-surface sources (only description)
1.3 Water requirement, Per capita demand, Factors affecting per capita demand
1.4 Rate of demand and variation in rate of demand
1.5 Design Period, Factors governing the design period, Design period values for different components of a water supply scheme
1.6 Population forecasting methods (with Numerical Problems)
1.7 Physical, Chemical and bacteriological tests and their significance

1.8 Standard of potable water as per Indian Standard, water meter

UNIT II

Water Treatment

**2.1 Sedimentation - Purpose, Types of sedimentation tanks

**2.2 Coagulation / Flocculation - usual coagulation and their feeding

**2.3 Filtration - Slow and Rapid sand filters, their significance and suitability

2.4 Necessity of disinfection of water, forms of chlorination, break point chlorine, residual chlorine, application of chlorine.

2.5 Miscellaneous Treatments – Aeration, Aquaguard, Reverse Osmosis System

UNIT III

Water Distribution System

3.1 Requirement of a good water distribution system

3.2 Layout of distribution networks

3.3 Methods of distribution

3.4 Distribution reservoirs – their functions and types

3.5 Storage capacity of distribution reservoirs

3.6 Stand Pipes

B. WASTE WATER ENGINEERING

UNIT IV

Waste Water Disposal

4.1 Sanitation – Purpose and necessity of sanitation

4.2 Components of sewerage system - Manhole

4.3 Types of sewage and types of sewerage system

4.4 Properties of sewage and IS standards for analysis of sewage

4.5 Physical, chemical and bacteriological parameters of sewage

4.6 Sewage disposal methods - Disposal by dilution and land treatment

4.7 Self-purification of stream, Nuisance due to disposal

UNIT V

Sewage Treatment

5.1 Primary and secondary treatment

5.2 Screens, Grit chambers, Skimming tanks

5.3 Plain sedimentation tanks

5.4 Filtration, Trickling filter

5.5 Sludge treatment and disposal

5.7 Oxidation Ponds (Visit to a sewage treatment plant)

NOTE: ** A field visit may be planned to explain and show the relevant things

PRACTICAL EXERCISES

1) To determine turbidity of water sample
2) To determine dissolved oxygen of given sample
3) To determine pH value of water
4) To perform jar test for coagulation
5) To determine BOD of given sample
6) To determine residual chlorine in water
7) To determine conductivity of water and total dissolved solids
8) To study the installation of following:
   a) Water meter
   b) Connection of water supply of building with main
   c) Pipe valves and bends
   d) Water supply and sanitary fittings
9) To study and demonstrate the joining / threading of GI Pipes, CI Pipes, SWG pipes, PVC pipes and copper pipes.
10) To demonstrate the laying of SWG pipes for sewers
11) Study of water purifying process by visiting a field lab.
12) To study the installation and working of water cooler available in Institution
13) To study the installation and working of Reverse Osmosis System available in Institution
14) To study the working of Rain Water Harvesting System
15) To demonstrate the drainage of roof top rain water of Institutional building
16) Prepare a report of a field visit to sewage treatment plant
17) Undertake a field visit to water treatment plant and prepare a report.

RECOMMENDED BOOKS

1. KN Duggal, “Elements of Public Health Engineering”; S. Chand and Co. New Delhi.
2. SC Rangwala, “Water Supply and Sanitary Engineering”, Charotar Book Stall, Anand.
3. SR Kshirsagar, “Water Supply Engineering”, Roorkee Publishing House, Roorkee.
4. SR Kshirsagar, “Sewage and Sewage Tratement”, Roorkee Publishing House, Roorkee.

5. GS Birdie, “Water Supply and Sanitary Engineering”, Dhanpat Rai and Sons, Delhi.
6. Santosh Kumar Garg, “Water Supply Engineering”, Khanna Publishers, Delhi.
7. Santosh Kumar Garg, “Sewage and Waste Water Disposal Engineering”, Khanna Publishers, Delhi.
8. Ajay K Duggal, and Sanjay Sharma, “A Laboratory Manual in Public Health Engineering”, Galgotia Publications, 2006, New Delhi.
9. e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

SUGGESTED WEBSITES

1. http://swayam.gov.in

INSTRUCTIONAL STRATEGY

Before imparting the instructions in the class room, visits to water works and sewage treatment plants can go a long way for increased motivation of students for learning in the class room. As the subject is of practical nature, lecture work be supplemented by field visits from time to time. Home assignments related to collection of information, pamphlets and catalogues from hardware shop dealing water supply and sanitary fittings will be very helpful for the students. This subject contains five units of equal weightage.

4.4 SOIL MECHANICS AND FOUNDATION ENGINEERING

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RATIONALE

Civil Engineering diploma engineers are required to supervise the construction of roads, pavements, dams, embankments, and other Civil Engineering structures. As such the knowledge of basic soil engineering is the pre-requisite for these engineers for effective discharge of their duties. The subject covers only such topics which will enable the diploma engineers to identify and classify the different types of soils, their selection and proper use in the field for various types of engineering structures.

COURSE OUTCOMES

After undergoing the subject, students will be able to:

CO1: Identify and classify various types of soils
CO2: Select particular type of foundation according to loading of structure
CO3: Determine shear strength of soil
CO4: Carry out compaction of soils as per density
CO5: Calculate bearing capacity of soil
CO6: Calculate liquid limit and plastic limit of soil
CO7: Perform various tests of the soil

DETAILED CONTENTS

UNIT I

1. Introduction

1.1 Importance of Soil Studies in Civil Engineering

1.2 Geological origin of soils with special reference to soil profiles in India: residual and transported soil, alluvial deposits, lake deposits, local soil found in Punjab, dunes and loess, glacial deposits, black cotton soils, conditions in which above deposits are formed and their engineering characteristics.

1.3 Names of organizations dealing with soil engineering work in India, soil map of India

2. Physical Properties of Soils

2.1 Constituents of soil and representation by a phase diagram

2.2 Definitions of void ratio, porosity, degree of saturation, water content, specific gravity, unit weight, bulk density/bulk unit weight, dry unit weight, saturated unit weight and submerged unit weight of soil grains.

UNIT II

3. Classification and Identification of Soils

3.1. Particle size, shape, and their effect on engineering properties of soil, particle size classification of soils

3.2. Gradation and its influence on engineering properties

3.3 Relative density and its use in describing cohesionless soils

3.4 Behaviour of cohesive soils with change in water content, Atterberg's limit - definitions, use and practical significance

3.5 Field identification tests for soils

4. Flow of Water Through Soils

4.1 Concept of permeability and its importance

4.2 Darcy's law, coefficient of permeability, seepage velocity and factors affecting permeability

4.3 Comparison of permeability of different soils as per BIS

4.4 Measurement of permeability in the laboratory

UNIT III

5. Effective Stress: (Concept only)

5.1 Stresses in subsoil

5.2 Definition and meaning of total stress, effective stress and neutral stress

5.3 Principle of effective stress

5.4 Importance of effective stress in engineering problems

6. Deformation of Soils

6.1 Meaning, conditions/situations of occurrence with emphasis on practical significance of:

a) Consolidation and settlement
b) Creep
c) Plastic flow
d) Heaving
e) Lateral movement
f) Freeze and thaw of soil

6.2 Meaning of total settlement, uniform settlement, and differential settlement; rate of settlement and their effects.

6.3 Settlement due to construction operations and lowering of water table

6.4 Tolerable settlement for different structures as per BIS

UNIT IV

7. Shear Strength of Soil

7.1. Concept and Significance of shear strength

7.2 Factors contributing to shear strength of cohesive and cohesion less soils, Coulomb's law

8. Compaction

8.1 Definition and necessity of compaction

8.2 Laboratory compaction test (standard and modified proctor test as per IS) definition and importance of optimum water content, maximum dry density; moisture dry density relationship for typical soils with different compactive efforts

8.3. Compaction control; Density control, measurement of field density by core cutter method and sand replacement method, moisture control, Proctor's needle and its use, thickness control

9. Soil Exploration

9.1 Purpose and necessity of soil exploration

9.2 Reconnaissance, methods of soil exploration, Trial pits, borings (auger, wash, rotary, percussion to be briefly dealt)

9.3 Sampling; undisturbed, disturbed, and representative samples; selection of type of sample; thin wall and piston samples; area ratio, recovery ratio of samples and their significance, number, and quantity of samples, resetting, sealing and preservation of samples.

9.4 Presentation of soil investigation results

UNIT V

10 Bearing Capacity of soil

10.1 Concept of bearing capacity

10.2 Definition and significance of ultimate bearing capacity, net safe bearing capacity and allowable bearing pressure

10.3 Factors affecting bearing capacity.

10.4 Improvement of bearing capacity by sand drain method, compaction, use of geo-synthetics.

11. Foundation Engineering

11.1 Concept of shallow and deep foundation.

11.2 types of shallow foundations: combined, isolated, strip, mat, and their suitability.

11.3 Factors affecting the depth of shallow foundations, deep foundations,

11.4 type of piles and their suitability; pile classification based on material, pile group and pile cap**.**

PRACTICAL EXERCISES

1. To determine the moisture content of a given sample of soil
2. Auger Boring and Standard Penetration Test
   a) Identifying the equipment and accessories
   b) Conducting boring and SPT at a given location
   c) Collecting soil samples and their identification
   d) Preparation of boring log and SPT graphs
   e) Interpretation of test results
3. Extraction of Disturbed and Undisturbed Samples
   a) Extracting a block sample
   b) Extracting a tube sample
   c) Extracting a disturbed samples for mechanical analysis.
   d) Field identification of samples
4. Field Density Measurement (Sand Replacement and Core Cutter Method)
   a) Calibration of sand
   b) Conducting field density test at a given location
   c) Determination of water content
   d) Computation and interpretation of results
5. Liquid Limit and Plastic Limit Determination:
   a) Identifying various grooving tools
   b) Preparation of sample
   c) Conducting the test
   d) Observing soil behaviour during tests
   e) Computation, plotting and interpretation of results
6. Mechanical Analysis
   a) Preparation of sample
   b) Conducting sieve analysis
   c) Computation of results

d) Plotting the grain size distribution curve
e) Interpretation of the curve

7 Laboratory Compaction Tests (Standard Proctor test)
a) Preparation of sample
b) Conducting the test
c) Observing soil behaviour during test
d) Computation of results and plotting
e) Determination of optimum moisture and maximum dry density

8. Direct Shear Test
9. Permeability Test
10. Demonstration of Unconfined Compression Test
a) Specimen preparation
b) Conducting the test
c) Plotting the graph
d) Interpretation of results and finding/bearing capacity
11. Demonstration of Vane shear Test

RECOMMENDED BOOKS

1. BC Punmia, "Soil Mechanics and Foundations", Standard Publishers, Delhi.
2. Bharat Singh and Shamsher Prakash, "Soil Mechanics and Foundations Engineering", Nem Chand and Bros, Roorkee.
3. AK.Duggal, TR. Ramana, S Krishnamurthy, "Soil Sampling and Testing - A Laboratory Manual", Galgotia Publications, Delhi.
4. BIS Codes IS 6403 (latest edition) and IS 1498 (latest edition).
5. "Shallow Foundations" by NITTTR, Chandigarh.
6. Vinod Kumar, "Video films on Geo-technical Laboratory Practices", NITTTR, Chandigarh.
7 e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

SUGGESTED WEBSITES

1. http://swayam.gov.in

INSTRUCTIONAL STRATEGY

The teacher while imparting instructions are expected to lay greater emphasis on the practical aspects rather than theory and mathematical treatment. To bring clarity regarding concepts and principles involved, teachers should organize demonstrations in the laboratories and fields. It is necessary to create understanding that soils fail either under shear or settlement due to heavy loads. This can be shown by making use of photographs on working models of such failures. Efforts should be made in the practical classes that students perform practical exercises individually. Conduct of viva examination at the end of each practical work will develop clear understanding about the concepts and principles related to this subject. This subject contains five units of equal weightage.

4.5 IRRIGATION ENGINEERING

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RATIONALE

Diploma holders in Civil Engineering have to supervise the construction, repair and maintenance of canals, head works, river training works, cross drainage works, regulatory and other works. Some of diploma holders are also engaged for preventing water logging and irrigation by tube wells. This subject imparts knowledge regarding hydrology, flow irrigation – storage and distribution system, constructional features of head works, river training works, cross drainage works, causes and prevention of water logging and construction of tube wells.

COURSE OUTCOMES

After undergoing the subject, students will be able to:

CO1: Recognise different crops and their water requirements
CO2: Supervise maintenance and construction work of canal head works and cross Regulators
CO3: Supervise constructions of various river training works
CO4: Monitor installation of water harvesting techniques

DETAILED CONTENTS

UNIT I

1. Introduction: Irrigation Engineering, Hydrological Cycle, Run-off and Catchment Area

1.1 Definition and necessity of irrigation
1.2 Major, medium and minor irrigation projects
1.3 Hydrology and hydrological cycle
1.4 Rain-gauges – automatic and non-automatic (Symons rain gauge)
1.5 Methods of estimating average rainfall (Arithmetic system)
1.6 Runoff and Factors affecting runoff, Catchment area
1.7 Hydrograph and basic concept of unit hydrograph.

UNIT II

2. Water Requirement of Crops

2.1 Principal crops in India and their water requirements

2.2 Crop seasons – Kharif and Rabi

2.3 Crop period, base period, Duty, Delta and their relationship.

2.4 Gross commanded area (GCA), culturable commanded area (CCA), Intensity of Irrigation, Irrigable area

3. Methods of Irrigation

3.1 Flow irrigation – Definition and its types (only description)

3.2 Lift Irrigation – Tube well, Types of tube wells (only description)

3.3 Explanation of terms: water table, radius of influence, depression head, cone of depression, confined and unconfined aquifers, advantages and disadvantages of tube well irrigation.

3.4 Sprinkler irrigation- Conditions favourable, Types and component parts, advantages and disadvantages of sprinkler irrigation.

3.5 Drip irrigation- layout, component parts, advantages and disadvantages of drip irrigation.

UNIT III

4. Canals, Canal Head Works, Regulatory Works and Cross Drainage Works

4.1 Definition and Classification of canal. (Visit to a Canal)

**4.2 Appurtenances of a canal and their functions.

4.3 Various types of canal lining - their related advantages and disadvantages,

4.4 Canal breaches and their control.

4.5 Maintenance of lined and unlined canals

4.6 Definition, objectives and general layout of different parts of head works.

4.7 Difference between weir and barrage

**4.8 Definition and necessity of Cross Drainage Works (Visit to a Cross Drainage Works)

**4.9 Concept of Aqueduct, super passage, level crossing, inlet and outlet.

UNIT IV

5. Dams and hydraulic Structures

5.1 Dam and its Classification

**5.2 Earth dams - types, causes of failure; cross-section of zoned earth dam, method of construction,

**5.3 Gravity dams – types, cross-sections of a dam, method of construction

5.4 Concept of spillways and energy dissipators

5.5 Concept of Canal Falls, Outlets and Escapes

UNIT V

6. River Training Works

6.1 Definition, function of river training works.

6.2 Types of river training- Embankments or levees.

6.3 Concept of Guide bank, Groynes or spurs, Pitched island, Cut-off

7. Water Logging and Drainage and Ground Water Re-charge

7.1 Definition of water logging – its causes and effects.

7.2 Detection, prevention and remedies

7.3 Surface and sub-surface drains and their layout (only description)

7.4 Water Harvesting Techniques: Need and requirement.

7.5 Various methods of rain water harvesting.

NOTE: ** A field visit may be planned to explain and show the relevant things

RECOMMENDED BOOKS

1. Santosh Kumar Garg, "Irrigation Engineering and Hydraulics Structures", Khanna Publishers, Delhi.
2. BC Punmia, and Brij Bansi Lal Pande, "Irrigation and Water Power Engineering", Standard Publishers Distributors, Delhi.
3 SR Saharsabudhe, "Irrigation Engineering and Hydraulic Structures".
4 BIS Codes.
5. Central Ground Water Board and Central Water Commission Guidelines and Reference Books.
6. e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

SUGGESTED WEBSITES

1. http://swayam.gov.in

INSTRUCTIONAL STRATEGY

The teaching of the subject should be supplemented by field visits at regular intervals of time to expose the students to irrigation works. Students should be asked to prepare and interpret drawings of various irrigation works. This subject contains five units of equal weightage.

4.6 OPEN ELECTIVE

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RATIONALE

Open electives are very important and play major role in implementation of National Education Policy. These subjects provide greater autonomy to the students in the curriculum, giving them the opportunity to customize it to reflect their passions and interests. The system of open electives also encourages cross learning, as students pick and choose subjects from the different streams.

COURSE OUTCOMES

At the end of the open elective, the students will be able to:

CO1: State the basic concepts and principles about the subject of interest.
CO2: Perform in a better way in the professional world.
CO3: Select and learn the subject related to own interest.
CO4: Explore latest developments in the field of interest.
CO5: Develop the habit of self-learning through online courses.

LIST OF OPEN ELECTIVES

(The list is indicative and not exhaustive)

1. Computer Application in Business
2. Introduction to NGO Management
3. Basics of Event Management
4. Event Planning
5. Administrative Law
6. Introduction to Advertising
7. Moodle Learning Management System
8. Linux Operating System
9. E-Commerce Technologies
10. NCC
11. Marketing and Sales
12. Graphics and Animations

13. Digital Marketing
14. Human Resource Management
15. Supply Chain Management
16. TQM

GUIDELINES

Open Elective shall be offered preferably in online mode. Online mode open elective shall preferably be through Massive Open Online Courses (MOOCs) from Swayam, NPTEL, Upgrad, Udemy, Khan Academy or any other online portal to promote self-learning. A flexible basket of large number of open electives is suggested which can be modified depending upon the availability of courses at suggested portals and requirements. For online open electives, department coordinators shall be assigned to monitor and guide the group of students for selection of minimum 20 hours duration online course of their choice. For offline open electives, a suitable relevant subject shall be offered by the respective department to the students with minimum 40% of the total class strength as per present and future requirements.

Assessment of MOOCs open elective shall be based on continuous evaluation by the respective coordinator. The coordinator shall consider the submitted assignments by the students from time to time during the conduct of MOOCs. The MOOCs assessment shall be conducted by the coordinator along with one external expert by considering submitted assignments out of 100 marks.

In case, no suitable open elective is available online, only then the course may be conducted in offline mode. The assessment of offline open elective shall be internal and external. The offline open elective internal assessment of 40 marks shall be based on internal sessional tests; assignments etc. and external assessment of 60 marks shall be based on external examination at institute level.

NOTE

The students enrolled under NCC will compulsorily undertake NCC as an open elective subject.

SUGGESTED WEBSITES

1. https://swayam.gov.in/
2. https://www.udemy.com/
3. https://www.upgrad.com/
4. https://www.khanacademy.org/

4.7 MINOR PROJECT

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RATIONALE

Minor project work will help in developing the relevant skills among the students as per National Skill Qualification Framework. It aims at exposing the students to the present and future needs of various relevant industries. It is expected from the students to get acquainted with desired attributes for industrial environment. For this purpose, students are required to be involved in Minor Project Work in different establishments.

COURSE OUTCOMES

After undergoing this course, the students will be able to:

CO1: Define the problem statement of the minor project according to the need of industry.
CO2: Work as a team member for successful completion of minor project.
CO3: Write the minor project report effectively.
CO4: Present the minor project report using PPT.

GUIDELINES

Depending upon the interest of the students, they can develop minor projects as per present and future demand of the industry. The supervisors may guide the students to identify their minor project work and chalk out their plan of action well in advance. As a minor project activity each student is supposed to study the operations at site and prepare a detailed project report of the observations/processes/activities. The supervisor may create a group of 4-5 students as per their interest to work as a team for successful completion of the minor project.

The supervisor shall evaluate the students along with one external expert by considering the following parameters:

	Parameter	**Weightage**
i	Defining problem statement, focus and approach	20%
ii	Innovation / creativity	20%
iii	Report Writing	20%
iv	Power Point Presentation	20%
v	Viva - voce	20%


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