

GOVERNMENT POLYTECHNIC, MUMBAI

(An Autonomous Institute of Govt. of Maharashtra)



Department of Civil Engineering

**P-19 Curriculum
(Sandwich Pattern)**

Government Polytechnic, Mumbai

Department of Civil Engineering

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Government Polytechnic, Mumbai

Department of Civil Engineering

INSTITUTE VISION

- Transform knowledge into work

INSTITUTE MISSION

We are committed to:

- Quality education for lifelong learning.
- Need based educational programmes through different modes.
- Outcome based curriculum implementation.
- Development and up gradation of standard laboratory practices.
- Promoting entrepreneurial programmes.
- We believe in ethical values, safety and environment friendly practices and teaching learning innovations.

DEPARTMENT VISION

- To provide quality education in Civil Engineering and prepare national proactive technician in contribution towards social uplifting and national building.

DEPARTMENT MISSION

- To prepare disciplined, compassionate and virtuous technician to make significant contribution to the economic development of the state and the country on a whole.

Government Polytechnic, Mumbai

Department of Civil Engineering

PROGRAMME OUTCOMES (POs)

1. Basic and Discipline specific knowledge: Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the engineering problems.
2. Problem analysis: Identify and analyse well-defined engineering problems using codified standard methods.
3. Design/ development of solutions: Design solutions for well-defined technical problems and assist with the design of systems components or processes to meet specified needs.
4. Engineering Tools, Experimentation and Testing: Apply modern engineering tools and appropriate technique to conduct standard tests and measurements.
5. Engineering practices for society, sustainability and environment: Apply appropriate technology in context of society, sustainability, environment and ethical practices.
6. Project Management: Use engineering management principles individually, as a team member or a leader to manage projects and effectively communicate about well-defined engineering activities.
7. Life-long learning: Ability to analyse individual needs and engage in updating in the context of technological changes.

Government Polytechnic, Mumbai

Department of Civil Engineering

PROGRAMME EDUCATIONAL OBJECTIVES (PEOS)

- PEO1.** Diploma graduates will establish themselves as skilled technicians and quality supervisor in solving the problems for addressing the needs of the society.
- PEO2.** Diploma graduates will be well equipped with latest technologies prevailing in the construction industries and making themselves able to stand confidently and industriously in the rapid changing scenario in India and abroad.
- PEO3.** Diploma graduates will pursue lifelong learning and will establish themselves as the leaders, both in their chosen profession and in other activities and act professionally and ethically while making decisions fulfilling the social, cultural and sustainability requirements.

Programme Specific Outcomes (PSOs)

- PSO 1.** To understand, read, draw & interpret drawings of different Civil Engineering Systems.
- PSO 2.** To be able to supervise different Civil Engg. sites.
- PSO 3.** To conduct different surveying activities in Civil Engineering Practices.

Government Polytechnic Mumbai



Curriculum Philosophy **(P19 Outcome based Curriculum)** **(Sandwich Pattern)**

Preface

The quality of technical education is dependent on a well-developed curriculum. The curriculum should not focus only on technical contents but it should impart necessary skills that help students to learn how to cope with new challenges. It should prepare them for lifelong learning once they enter the workforce. It is very necessary that the diploma students should be well updated with the latest technological skills and advancements, to meet industrial demands and contribute to nation building. With this thought we have designed outcome based curriculum keeping in view the latest industry trends and market requirements. Outcome based curriculum will be offered to students 2019 onwards. Outcome based curriculum is student centric rather than teacher centric. It is comprising of basic science and engineering having focus on fundamentals, significant discipline level courses and electives. Six month Inplant training is also included in the curriculum to make the student understand industry requirements, have hands on experience and take up project work relative to industry in their final year. These features will allow the students to develop problem solving approach to face the challenges in real life.

In outcome based education, Programme Outcomes, Programme specific outcomes, Course outcomes are defined first and then course contents are designed to achieve these outcomes. During curriculum implementation the teacher will analyze the contents and then develop the learning experiences which will ensure accomplishment of outcome. The industry experts, being main stakeholders are actively involved, while designing the curriculum. Outcomes are validated by industry experts, so it will produce industry ready pass outs and increase the employability of students.

Salient features of this curriculum are

- Outcome based curriculum with well defined outcomes for each course
- Incorporation of six month Inplant training
- Built in flexibility to the students in terms of elective courses
- Course on Entrepreneurship and Start-up to encourage entrepreneurial skills
- More weightage for practical's in terms of contact hours to increase skill component
- Student Centered Activity in first, second and third semester to inculcate the habit of physical and mental fitness right at the start
- One MOOC in each semester in order to inculcate self learning capability in students.

- A list of experiments with clear outcomes.

The New Curriculum has been designed to better meet the needs of the industry considering evolving technological trends and implications for the engineering workforce. This curriculum is also expected to enhance employability skills and develop well trained Diploma Engineers who have the knowledge and the skills to get engineering solutions for real-world problems.

I gratefully acknowledge the time and efforts of all those who contributed to design the curriculum, especially the contributions of chairperson and members of Board of Studies and Program wise Board of Studies. I acknowledge all the stake holders, alumnies and subject experts.

(Mrs. Swati Deshpande)
Principal
Government Polytechnic Mumbai

Outcome Based Education Philosophy

As the National Board of Accreditation (NBA) is focusing on the adoption of Outcome Based Education (OBE) approach, Government Polytechnic, Mumbai has adopted the OBE approach for design of curriculum P19 to all programmes. NBA adopted Outcome based Model because, OBE is “Student Centric” rather than “Teacher Centric”. OBE focuses on the graduate attributes or outcomes after completing an academic programme. Outcome based approach means knowing what you want to achieve and then taking the steps to do so. Starting with a clear picture of what is important for students to be able to do and then organizing the curriculum delivery and assessment to make sure learning happens.

Some Benefits of OBE are

1. Satisfying the need of stake holders
2. More specific and coherent curriculum
3. Student centric

Components of the OBE are

1. Outcome based curriculum: What students should be able to do after learning the curriculum?
2. Outcome based Teaching Learning: Prepare and train the students to achieve the outcomes.
3. Outcome based assessment: Measure what the student has achieved? Identify which outcome has not attained by the students.
4. Remedial measures: Take the remedial measures so that student can achieve that outcome.



Fig1. Outcome Based Education Philosophy

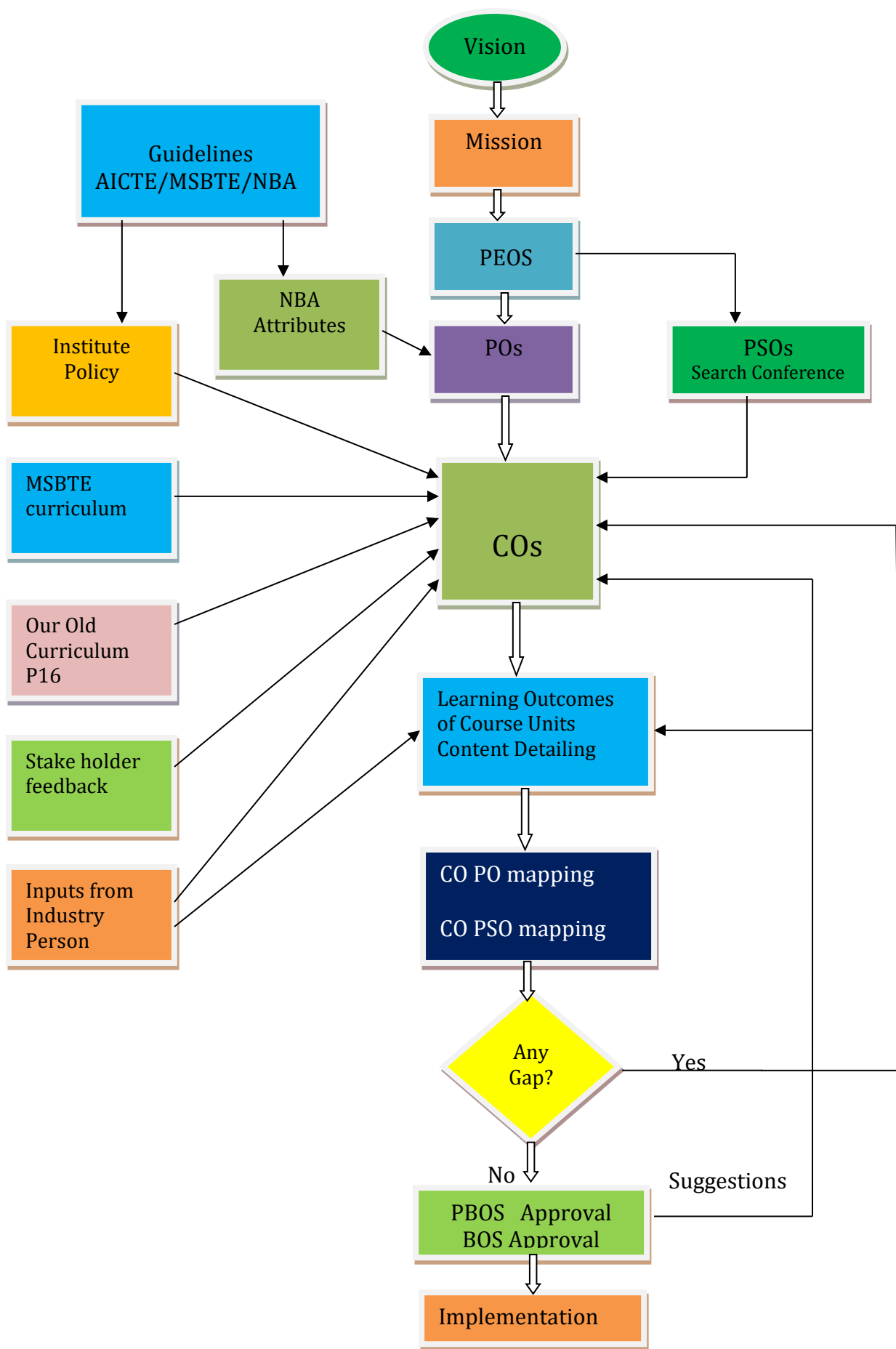


Fig. 2 Curriculum Design Process

Figure 1 shows outcome based education philosophy. Vision and mission statements will be finalized first, and then each programme will finalize Programme educational objectives (PEOs). Programme outcomes (POs) are given by NBA. Each programme will finalize their Programme Specific Outcomes (PSOs). Then course outcomes (COs) are finalized and then content detailing of each course will be carried out.

Figure 2 shows our curriculum design process/philosophy. Figure is self explanatory. Important steps are given below. Process starts with formulation of vision mission statements of the institute.

1. Formulation of Vision Mission Statements

Vision Mission statements of the institute are finalized using following steps.

- Bottoms up approach
- Involvement all stakeholders
- Discussion, Brain storming sessions among all stake holders
- Gap analysis or SWOT analysis
- Challenges before the institute
- What are the immediate and long term goals

After following these steps vision and mission statements of the institute is finalized as

Institute Vision

Transform Knowledge into Work

Institute Mission

We are committed for

- Quality education for lifelong learning
- Need based educational programmes through different modes.
- Outcome based curriculum implementation
- Development and up gradation of standard laboratory practices
- Promoting entrepreneurial programmes

We believe in ethical, safety, environmental friendly practices and teaching learning innovations.

Once, the vision mission statements are finalized. Using the same procedure vision mission statements of each programmes are finalized.

2. Programme Educational Objectives (PEOs)

The Programme educational objectives of a diploma program are the statements that describe the expected achievements of diploma holders in their career, and also in particular, what they are expected to perform and achieve during the first few years after diploma. The PEOs, may be guided by global and local needs, vision of the Institution, long term goals etc. For defining the PEOs the faculty members of the program have continuously worked with all Stakeholders: Local Employers, Industry, Students and the Alumni

3. Programme Outcomes (POs)

Programme outcomes are given by NBA. They are

1. **Basic and Discipline specific knowledge:** Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the engineering problems.
2. **Problem analysis:** Identify and analyze well defined engineering problems using codified standard methods.
3. **Design/ development of solutions:** Design solutions for well-defined technical problems and assist with the design of systems components or processes to meet specified needs.
4. **Engineering tools experimentation and testing:** Apply modern engineering tools and appropriate technique to conduct standard test and measurements.
5. **Engineering practices for society sustainability and environment:** apply appropriate technology in context of society sustainability environment and ethical practices
6. **Project management:** Use Engineering Management principles individually, as a team member or a leader to manage projects and effectively communicate about well-defined engineering activities.
7. **Life-long learning:** Ability to analyze individual needs and engage in updating in the context of technological changes

4. Programme Specific Outcomes (PSOs)

These outcomes are specific to a program in addition to NBA defined POs, namely, Civil, Computer, Electrical, Electronics, Mechanical, Information Technology, Instrumentation, Rubber Technology, Leather Technology, and Leather Goods and Footwear technology.

5. Course Outcomes (COs) and Content detailing

“Statements of observable student actions that serve as evidence of the Knowledge, Skills and Attitudes acquired in a course”. Each course is designed to meet (about 4 to 6) Course Outcomes. The Course Outcomes are stated in such a way that they can be actually measured. “Blooms Taxonomy” is used for framing course outcomes.

Course Outcome statements are broken down into two main components:

- **An action word** that identifies the performance to be demonstrated;
- **Learning statement** that specifies what learning will be demonstrated in the performance;

Once the COs are finalized, content detailing of each course is done as per the course outcomes. For content detailing inputs are taken from stake holders, MSBTE curriculum and industry persons.

6. CO-PO and CO-PSO mapping

When all COs are finalized, COs are mapped with POs and PSOs. During mapping if it is found that particular PO or PSO has not been addressed by any CO, then it is considered as gap. To remove this gap, again COs are modified. This process will repeat till all POs and PSOs are mapped by COs.

7. Approval in PBOS and BOS meetings.

After CO-PO and CO-PSO mapping, content detailing is done. Then the curriculum is kept for approval in Programme wise Board of studies (PBOS) meeting. Each programme has its own PBOS committee whose structure is as follows.

| | |
|---|----------|
| Head of Department concerned | Chairman |
| Two senior Lecturers | Members |
| One expert from the neighboring institute | Member |
| Nominee from the board of technical Education | Member |

| | |
|-------------------------------------|------------------|
| One expert from the local industry | Member |
| Departmental Curriculum Coordinator | Member Secretary |

Suggestions given by PBOS members are incorporated in the curriculum and then it is put in front of Board of studies (BOS). Structure of BOS is as follows.

| | |
|---|------------------|
| Representative from Industry | Chairman |
| Principal | Member |
| Head of All departments | Member |
| Local Experts of all programmes | Member |
| Nominee from the board of technical Education | Member |
| In charge CDC | Member Secretary |

Suggestions given by BOS members are incorporated in the curriculum and the finalized curriculum is then offered to the students.

8. Institute Policies

As per the guidelines given by All India Council of Technical Education (AICTE), Maharashtra State Board of Technical Education (MSBTE), Directorate of Technical Education (DTE) and NBA, Institute policies about curriculum design are decided in the meeting of all Heads of the departments.

Being an autonomous institute, we revise our curriculum after every 4 to 5 years. Earlier it was revised in 2016. Curriculum 2016 was outcome based curriculum. As per instructions received from AICTE and NBA, Outcome based curriculum should be offered to students, we have offered Outcome based curriculum in 2016. In 2019, we have conducted search conference in all departments to identify set of skill components that should be developed in students at the end of the diploma programme. Here we got suggestions from industry experts as well as from stakeholders about incorporation of six month Inplant training in the curriculum itself to give awareness about industry culture to students. So in 2019 we revised our curriculum. It is outcome based with six months Inplant training. We got approval from AICTE also. So now all courses are sandwich pattern. This scheme we name as P19 scheme. In 2019 it will be offered to first year and in subsequent years it will be offered to second year and third year. Once the curriculum frame work is finalized at the institute level, as per the demand of the industry, course contents can be

changed at any level without disturbing the frame work. This is necessary to satisfy the present demand of the industry and remove the curricula gaps as per the advancement in technology.

2019 curriculum is of 180 credits (215 teaching hours). As per AICTE norms given in APH 2015-16, contact hours per semester should be 525 hours and number of teaching days should be 75 in a semester (7 hours per day i.e. 35 hours per week). Total weeks for teaching are 15. One week will be for unit test exam. Total term will be of 16 week.

So we decided to design 2019 curriculum with 180 credits.

Definition of Credit:

1 Hr. Lecture (L) per week 1 credit

1 Hr. Tutorial (T) per week 1 credit

2 Hours Practical (P) per week 2 credit

All programmes (Civil Engineering, Computer Engineering, Electrical Engineering, Electronics Engineering, Information Technology, Instrumentation, Mechanical Engineering, Rubber Technology, Leather Technology, Leather Goods and Footwear Technology) have incorporated six month Inplant training in their curriculum, wherein students will go for Inplant training in the industries during last semester. 20 credits (40 teaching hours per week) are allotted for Inplant training.

Curriculum Framework

Semester wise Credit distribution and Mark distribution is given below.

Curriculum Frame work for All Programmes

| Year | Semester | Credits | Teaching hours | Marks |
|---------------|-----------------|----------------|-----------------------|--------------|
| First | First | 30 | 35 | 600 to 700 |
| | Second | 30 | 35 | 600 to 700 |
| Second | Third | 30 | 35 | 600 to 700 |
| | Fourth | 35 | 35 | 700 to 800 |
| Third | Fifth | 35 | 35 | 700 to 800 |
| | Sixth | 20 | 40 | 200 |
| Total | | 180 | 215 | 3400 to 3900 |

Apart from technical courses, in first 3 semesters, 5 teaching hours per week are allotted for Student Center Activities. Breakup of these five hours is as follows.

Library – 1 hr

Sports – 2 hrs

Creative arts – 2 hrs

In order to inculcate self learning capability in students MOOC (Massive Open Online Course) in each semester is incorporated in the curriculum of all programmes.

As per AICTE model curriculum 60% weightage is given for external examination and 40% weightage is given for internal examination as far as theory is considered. For all courses in all programmes 60+20+20 pattern of examination is followed. Two internal progressive assessment tests are conducted for theory courses in a semester having maximum marks 20. End semester examination of 60 Marks is conducted at the end of the semester. Addition of two test marks with end semester examination marks will give total marks out of 100.

After test as well as end term examination bitwise analysis of answer book of each student will be done in order to calculate course outcome attainment. From course attainment, PO and PSO attainment will be calculated. If attainment is not satisfactory remedial measures will be taken by respective department.

For courses, those they are having practical's, Term work is kept, where continuous assessment is made compulsory.

In the sixth semester, students are going for Inplant training. Before going into industry at least he/she should learn basic things required for his/her programme. In order to achieve this, a prerequisite of minimum 100 credits is must for registration of Inplant training. A student will be eligible for registration of Inplant training only when he/she completes minimum 100 credits.

Award of Diploma

For the award of diploma in all programmes, all courses of 5th semester and Inplant training will be considered along with weightage of third and fourth semester courses as shown in following table.

| | |
|--|--------------------|
| All courses of fifth semester | 700 to 800 Marks |
| Inplant Training | 200 Marks |
| Consolidated marks of third and fourth semester* | 200 marks |
| Total marks | 1100 to 1200 Marks |

*Consolidated Marks of third and fourth semester – the total marks of third and fourth semesters are converted to 100 marks each. These marks are then added (3rdSem + 4thsem) as 100+100 = 200 marks.

Implementation of MOOC:

In each semester all programmes will offer a MOOC. Programme head should see that this MOOC is freely available to all students; it should not be financial burden on students. Sufficient number of lectures/sessions should be available for the course which is offered through MOOC. For 1 credit per week one lecture or one session of 45 minutes to 60 minutes should be available.

For MOOC courses online examination is conducted by service provider for example spoken tutorial. Spoken tutorial will issue certificates also. Programme head should collect certificates of all students semester wise and submit to controller of examination.

As exam is conducted by some other agency, marks are not taken into consideration. They will not reflect in the result. But unless and until student complete certification, credits of MOOC will not be awarded to the students. Without completion of 180 credits diploma will not be awarded.

Student can complete MOOC at any time throughout of this tenure of diploma. Course or exam registration of student in any semester will not be blocked due to incompleteness of MOOC. Whenever student completes certification, in that term, in the result of term end examination credits will be allotted.

If a MOOC is performed through NPTEL, course is free but for getting certification, student has to pay extra fees. In such a case, to avoid financial burden on students, MCQ based examination of such courses will be conducted by respective departments and certification can be provided by respective department. For certification, passing criteria of 40% should be used.

Course Codes:

Entire curriculum of all Programmes is divided into five levels. These levels and their percentage is given below.

Level1- Science and Humanities (10 to 15%)

Level2- Core Technology (25 to 30%)

Level3- Applied Technology (45 to 50%)

Level4- Diversified Courses (5 to 10%)

Level5- Management courses (3 to 5%)

Course Coding Scheme:-

| Course Code abbreviations | Definitions |
|---------------------------|----------------------------|
| HU | Humanities |
| SC | Science |
| MG | Management |
| CE | Civil |
| CO | Computer |
| EC | Electronics |
| EE | Electrical |
| IT | Information Technology |
| IS | Instrumentation |
| RT | Rubber |
| LT | Leather Technology |
| LG | Leather Goods and Footwear |
| ME | Mechanical Engineering |

Course codes are formed as:

First two letters are course code abbreviations. Then two digits “19” refers to 2019 curriculum.

Next digit is level number and last two digits are serial number from that level.

For example: HU19101 (Communication Skill)

HU- It belongs to Level 1 Science & humanities

19- 2019 curriculum

1- Level 1

01- Sr. No of Level 1 courses.

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180 Credit Scheme P-19 Level Wise Marks Distribution

Department of Civil Engineering

Level I Courses

| Course Code | Course Title | Teaching Hours/Contact Hours | | | | Credits | Examination Scheme (Marks) | | | | | | |
|-------------|--|------------------------------|----------------|----|-------|----------------|----------------------------|-----|-----|-----|----|-----|-------|
| | | L | P | TU | Total | | Theory | | | PR | OR | TW | Total |
| | | | | | | | TH | TS1 | TS2 | | | | |
| SC19107 | Engineering Chemistry | 3 | 2 | -- | 5 | 5 | 60 | 20 | 20 | 25* | -- | 25 | 150 |
| SC19109 | Basic Mathematics | 4 | -- | -- | 4 | 4 | 60 | 20 | 20 | -- | -- | | 100 |
| HU19101 | Communication Skill | 2 | 2 | -- | 4 | 4 | 60 | 20 | 20 | 25* | -- | 25 | 150 |
| SC19102 | Engineering Physics | 3 | 2 | -- | 5 | 5 | 60 | 20 | 20 | 25* | -- | 25 | 150 |
| SC19110 | Engineering Mathematics | 4 | -- | -- | 4 | 4 | 60 | 20 | 20 | -- | -- | | 100 |
| HU19102 | Environmental Studies | -- | 2 | -- | 2 | 2 | -- | -- | -- | -- | 25 | 25 | 50 |
| CE19102 | Libre Office Calc on BOSS Linux (9) (Spoken Tutorials) | -- | 4 [#] | -- | 4 | 4 [#] | -- | -- | -- | -- | -- | -- | -- |
| | Total | 16 | 12 | -- | 28 | 28 | 300 | 100 | 100 | 75 | 25 | 100 | 700 |

Government Polytechnic, Mumbai

Department of Civil Engineering

Level II Courses

| Course Code | Course Title | Teaching Hours/Contact Hours | | | | Credits | Examination Scheme (Marks) | | | | | | |
|-------------|---|------------------------------|----------------|----|-------|----------------|----------------------------|-----|-----|-----|-----|-----|-------|
| | | L | P | TU | Total | | Theory | | | PR | OR | TW | Total |
| | | | | | | | TH | TS1 | TS2 | | | | |
| ME19201 | Engineering Drawing I | 2 | 4 | -- | 6 | 6 | -- | -- | -- | 50* | -- | 50 | 100 |
| WS19201 | Workshop Practice | -- | 4 | -- | 4 | 4 | -- | -- | -- | -- | -- | 50 | 50 |
| CE19101 | Construction Materials | 3 | -- | -- | 3 | 3 | 60 | 20 | 20 | -- | -- | -- | 100 |
| AM19201 | Engineering Mechanics | 3 | 2 | -- | 5 | 5 | 60 | 20 | 20 | 25 | -- | 25 | 150 |
| CE19201 | Building Drawing | 1 | 4 | -- | 5 | 5 | -- | -- | -- | 50* | -- | 50 | 100 |
| CE19202 | Surveying I | 3 | 4 | -- | 7 | 7 | 60 | 20 | 20 | 50* | -- | 50 | 200 |
| CE19203 | Libre Office Draw (Spoken Tutorials) | -- | 4 [#] | -- | 4 | 4 [#] | -- | -- | -- | -- | -- | -- | -- |
| AM19301 | Mechanics of Structures | 3 | 2 | -- | 5 | 5 | 60 | 20 | 20 | -- | -- | 25 | 125 |
| CE19301 | Construction Technology | 3 | 2 | -- | 5 | 5 | 60 | 20 | 20 | -- | 25* | -- | 125 |
| CE19302 | Transportation Engineering | 3 | -- | -- | 3 | 3 | 60 | 20 | 20 | -- | -- | -- | 100 |
| AM19402 | Concrete Technology | 4 | 2 | -- | 6 | 6 | 60 | 20 | 20 | -- | -- | 25 | 125 |
| CE19401 | Hydraulics | 3 | 2 | -- | 5 | 5 | 60 | 20 | 20 | -- | 25 | -- | 125 |
| | Total | 28 | 30 | -- | 58 | 58 | 480 | 160 | 160 | 175 | 50 | 275 | 1300 |

Government Polytechnic, Mumbai

Department of Civil Engineering

Level III Courses

| Course Code | Course Title | Teaching Hours/Contact Hours | | | | Credits | Examination Scheme (Marks) | | | | | | |
|-------------|---|------------------------------|----------------|----|-------|----------------|----------------------------|-----|-----|-----|-----|-----|-------|
| | | L | P | TU | Total | | Theory | | | PR | OR | TW | Total |
| | | | | | | | TH | TS1 | TS2 | | | | |
| AM19302 | Soil Mechanics | 3 | 2 | -- | 5 | 5 | 60 | 20 | 20 | -- | -- | 25 | 125 |
| CE19303 | Surveying II | 2 | 4 | -- | 6 | 6 | 60 | 20 | 20 | 50* | -- | 25 | 175 |
| CE19304 | QGIS (16) (Spoken Tutorials) | -- | 4 [#] | -- | 4 | 4 [#] | -- | -- | -- | -- | -- | -- | -- |
| AM19401 | Theory of Structures | 4 | -- | 01 | 5 | 5 | 60 | 20 | 20 | -- | -- | -- | 100 |
| CE19402 | Environmental Engineering | 4 | 2 | -- | 6 | 6 | 60 | 20 | 20 | -- | 25* | 25 | 150 |
| CE19403 | Computer Aided Drafting | 1 | 4 | -- | 5 | 5 | -- | -- | -- | 50 | -- | 50 | 100 |
| CE19408 | QCAD (5) (Spoken Tutorials) | -- | 4 [#] | -- | 4 | 4 [#] | -- | -- | -- | -- | -- | -- | -- |
| AM19501 | Design of Reinforced Concrete and Steel Structures | 4 | 4 | -- | 8 | 8 | 60 | 20 | 20 | -- | 25* | 25 | 150 |
| CE19501 | Estimation and Costing | 4 | 2 | -- | 6 | 6 | 60 | 20 | 20 | -- | 25* | 25 | 150 |
| CE19502 | Contracts, Accounts and Valuation | 4 | 2 | -- | 6 | 6 | 60 | 20 | 20 | -- | 25* | -- | 125 |
| CE19503 | Irrigation Engineering | 3 | -- | -- | 3 | 3 | 60 | 20 | 20 | -- | 25* | -- | 125 |
| CE19506 | Project | -- | 4 | -- | 4 | 4 | -- | -- | -- | -- | 50* | 50 | 100 |
| | Total | 29 | 32 | 01 | 62 | 62 | 480 | 160 | 160 | 100 | 175 | 225 | 1300 |

Government Polytechnic, Mumbai

Department of Civil Engineering

Level IV Courses

| Course Code | Course Title | Teaching Hours/Contact Hours | | | | Credits | Examination Scheme (Marks) | | | | | | |
|-------------|--------------------------------------|------------------------------|----|----|-------|---------|----------------------------|-----|-----|----|------|------|-------|
| | | L | P | TU | Total | | Theory | | | PR | OR | TW | Total |
| | | | | | | | TH | TS1 | TS2 | | | | |
| | Elective – I (Any one) | 4 | -- | -- | 4 | 4 | 60 | 20 | 20 | -- | -- | -- | 100 |
| CE19404 | Repairs & Rehabilitation of Building | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| CE19405 | Building Services & Maintenance | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| CE19406 | Material Management | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| CE19407 | Safety & Quality Control | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | Elective – II (Any one) | 4 | -- | -- | 4 | 4 | 60 | 20 | 20 | -- | -- | -- | 100 |
| AM19502 | Prestressed & Precast Concrete | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| AM19503 | Advanced Geotechnical Engineering | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| CE19505 | Solid Waste Management | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| CE19601 | Inplant Training | -- | 40 | -- | 40 | 20 | -- | -- | -- | -- | 100* | 100* | 200 |
| | Total | 08 | 40 | -- | 48 | 28 | 120 | 40 | 40 | -- | 100 | 100 | 400 |

Government Polytechnic, Mumbai

Department of Civil Engineering

Level V Courses

| | Course Title | Teaching Hours/Contact Hours | | | | Credits | Examination Scheme (Marks) | | | | | | |
|---------|--------------------------|------------------------------|----------------|----|-------|----------------|----------------------------|-----|-----|----|----|----|-------|
| | | L | P | TU | Total | | Theory | | | PR | OR | TW | Total |
| | | | | | | | TH | TS1 | TS2 | | | | |
| | Elective – II (Any one) | 4 | -- | -- | 4 | 4 | 60 | 20 | 20 | -- | -- | -- | 100 |
| CE19504 | Construction Management | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| CE19507 | Entrepreneurship (NPTEL) | -- | 4 [#] | -- | 4 | 4 [#] | -- | -- | -- | -- | -- | -- | -- |
| | Total | 04 | 04 | -- | 08 | 08 | 60 | 20 | 20 | -- | -- | -- | 100 |

Government Polytechnic, Mumbai

Semester wise credits and marks distribution

Department of Civil Engineering

| Sr.No. | Term / Semester | Teaching Hours/Contact Hours | | | | Credits | Examination Scheme (Marks) | | | | | | |
|--------|-----------------|------------------------------|-----|----|-------|---------|----------------------------|-----|-----|------|-----|------|-------|
| | | L | P | TU | Total | | Theory | | | PR | OR | TW | Total |
| | | | | | | | TH | TS1 | TS2 | | | | |
| 1. | I | 14 | 16 | -- | 30+5 | 30 | 240 | 80 | 80 | 100 | -- | 150 | 650 |
| 2. | II | 14 | 16 | -- | 30+5 | 30 | 240 | 80 | 80 | 150 | -- | 150 | 700 |
| 3. | III | 14 | 16 | -- | 30+5 | 30 | 300 | 100 | 100 | 50 | 50 | 100 | 700 |
| 4. | IV | 20 | 14 | 01 | 35 | 35 | 300 | 100 | 100 | 50 | 50 | 100 | 700 |
| 5. | V | 19 | 16 | -- | 35 | 35 | 300 | 100 | 100 | -- | 150 | 100 | 750 |
| 6. | VI | -- | 40 | -- | 40 | 20 | -- | -- | -- | -- | 100 | 100 | 200 |
| | Total | 81 | 118 | 01 | 215 | 180 | 1380 | 460 | 460 | 350 | 350 | 700 | 3700 |
| | Grand Total | 81 | 119 | | 215 | 180 | 2300 | | | 1400 | | 3700 | |
| | % | 40 | 60 | | | | 62 | | | 38 | | | |

GOVERNMENT POLYTECHNIC MUMBAI
 (Academically Autonomously Institute, Government of Maharashtra)
Teaching and Examination Scheme (P19)
With effect from AY 2019-20

Programme: Diploma in Civil Engineering (Sandwich Pattern)

(Term / Semester – I)

| Course Code | Course Title | Teaching Hours/Contact Hours | | | | Credits | Examination Scheme (Marks) | | | | | | |
|--------------------------------|--|------------------------------|----------------|----|-------|----------------|----------------------------|-----|-----|-----|----|-----|-------|
| | | L | P | TU | Total | | Theory | | | PR | OR | TW | Total |
| | | | | | | | TH | TS1 | TS2 | | | | |
| SC19107 | Engineering Chemistry | 3 | 2 | -- | 5 | 5 | 60 | 20 | 20 | 25* | -- | 25 | 150 |
| SC19109 | Basic Mathematics | 4 | -- | -- | 4 | 4 | 60 | 20 | 20 | -- | -- | | 100 |
| HU19101 | Communication Skill | 2 | 2 | -- | 4 | 4 | 60 | 20 | 20 | 25* | -- | 25 | 150 |
| ME19201 | Engineering Drawing I | 2 | 4 | -- | 6 | 6 | -- | -- | -- | 50* | -- | 50 | 100 |
| WS19201 | Workshop Practice | -- | 4 | -- | 4 | 4 | -- | -- | -- | -- | -- | 50 | 50 |
| CE19101 | Construction Materials | 3 | -- | -- | 3 | 3 | 60 | 20 | 20 | -- | -- | -- | 100 |
| CE19102 | Libre Office Calc on BOSS Linux (9) (Spoken Tutorials) | -- | 4 [#] | -- | 4 | 4 [#] | -- | -- | -- | -- | -- | -- | -- |
| | Total | 14 | 16 | -- | 30 | 30 | 240 | 80 | 80 | 100 | -- | 150 | 650 |
| Student Centered Activity(SCA) | | | | | 05 | | | | | | | | |
| Total Contact Hours | | | | | 35 | | | | | | | | |

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment)

* Indicates assessment by External Examiner else internal assessment, #indicates Self, on- line learning Mode, @ indicates on line examination

Note: Duration of Examination--TS1&TS2 -1 hour , TH- 2 hours 30 minutes, PR/OR – 3 hours per batch , SCA- Library -1 hour, Sports- 2hours, Creative Activity-2 hours
 Self, on- line learning Mode through MOOCS/Spoken Tutorials /NPTEL/SWAYAM/FOSSEE etc.

Coordinator,
Curriculum Development,
Department of Civil Engineering

In-Charge
Curriculum Development Cell

Head of Departments
Department of Civil Engineering

Principal

GOVERNMENT POLYTECHNIC MUMBAI
(Academically Autonomously Institute, Government of Maharashtra)
Teaching and Examination Scheme (P19)
With effect from AY 2019-20

Programme: Diploma in Civil Engineering (Sandwich Pattern)

Term / Semester - II

| Course Code | Course Title | Teaching Hours/Contact Hours | | | | Credits | Examination Scheme (Marks) | | | | | | |
|--------------------------------|---|------------------------------|----------------|----|-------|----------------|----------------------------|-----|-----|-----|----|-----|-------|
| | | L | P | TU | Total | | Theory | | | PR | OR | TW | Total |
| | | | | | | | TH | TS1 | TS2 | | | | |
| SC19102 | Engineering Physics | 3 | 2 | -- | 5 | 5 | 60 | 20 | 20 | 25* | -- | 25 | 150 |
| SC19110 | Engineering Mathematics | 4 | -- | -- | 4 | 4 | 60 | 20 | 20 | -- | -- | | 100 |
| CE19201 | Building Drawing | 1 | 4 | -- | 5 | 5 | -- | -- | -- | 50* | -- | 50 | 100 |
| CE19202 | Surveying I | 3 | 4 | -- | 7 | 7 | 60 | 20 | 20 | 50* | -- | 50 | 200 |
| AM19201 | Engineering Mechanics | 3 | 2 | -- | 5 | 5 | 60 | 20 | 20 | 25 | -- | 25 | 150 |
| CE19203 | Libre Office Draw (Spoken Tutorials) | -- | 4 [#] | -- | 4 | 4 [#] | -- | -- | -- | -- | -- | -- | -- |
| | Total | 14 | 16 | -- | 30 | 30 | 240 | 80 | 80 | 150 | -- | 150 | 700 |
| Student Centered Activity(SCA) | | | | | 05 | | | | | | | | |
| Total Contact Hours | | | | | 35 | | | | | | | | |

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment)

* Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination

Note: Duration of Examination--TS1&TS2 -1 hour , TH- 2 hours 30 minutes, PR/OR – 3 hours per batch , SCA- Library - 1 hour, Sports- 2 hours, Creative Activity-2 hours
Self, on- line learning Mode through MOOCs /Spoken Tutorials / NPTEL / SWAYAM / FOSSEE etc.

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Teaching and Examination Scheme (P19)
With effect from AY 2019-20

Programme: Diploma in Civil Engineering (Sandwich Pattern)

Term / Semester - III

| Course Code | Course Title | Teaching Hours/Contact Hours | | | | Credits | Examination Scheme (Marks) | | | | | | |
|--------------------------------|-----------------------------------|------------------------------|----------------|----|-------|----------------|----------------------------|-----|-----|-----|-----|-----|-------|
| | | L | P | TU | Total | | Theory | | | PR | OR | TW | Total |
| | | | | | | | TH | TS1 | TS2 | | | | |
| CE19301 | Construction Technology | 3 | 2 | -- | 5 | 5 | 60 | 20 | 20 | -- | 25* | -- | 125 |
| CE19302 | Transportation Engineering | 3 | -- | -- | 3 | 3 | 60 | 20 | 20 | -- | -- | -- | 100 |
| CE19303 | Surveying II | 2 | 4 | -- | 6 | 6 | 60 | 20 | 20 | 50* | -- | 25 | 175 |
| AM19301 | Mechanics of Structures | 3 | 2 | -- | 5 | 5 | 60 | 20 | 20 | -- | -- | 25 | 125 |
| AM19302 | Soil Mechanics | 3 | 2 | -- | 5 | 5 | 60 | 20 | 20 | -- | -- | 25 | 125 |
| HU19102 | Environmental Studies | -- | 2 | -- | 2 | 2 | -- | -- | -- | -- | 25 | 25 | 50 |
| CE19304 | Scilab (30) (Spoken Tutorials) | -- | 4 [#] | -- | 4 | 4 [#] | -- | -- | -- | -- | -- | -- | -- |
| | Total | 14 | 16 | -- | 30 | 30 | 300 | 100 | 100 | 50 | 50 | 100 | 700 |
| Student Centered Activity(SCA) | | | | | 05 | | | | | | | | |
| Total Contact Hours | | | | | 35 | | | | | | | | |

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment)

* Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination

Note: Duration of Examination--TS1&TS2 -1 hour , TH- 2 hours 30 minutes, PR/OR – 3 hours per batch , SCA- Library - 1 hour, Sports- 2 hours, Creative Activity-2 hours
 Self, on- line learning Mode through MOOCs /Spoken Tutorials / NPTEL / SWAYAM / FOSSEE etc.

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GOVERNMENT POLYTECHNIC MUMBAI
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Teaching and Examination Scheme (P19)
With effect from AY 2019-20

Programme: Diploma in Civil Engineering (Sandwich Pattern)

Term / Semester - IV

| Course Code | Course Title | Teaching Hours/Contact Hours | | | | Credits | Examination Scheme (Marks) | | | | | | |
|-------------|--------------------------------------|------------------------------|----------------|----|-------|----------------|----------------------------|-----|-----|----|-----|-----|-------|
| | | L | P | TU | Total | | Theory | | | PR | OR | TW | Total |
| | | | | | | | TH | TS1 | TS2 | | | | |
| AM19401 | Theory of Structures | 4 | -- | 01 | 5 | 5 | 60 | 20 | 20 | -- | -- | -- | 100 |
| AM19402 | Concrete Technology | 4 | 2 | -- | 6 | 6 | 60 | 20 | 20 | -- | -- | 25 | 125 |
| CE19401 | Hydraulics | 3 | 2 | -- | 5 | 5 | 60 | 20 | 20 | -- | 25 | -- | 125 |
| CE19402 | Environmental Engineering | 4 | 2 | -- | 6 | 6 | 60 | 20 | 20 | -- | 25* | 25 | 150 |
| CE19403 | Computer Aided Drafting | 1 | 4 | -- | 5 | 5 | -- | -- | -- | 50 | -- | 50 | 100 |
| | Elective – I (Any one) | 4 | -- | -- | 4 | 4 | 60 | 20 | 20 | -- | -- | -- | 100 |
| CE19404 | Repairs & Rehabilitation of Building | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| CE19405 | Building Services & Maintenance | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| CE19406 | Material Management | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| CE19407 | Safety & Quality Control | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| CE19408 | QCAD (5) (Spoken Tutorials) | -- | 4 [#] | -- | 4 | 4 [#] | -- | -- | -- | -- | -- | -- | -- |
| | Total | 20 | 14 | 01 | 35 | 35 | 300 | 100 | 100 | 50 | 50 | 100 | 700 |

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment)

* Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination

Note: Duration of Examination--TS1&TS2 -1 hour , TH- 2 hours 30 minutes, PR/OR – 3 hours per batch , SCA- Library - 1 hour, Sports- 2 hours, Creative Activity-2 hours
 Self, on- line learning Mode through MOOCs /Spoken Tutorials / NPTEL / SWAYAM / FOSSEE etc.

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With effect from AY 2019-20

Programme: Diploma in Civil Engineering (Sandwich Pattern)

Term / Semester - V

| Course Code | Course Title | Teaching Hours/Contact Hours | | | | Credits | Examination Scheme (Marks) | | | | | | |
|-------------|--|------------------------------|----------------|----|-------|----------------|----------------------------|-----|-----|----|-----|-----|-------|
| | | L | P | TU | Total | | Theory | | | PR | OR | TW | Total |
| | | | | | | | TH | TS1 | TS2 | | | | |
| AM19501 | Design of Reinforced Concrete and Steel Structures | 4 | 4 | -- | 8 | 8 | 60 | 20 | 20 | -- | 25* | 25 | 150 |
| CE19501 | Estimation and Costing | 4 | 2 | -- | 6 | 6 | 60 | 20 | 20 | -- | 25* | 25 | 150 |
| CE19502 | Contracts, Accounts and Valuation | 4 | 2 | -- | 6 | 6 | 60 | 20 | 20 | -- | 25* | -- | 125 |
| CE19503 | Irrigation Engineering | 3 | -- | -- | 3 | 3 | 60 | 20 | 20 | -- | 25* | -- | 125 |
| | Elective – II (Any one) | 4 | -- | -- | 4 | 4 | 60 | 20 | 20 | -- | -- | -- | 100 |
| AM19502 | Prestressed & Precast Concrete | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| CE19504 | Construction Management | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| AM19503 | Advanced Geotechnical Engineering | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| CE19505 | Solid Waste Management | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| CE19506 | Project | -- | 4 | -- | 4 | 4 | -- | -- | -- | -- | 50* | 50 | 100 |
| CE19507 | Entrepreneurship (NPTEL) | -- | 4 [#] | -- | 4 | 4 [#] | -- | -- | -- | -- | -- | -- | -- |
| | Total | 19 | 16 | -- | 35 | 35 | 300 | 100 | 100 | -- | 150 | 100 | 750 |

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment)

* Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination

Note: Duration of Examination--TS1&TS2 -1 hour , TH- 2 hours 30 minutes, PR/OR – 3 hours per batch , SCA- Library - 1 hour, Sports- 2 hours, Creative Activity-2 hours
Self, on- line learning Mode through MOOCs /Spoken Tutorials / NPTEL / SWAYAM / FOSSEE etc.

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Teaching and Examination Scheme (P19)
With effect from AY 2019-20

Programme: Diploma in Civil Engineering (Sandwich Pattern)

Term / Semester - VI

| Course Code | Course Title | Teaching Hours/Contact Hours | | | | Credits | Examination Scheme (Marks) | | | | | | |
|-------------|---------------------|------------------------------|----|----|-------|---------|----------------------------|-----|-----|----|------|------|-------|
| | | L | P | TU | Total | | Theory | | | PR | OR | TW | Total |
| | | | | | | | TH | TS1 | TS2 | | | | |
| CE19601 | Industrial Training | -- | 40 | -- | 40 | 20 | -- | -- | -- | -- | 100* | 100* | 200 |
| | Total | -- | 40 | -- | 40 | 20 | -- | -- | -- | -- | 100 | 100 | 200 |

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment)

* Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination

Note: Duration of Examination--TS1&TS2 -1 hour , TH- 2 hours 30 minutes, PR/OR – 3 hours per batch , SCA- Library - 1 hour, Sports- 2 hours, Creative Activity-2 hours
 Self, on- line learning Mode through MOOCs /Spoken Tutorials / NPTEL / SWAYAM / FOSSEE etc.

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Programme: Diploma in Civil Engineering (Sandwich Pattern)

| Sr.No. | Term / Semester | Teaching Hours/Contact Hours | | | | Credits | Examination Scheme (Marks) | | | | | | |
|--------|-----------------|------------------------------|----|----|-------|---------|----------------------------|-----|-----|-----|-----|-----|-------|
| | | L | P | TU | Total | | Theory | | | PR | OR | TW | Total |
| | | | | | | | TH | TS1 | TS2 | | | | |
| 1. | I | 14 | 16 | -- | 30+5 | 30 | 240 | 80 | 80 | 100 | -- | 150 | 650 |
| 2. | II | 14 | 16 | -- | 30+5 | 30 | 240 | 80 | 80 | 150 | -- | 150 | 700 |
| 3. | III | 14 | 16 | -- | 30+5 | 30 | 300 | 100 | 100 | 50 | 50 | 100 | 700 |
| 4. | IV | 20 | 14 | 01 | 35 | 35 | 300 | 100 | 100 | 50 | 50 | 100 | 700 |
| 5. | V | 19 | 16 | -- | 35 | 35 | 300 | 100 | 100 | -- | 150 | 100 | 750 |
| 6. | VI | -- | 40 | -- | 40 | 20 | -- | -- | -- | -- | 100 | 100 | 200 |
| | Total | 81 | 78 | 01 | 215 | 180 | 1380 | 460 | 460 | 350 | 350 | 700 | 3700 |

Government Polytechnic, Mumbai

Department of Civil Engineering

Award of Diploma

For the award of diploma in all programmes, all courses of 5th semester and Inplant training will be considered along with weightage of third and fourth semester courses as shown in following table.

| | |
|--|--------------------|
| All courses of 5 th Semester | 700 to 800 Marks |
| Inplant training | 200 Marks |
| Consolidated marks of 3 rd to 4 th Semester* | 200 Marks |
| Total marks | 1100 to 1200 Marks |

*Consolidated Marks of third and fourth semester – the total marks of third and fourth semesters are converted to 100 marks each. These marks are then added (3rdSem + 4thsem) as 100+100 = 200 marks.

Government Polytechnic, Mumbai

Department of Civil Engineering

Direct second Year admitted students Backlogs

| Entry LEVEL Qualification | Course Code and Course Name Exempted from appearing for Examination | | Course Code and Course Name <u>NOT</u> Exempted | |
|--|---|-------------------------|---|--|
| I T I (CTS) | HU19101 | Communication Skill | SC19109 | Basic Mathematics |
| | SC19107 | Engineering Chemistry | CE19102 | Libre Office Calc on BOSS Linux (9) (Spoken Tutorials) |
| | WS19201 | Workshop Practice | CE19203 | Libre Office draw (Spoken Tutorials) |
| | ME19201 | Engineering Drawing I | AM19201 | Engineering Mechanics |
| | SC19102 | Engineering Physics | | |
| | SC19110 | Engineering Mathematics | | |
| | CE19101 | Construction Materials | | |
| | CE19202 | Surveying I | | |
| | CE19201 | Building Drawing | | |
| 12th Science, Biofocal – D9 (Technical) other than Civil group | HU19101 | Communication Skill | CE19102 | Libre Office Calc on BOSS Linux (9) (Spoken Tutorials) |
| | SC19107 | Engineering Chemistry | CE19203 | Libre Office draw (Spoken Tutorials) |
| | WS19201 | Workshop Practice | CE19202 | Surveying I |
| | ME19201 | Engineering Drawing I | CE19201 | Building Drawing |
| | SC19102 | Engineering Physics | | |
| | SC19110 | Engineering Mathematics | | |
| | CE19101 | Construction Materials | | |
| | SC19109 | Basic Mathematics | | |
| | AM19201 | Engineering Mechanics | | |
| 12 Science | HU19101 | Communication Skill | CE19102 | Libre Office Calc on BOSS Linux (9) (Spoken Tutorials) |
| | SC19109 | Basic Mathematics | CE19203 | Libre Office draw (Spoken |

| | | | | |
|--|---------|-------------------------|---------|--|
| | | | | Tutorials) |
| | SC19107 | Engineering Chemistry | CE19202 | Surveying I |
| | WS19201 | Workshop Practice | CE19201 | Building Drawing |
| | ME19201 | Engineering Drawing I | | |
| | SC19102 | Engineering Physics | | |
| | SC19110 | Engineering Mathematics | | |
| | CE19101 | Construction Materials | | |
| | AM19201 | Engineering Mechanics | | |
| (HSC Vocational / MCVC) (J7/J8/J9) (HA/HB/HC) | HU19101 | Communication Skill | CE19102 | Libre Office Calc on BOSS Linux (9) (Spoken Tutorials) |
| | SC19107 | Engineering Chemistry | SC19109 | Basic Mathematics |
| | WS19201 | Workshop Practice | CE19203 | Libre Office draw (Spoken Tutorials) |
| | ME19201 | Engineering Drawing I | AM19201 | Engineering Mechanics |
| | SC19109 | Basic Mathematics | | |
| | HU19101 | Communication Skill | | |
| | SC19102 | Engineering Physics | | |
| | SC19110 | Engineering Mathematics | | |
| | CE19101 | Construction Materials | | |
| | CE19202 | Surveying I | | |
| | CE19201 | Building Drawing | | |
| 12th Science, Biofocal - D9 (Technical) with Civil Engg .group | HU19101 | Communication Skill | CE19102 | Libre Office Calc on BOSS Linux (9) (Spoken Tutorials) |
| | SC19109 | Basic Mathematics | CE19203 | Libre Office draw (Spoken Tutorials) |
| | SC19107 | Engineering Chemistry | | |
| | WS19201 | Workshop Practice | | |
| | ME19201 | Engineering Drawing I | | |
| | SC19102 | Engineering Physics | | |
| | SC19110 | Engineering Mathematics | | |
| | AM19201 | Engineering Mechanics | | |
| | CE19101 | Construction Materials | | |
| | CE19202 | Surveying I | | |
| | CE19201 | Building Drawing | | |

Government Polytechnic, Mumbai

Department of Civil Engineering

Equivalence of P16 to P19 scheme

| SEM | Old Course Scheme (2016) | | New Course Scheme (2019) | | SEM |
|-----|--------------------------|-------------------------|--|--|-----|
| | Course Code | Course Name | Course Code | Course Name | |
| I | HU16101 | Basics of communication | HU19101 | Communication Skills | I |
| I | HU16103 | Generic skills | No equivalence. Should be completed across the table | | I |
| I | HU16104 | Environmental studies | HU19102 | Environmental Studies | III |
| I | NC16101 | Yoga | --- | Student Centered Activity (SCA) | I |
| I | NC16102 | Social service | --- | Student Centered Activity (SCA) | II |
| I | SC16107 | Mathematics I | SC19109 | Basic Mathematics | I |
| I | ME16201 | Engineering drawing, I | ME19201 | Engineering drawing, I | I |
| I | SC16105 | Engineering chemistry | SC19107 | Engineering Chemistry | I |
| I | CO16201 | Computer Fundamentals | CE19102 | Libre Office Calc on BOSS Linux (9) (Spoken Tutorials) | I |
| I | WS16201 | Workshop practice | WS19201 | Workshop Practice | I |
| II | HU16102 | Communication skill | No equivalence. Should be completed across the table | | --- |
| II | SC16104 | Engineering physics | SC19102 | Engineering Physics | II |
| II | SC16108 | Mathematics II | SC19110 | Engineering Mathematics | II |
| II | AM16201 | Engineering mechanics | AM19201 | Engineering Mechanics | II |
| II | CE16201 | Building construction | CE19301 | Construction Technology | III |
| II | CE16202 | Surveying | CE19202 | Surveying I | II |
| II | CE16203 | Building drawing | CE19201 | Building Drawing | II |
| --- | --- | --- | CE19203 | Libre office draw | II |

| | | | | | |
|-----|-------------|--|--|--------------------------------------|-----|
| III | CE16204 | Hydraulics | CE19401 | Hydraulics | IV |
| III | AM16202 | Mechanics of structure | AM19301 | Mechanics of Structures | III |
| III | AM16203 | Concrete technology | AM19402 | Concrete Technology | IV |
| III | CE16205 | Highway engineering | CE19302 | Transportation Engineering | III |
| III | CE16306 | Water supply engineering | CE19402 | Environmental Engineering | IV |
| III | CE16303 | Computer Aided Drafting | CE19403 | Computer Aided Drafting | IV |
| III | CE16302 | Advanced construction practice | No equivalence. Should be completed across the table | | |
| IV | CE16302 | Advanced surveying | CE19303 | Surveying II | III |
| IV | CE16205 | Railway and bridge engineering | CE19302 | Transportation Engineering | III |
| IV | CE16307 | Sanitary engineering | CE19402 | Environmental Engineering | IV |
| IV | AM16304 | Soil mechanics | AM19302 | Soil Mechanics | III |
| IV | AM16301 | Theory of structure | AM19401 | Theory of Structures | IV |
| IV | CE16501 | Construction management | CE19504 | Construction Management | V |
| IV | CE 16401(O) | Repairs and rehabilitation of structures | CE19404(O) | Repairs & Rehabilitation of Building | IV |
| IV | CE 16402(O) | Plumbing and sanitary services | CE19405(O) | Building Services & Maintenance | IV |
| IV | CE 16404(O) | Safety and quality control | CE19407(O) | Safety and quality control | IV |
| IV | CE 16403(O) | Material management | CE19406(O) | Material Management | IV |
| --- | --- | --- | CE19408 | Q Cad (Spoken Tutorials) | IV |
| V | CE16305 | Irrigation engineering | CE19503 | Irrigation Engineering | V |
| V | CE16304 | Estimating and costing | CE19501 | Estimation and Costing | V |

| | | | | | |
|-----|-------------|-------------------------------------|---------|--|-----|
| V | CE 16309 | Contracts, accounts and valuation | CE19502 | Contracts, Accounts and Valuation | V |
| V | MG16502 | Entrepreneurship Development | CE19507 | Entrepreneurship (NPTEL) | V |
| V | AM16302 | Design of RCC and Steel structures. | AM19501 | Design of Reinforced Concrete and Steel Structures | V |
| V | CE16308 | Project | CE19506 | Project | V |
| V | AM16401(O) | Prestressed and precast concrete | AM19502 | Prestressed & Precast Concrete | V |
| V | AM16402(O) | Advanced geotechnical engineering | AM19503 | Advanced Geotechnical Engineering | V |
| V | CE 16405(O) | Solid waste management | CE19505 | Solid Waste Management | V |
| V | AM16403(O) | Advanced Design of Structures | --- | --- | --- |
| VI | CE16406 | Industrial training | CE19601 | In plant Training | VI |
| --- | --- | --- | CE19101 | Construction Materials | I |
| --- | --- | --- | CE19304 | QGIS (Spoken Tutorials) | III |

Policy for Course Detention P19

If the theory attendance of the student in any course in a semester is less than 75% and practical attendance is less than 100% (student has not completed all the prescribed practicals and not submitted the Term Work), he/she will be detained in that course at the end of the semester. Such student will not be allowed to appear for end semester examination of that course. Such students need to do course registration of that course again as per detention rules given below. Student has to satisfy the attendance and Term work criterion. After that he/she will be allowed for examination of that course. Rules of detention are as follows

- If a student is detained in any course of first year, he/she will not be eligible for second year admission, till he/she will not clear his/her detention.
- If a student is detained in any course of second year, he/she will not be eligible for third year admission, till he/she will not clear his/her detention.
- However, if a student is detained in any course of Odd semester, he/she can register for detained courses (maximum 2) in even semester, by paying additional fees as per rules.
- If a student is detained in any course of Even semester, he/she can register for detained courses (maximum 2) in vacation semester, for which he/she needs to pay additional fees as per rules of vacation semester.
- Student will not be eligible for registration of Inplant training unless, he/she completes minimum 100 credits.
- MOOC courses are exempted from above rules.
- Detention rule is not applicable for First Year Backlog courses of Direct Second Year admitted students.



Government Polytechnic, Mumbai

Department of Civil Engineering

**P-19 Curriculum
(Sandwich Pattern)**

**Semester-I
(Course Contents)**

GOVERNMENT POLYTECHNIC MUMBAI
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Teaching and Examination Scheme (P19)
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Programme: Diploma in Civil Engineering (Sandwich Pattern)

(Term / Semester – I)

| Course Code | Course Title | Teaching Hours/Contact Hours | | | | Credits | Examination Scheme (Marks) | | | | | | |
|--------------------------------|--|------------------------------|----------------|----|-------|----------------|----------------------------|-----|-----|-----|----|-----|-------|
| | | L | P | TU | Total | | Theory | | | PR | OR | TW | Total |
| | | | | | | | TH | TS1 | TS2 | | | | |
| SC19107 | Engineering Chemistry | 3 | 2 | -- | 5 | 5 | 60 | 20 | 20 | 25* | -- | 25 | 150 |
| SC19109 | Basic Mathematics | 4 | -- | -- | 4 | 4 | 60 | 20 | 20 | -- | -- | | 100 |
| HU19101 | Communication Skill | 2 | 2 | -- | 4 | 4 | 60 | 20 | 20 | 25* | -- | 25 | 150 |
| ME19201 | Engineering Drawing I | 2 | 4 | -- | 6 | 6 | -- | -- | -- | 50* | -- | 50 | 100 |
| WS19201 | Workshop Practice | -- | 4 | -- | 4 | 4 | -- | -- | -- | -- | -- | 50 | 50 |
| CE19101 | Construction Materials | 3 | -- | -- | 3 | 3 | 60 | 20 | 20 | -- | -- | -- | 100 |
| CE19102 | Libre Office Calc on BOSS Linux (9) (Spoken Tutorials) | -- | 4 [#] | -- | 4 | 4 [#] | -- | -- | -- | -- | -- | -- | -- |
| | Total | 14 | 16 | -- | 30 | 30 | 240 | 80 | 80 | 100 | -- | 150 | 650 |
| Student Centered Activity(SCA) | | | | | 05 | | | | | | | | |
| Total Contact Hours | | | | | 35 | | | | | | | | |

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment)

* Indicates assessment by External Examiner else internal assessment, #indicates Self, on- line learning Mode, @ indicates on line examination

Note: Duration of Examination--TS1&TS2 -1 hour , TH- 2 hours 30 minutes, PR/OR – 3 hours per batch , SCA- Library -1 hour, Sports- 2hours, Creative Activity-2 hours
 Self, on- line learning Mode through MOOCS/Spoken Tutorials /NPTEL/SWAYAM/FOSSEE etc.

Coordinator,
Curriculum Development,
Department of Civil Engineering

In-Charge
Curriculum Development Cell

Head of Departments
Department of Civil Engineering

Principal

| | | | | | | | | | | |
|--|----------|-----------|----------|--|-------------------|--------------|------------|------------|-----------|------------|
| Programme : Diploma in CE/ME(Sandwich Pattern) | | | | | | | | | | |
| Course Code: SC19107 | | | | Course Title: Engineering Chemistry | | | | | | |
| Compulsory / Optional: Compulsory | | | | | | | | | | |
| Teaching Scheme and Credits | | | | Examination Scheme | | | | | | |
| L | P | TU | Total | TH (2.30 Hrs.) | TS1 (1 Hr.) | TS2 (1Hr) | PR | OR | TW | Total |
| 3 | 2 | -- | 5 | 60 | 20 | 20 | 25* | --- | 25 | 150 |

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination

Note: For Minimum passing marks under various heads, refer, examination rule AR26. Two practical skill tests are to be conducted. First skill test at midterm and second skill test at the end of the term.

Rationale:

The subject is included under category of basic sciences. The role is to understand the fundamental concepts and facts about infrastructure of physical matters and their interrelationship. This will provide input for better understanding of other foundation and technology subjects

Course Outcomes: Student should be able to

| | |
|-----|---|
| CO1 | Apply the principles of chemistry under different engineering situations. |
| CO2 | Apply various applications of electrolysis in engineering field. |
| CO3 | Illustrate various methods of softening of hard water |
| CO4 | Adopt methods of prevention of corrosion for environmental and safety concerns. |
| CO5 | Select suitable Lubricants, material for a particular use effectively. |

Course Content Details:

| Unit No | Topics / Sub-topics |
|---------|--|
| 1 | <p>Atomic Structure</p> <p>1.1 Introduction of atom, Molecules, Fundamental Particles, Proton, Neutron, Electron. their mass, charge, location. And symbol Bohr's theory, Postulates, Structure of modern atom.</p> <p>1.2 Atomic number and atomic mass number. Atomic weight Numerical based on atomic number & atomic mass number</p> <p>1.3 Rules governing filling up of atomic orbitals, Quantum no. Pauli's Exclusion Principle, Aufbau's Principle, Hund's rule. Electronic configuration of atoms up to atomic number 30</p> <p>1.4 Valence and chemical bonding. Valence: Definition, & examples. Types of valence : Electrovalence & Co-valence</p> <p>1.5 Electrovalent bond: Definition, Formation. Formation of NaCl</p> <p>1.6 Co-valent bond : Definition & formation Formation of following molecules Single bond: Chlorine. Double bond : Oxygen, Triple Bond : Nitrogen,</p> <p>1.7 Distinction between electrovalent and covalent compound.</p> <p>Course Outcome: CO1 Teaching Hours : 8 hrs Marks: 10 (R- 2, U-4, A-4)</p> |
| 2 | <p>Electrochemistry</p> <p>2.1 Definition of Electrochemistry, Electrolytes: Definition, Types. Differences between Atom and ion. Definition of ionization & electrolytic dissociation, Arrhenius theory, Degree of ionization with factors affecting it.</p> <p>2.2 Terms related to Electrolysis Mechanism of electrolysis. Examples of: mechanism of Electrolysis of CuSO_4 by using Cu electrodes.</p> <p>2.3 Faraday's First law and its mathematical derivation. Faraday's second law & its mathematical derivation, Numerical based on laws of Faraday.</p> <p>2.4 Application of Electrolysis: Electroplating.</p> <p>Course Outcome: CO2 Teaching Hours : 8 hrs Marks: 10 (R- 4 , U-4 , A-2)</p> |
| 3 | <p>Water</p> <p>3.1 Sources of water, impurities present in water. (suspended, dissolved, colloidal, biological) Types of water: hard & soft Causes of hardness of water Types of Hardness, Unit of hardness, Definition of hardness.</p> <p>3.2 Bad effects of Hard Water for Domestic purposes. & Industrial purposes (Textile , Dyeing, Sugar industry, Bakery)</p> <p>3.3 Bad effects of hard water in Boiler, Scales and Sludge's, causes of their formation, their disadvantages and their removal.</p> <p>3.4 Treatment of hard water for industrial purposes by Zeolite & Ion Exchange process</p> <p>3.5 Treatment of hard water for drinking purposes. (city water supply) <u>Various steps:</u> Screening, Sedimentation, Coagulation, Filtration, Sterilization by boiling.</p> <p>3.6 pH value: Definition, Formula, pH scale, its salient features, Numerical based on pH, Applications of pH related to Engg. field (corrosion of bridges, Electroplating,).</p> |

| | |
|---|--|
| | <p>Course Outcome: CO3 Teaching Hours : 8 hrs Marks: 10 (R-2 , U- 4 , A-4)</p> |
| 4 | <p>Corrosion</p> <p>4.1 Definition of corrosion. Types of corrosion. Atmospheric & Electrochemical Corrosion.</p> <p>4.2 Mechanism of atmospheric corrosion, types of oxide films formed, (stable, unstable, volatile, with examples)</p> <p>4.3 Electrochemical corrosion/immersed corrosion Definition. Example. Factors Affecting, Atmospheric & Electrochemical Corrosion.</p> <p>4.4 Protection of metals from Corrosion:- By protective coatings a) organic coating (Paints and Varnishes), b) inorganic coating (Metallic Coating)</p> <p>4.5 Different methods of Protective metallic coatings. A) Hot dipping (Galvanizing & Tinning) b) Sherardizing c) Metal Spraying</p> <p>Course Outcome: CO4 Teaching Hours :8 hrs Marks: 10 (R-2, U- 4 , A-4)</p> |
| 5 | <p>Lubricants</p> <p>5.1 Definition of lubricant, example, functions of lubricant, classification of lubricants (solid, semi-solid and liquid) examples. Conditions under which each lubricant is used.</p> <p>5.2 Lubrication: definition and types conditions under which each lubricant is used. Types of lubrications, Fluid film, Boundary, Extreme pressure lubrication. Definition, diagram & description of each type.</p> <p>5.3 Characteristic of good lubricant A) Physical Characteristics</p> <ul style="list-style-type: none"> • Viscosity • Viscosity index • Oiliness • Volatility • Flash point & Fire Point • Cloud and Pour point <p>B) Chemical Characteristics</p> <ul style="list-style-type: none"> • Acidity /Neutralization no. • Emulsification <p>Saponification value</p> <p>Course Outcome: CO5 Teaching Hours : 6 Marks: 10 (R- 4 , U-4 , A-2)</p> |
| 6 | <p>Nonmetallic Engineering Material</p> <p>6.1 Definition of nonmetallic engineering materials</p> <p>6.2 Plastic : definition , example Polymerization : definition ,Types of Polymerization addition and condensation Addition polymerization : definition formation of polyethylene , Condensation-polymerization : definition Formation Of nylon-66 Types of plastic: thermo softening, thermo setting plastics, Differences between them. Compounding of plastic , Materials needed for it (pigments, fillers, Plasticizers)</p> |

| | |
|--|--|
| | <p>Accelerators etc.,) Properties and engineering applications of plastic.</p> <p>6.3 Rubber: definition of rubber (elastomer) Natural rubber : Basic unit in natural rubber(isoprene) Occurrence & Processing of Latex .Drawbacks of natural Rubber, Vulcanization Of rubber: I Chemical reactions, ,Types of Rubber Synthetic rubber Importance ,difference , Example Bu rubber, Thiokol, Neoprene Properties of rubber: Elasticity, Tack, Rebound ,Abrasion resistance Applications of rubber</p> <p>6.4 Thermal insulating materials Definition, Examples Thermocole, Glass wool. Thermocole: Definition, Preparation, Properties & uses, Glass wool: Definition, Preparation, Properties & uses</p> <p>Course Outcome: CO5 Teaching Hours : 7 hrs Marks: 10 (R- 2 , U- 6 , A- 2)</p> |
|--|--|

Suggested Specifications Table (Theory):

| Unit No | Topic Title | Distribution of Theory Marks | | | |
|---------|-----------------------------------|------------------------------|---------|---------|-------------|
| | | R Level | U Level | A Level | Total Marks |
| 1 | Atomic Structure | 02 | 04 | 04 | 10 |
| 2 | Electrochemistry | 04 | 04 | 02 | 10 |
| 3 | Water | 02 | 04 | 04 | 10 |
| 4 | Corrosion | 02 | 04 | 04 | 10 |
| 5 | Lubricants | 04 | 04 | 02 | 10 |
| 6 | Nonmetallic Engineering Materials | 02 | 06 | 02 | 10 |
| Total | | 16 | 26 | 18 | 60 |

List of experiments:

| Sr. No. | Unit No | CO | List of Experiments | Hours |
|--------------|---------|-----|---|-----------|
| 1 | 1 | CO1 | Introduction of chemistry laboratory & safety measures. | 2 |
| 2 | 2 | CO2 | Determination of conductivity of different electrolytes by using conductivity meter. | 2 |
| 3 | 3 | CO3 | Estimation of Chloride content from given water sample | 2 |
| 4 | 4 | CO4 | Estimation of percentage purity of iron from the given alloy sample | 2 |
| 5 | 5 | CO5 | To find out acid value of given lubricant | 2 |
| 6 | 1 | CO1 | Basic radicals : Cu^{++} , Fe^{++} , Fe^{+++} , Cr^{+++} , Mn^{++} , Ni^{++} , Zn^{++} , Ca^{++} , Ba^{++} , Mg^{++} , NH_4^+ Acidic Radicals: Cl^- , Br^- , I^- , CO_3^{--} , SO_4^{--} , NO_3^- | 6 |
| 7 | 2 | CO2 | Determination of electrochemical equivalent of copper by using Cu-electrodes | 2 |
| 8 | 3 | CO3 | Find out the total hardness from given sample of water by EDTA method | 2 |
| 9 | 4 | CO4 | To Study Corrosion of Aluminum rod in acidic and basic medium and plot a graph of rate of corrosion. | 2 |
| 10 | 5 | CO5 | Determination of coefficient of viscosity of given oil (Glycerin) by using Ostwald's Viscometer | 2 |
| 11 | 3 | CO3 | To find out pH of different solutions using Lovibond comparator, pH paper, pH meter. | 2 |
| 12 | 4 | CO4 | Estimation of moisture content in given coal sample | 2 |
| 13 | 6 | CO5 | Preparation of phenol formaldehyde / Bakelite plastic | 2 |
| Total | | | | 30 |

Note: Experiments No. 1 to 10 are compulsory and should map all units and Cos. Remaining experiments are to be performed on the basis of availability of time.

References/ Books:

| Sr. No. | Title | Author, Publisher, Edition and Year Of publication | ISBN |
|---------|--|--|-------------------|
| 1 | Engineering Chemistry | M.M. Uppal, Khanna Publisher, Delhi | 978-81-7409-262-5 |
| 2 | Polytechnic Chemistry | V.P. Mehta, Jain Brothers, Delhi | 978-81-8360-093-X |
| 3 | Applied Chemistry | P.C. Jain, Monica Jain, Dhanpat Rai and Sons , Delhi | 13: 9788187433170 |
| 4 | Chemistry in Engineering and technology Volume 1 and 2 | J.C. Kurlacose, J. Jairam Tata Mcgraw hill. | 9780074517352 |

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2. www.chemistryclassroom.com
3. www.youtube/chemistry
4. www.ferrochemistry.com
5. <http://hperchemistry.phastr.gsu.edu/hbase/hph.htm>
6. www.sciencejoywagon.com/
7. <https://www.vedantu.com/ncert-solutions/ncert-solutions-class-12-chemistry>

CO Vs PO and CO Vs PSO Mapping (CIVIL ENGINEERING)

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | 2 | 1 | 2 | 2 | 1 | 1 | | 1 | |
| CO2 | 3 | 2 | 1 | 2 | 2 | 2 | 1 | | | |
| CO3 | 3 | 2 | 1 | 1 | 2 | 2 | 1 | | 1 | |
| CO4 | 3 | 2 | 1 | 2 | 2 | 2 | 1 | | 1 | |
| CO5 | 3 | 2 | 1 | 2 | 2 | 2 | 1 | | | 1 |

CO Vs PO and CO Vs PSO Mapping (MECHANICAL ENGINEERING)

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| CO1 | 3 | 2 | 1 | 2 | 2 | 1 | 1 | 1 | 1 |
| CO2 | 3 | 2 | 1 | 2 | 2 | 2 | 1 | 1 | 1 |
| CO3 | 3 | 2 | 1 | 1 | 2 | 2 | 1 | 1 | 2 |
| CO4 | 3 | 2 | 1 | 2 | 2 | 2 | 1 | 2 | 2 |

| | | | | | | | | | |
|-----|---|---|---|---|---|---|---|---|---|
| CO5 | 3 | 2 | 1 | 2 | 2 | 2 | 1 | 2 | 2 |
|-----|---|---|---|---|---|---|---|---|---|

Industry Consultation Committee:

| Sr. No | Name | Designation | Institute/Organisation |
|--------|-------------------------------|---|------------------------------------|
| 1 | Neelamkumar R. Sawant | State Head Technical Services for (Maharashtra and Goa) | JSW Cement Ltd. Mumbai Head Office |
| 2 | Mrs Vaishali Gokhale | Lecturer in Chemistry | Government Polytechnic Pune |
| 3 | Dr. Mrs. Smita Petkar Dhopate | Lecturer in Chemistry | Government Polytechnic Nagpur |
| 4 | Mrs J. V. Iyengar | Lecturer in Chemistry | Government Polytechnic Mumbai |
| 5 | Mrs S.M. Patil | Lecturer in Chemistry | Government Polytechnic Mumbai |

Coordinator,
Curriculum Development,
Department of Sci. & Humanities

Head of Departments
Department of Sci. & Humanities

I/C, Curriculum Development Cell

Principal

| | | | | | | | | | | |
|--|---|----|-----------|--|---------------|--------------|----|----|----|------------|
| Programme : Diploma in CE/ME/IT/CO/EC/IS/EE(Sandwich Pattern) | | | | | | | | | | |
| Course Code: SC19109 | | | | Course Title: BASIC MATHEMATICS | | | | | | |
| Compulsory / Optional: Compulsory | | | | | | | | | | |
| Teaching Scheme and Credits | | | | Examination Scheme | | | | | | |
| L | P | TU | Total | TH (2 Hrs. 30 Min.) | TS1 (1 Hr) | TS2 (1Hr) | PR | OR | TW | Total |
| 04 | - | - | 04 | 60 | 20 | 20 | - | - | - | 100 |

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination Note: For Minimum passing marks under various heads, refer, examination rule AR26. Two practical skill tests are to be conducted. First skill test at midterm and second skill test at the end of the term

Rationale:

This subject is kept under the branch of sciences. This subject intends to teach student basic facts ,concepts, principles, and procedure of mathematics as a tool to analyze engineering problems and as such lays down foundation for understanding the engineering and core technology subject.

Course Outcomes: Student should be able to

| | |
|------------|---|
| CO1 | Identify the basic principles of mathematics about the field analysis of any engineering problem. |
| CO2 | Apply rules ,concept and properties to solve the basic problems. |
| CO3 | Establish relation between two variables. |

Course Content Details:

| Unit No | Topics / Sub-topics |
|---------|--|
| 1 | 1.Trigonometry: 1.1 Trigonometric ratios of allied angles, compound angles, multiple angles (2A, 3A), Sub multiple angles 1.2 Factorization and De-factorization Formulae 1.3 Inverse Circular function (definition and simple problems). Course Outcome: CO1 Teaching Hours : 10 hrs Marks: 10 (R- 4, U-4, A-2) |
| 2 | 2.Vectors: 2.1 Definition of vector , position vector 2.2 Algebra of vectors (Equality, addition ,subtraction and scalar multiplication) 2.3 Dot (Scalar) product & Vector (Cross) product with properties. Course Outcome: CO3 Teaching Hours : 10 hrs Marks: 10 (R- 2 , U-4 , A-4) |
| 3 | 3.Logarithms: 3.1 Definition of logarithm 3.2 Laws of logarithm 3.3 simple examples based on laws. Course Outcome: CO2 Teaching Hours : 10hrs Marks:10 (R-4 , U- 4 , A-2) |
| 4 | 4.Probability : 4.1 Definition of random experiment , sample space, event, occurrence of event and types of event (Impossible , mutually exclusive , exhaustive ,equally likely) 4.2 Definition of Probability 4.3 Addition & Multiplication Theorems of probability without proof , simple examples Course Outcome: CO1 Teaching Hours :10hrs Marks:10 (R-4, U- 4 , A-2) |
| 5 | 5.Determinants:- 5.1 Definition of Determinant 5.2 Expansion of Determinant of order 2X3 5.3 Crammer's rule to solve simultaneous equations in 3 unknowns Course Outcome: CO2 Teaching Hours :10 hrs Marks:10 (R- 2 , U-4 , A-4) |
| 6 | 6.Matrices: 6.1 Definition of a matrix of order m x n 6.2 Types of matrices 6.3 Algebra of matrices - equality, addition, subtraction ,multiplication & scalar multiplication. 6.4 Transpose of matrix. 6.5 Minor , co-factor of an element. 6.6 Adjoint & inverse of a matrix by adjoint method. 6.7 Solution of a simultaneous equations by matrix inversion method. Course Outcome: CO3 Teaching Hours : 10 hrs Marks: 10 (R- 2 , U- 4 , A- 4) |

Suggested Specifications Table (Theory):

| Unit No | Topic Title | Distribution of Theory Marks | | | |
|--------------|---------------------|------------------------------|-----------|-----------|-------------|
| | | R Level | U Level | A Level | Total Marks |
| 1 | Trigonometry | 04 | 04 | 02 | 10 |
| 2 | Vectors | 02 | 04 | 04 | 10 |
| 3 | Logarithms | 04 | 04 | 02 | 10 |
| 4 | Probability | 04 | 04 | 02 | 10 |
| 5 | Determinants | 02 | 04 | 04 | 10 |
| 6 | Matrices | 02 | 04 | 04 | 10 |
| Total | | 18 | 24 | 18 | 60 |

References/ Books:

| Sr. No. | Title | Author, Publisher, Edition and Year Of publication | ISBN |
|---------|---|--|--------------------------------|
| 1 | Mathematics for Polytechnic Students | S.P.Deshpande, Pune Vidyavardhini Graha Prakashan | - |
| 2 | Mathematics for Polytechnic Students (Volume I) | H.K.Dass, S.Chand Prakashan | 9788121935241 |
| 3 | Companions to Basic Maths | G.V.Kumbhojkar, Phadke Prakashan | 10-B07951HJDQ 13-B07951HJDQ |
| 4 | Applied Mathematics | N.Raghvendra Bhatt late, Tata McGraw Hill Publication Shri R Mohan Singh | 9789339219567, 9339219562 |

E-References:

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3. www.mathworks.com/Products/Matlab/-MATLAB
4. www.wolfram.com/mathematica/-Mathematica
5. <https://www.khanaacademy.org/math?gclid=CNqHuabCys4CFdoJaAoddHoPig>
6. www.dplot.com/-Dplot
7. www.allmathcad.com/-Math CAD
8. www.easycalculation.com
9. <https://www.vedantu.com/ncert-solutions/ncert-solutions-class-12-maths>
10. MYCBSEGUIDE

CO Vs PO and CO Vs PSO Mapping (CIVIL ENGINEERING)

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | | | 2 | | | 1 | 1 | | 1 |
| CO2 | 3 | 2 | | | | | 1 | 1 | | 1 |
| CO3 | 3 | | | 2 | | | 1 | 1 | | 1 |

CO Vs PO and CO Vs PSO Mapping (MECHANICAL ENGINEERING)

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| CO1 | 3 | | | 2 | | | 1 | 1 | |
| CO2 | 3 | 2 | | | | | 1 | 1 | |
| CO3 | 3 | | | 2 | | | 1 | 1 | |

CO Vs PO and CO Vs PSO Mapping (COMPUTER ENGINEERING)

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | | | 2 | | | 1 | 1 | | |
| CO2 | 3 | 2 | | | | | 1 | 1 | | |
| CO3 | 3 | | | 2 | | | 1 | 1 | | |

CO Vs PO and CO Vs PSO Mapping (INFORMATION TECHNOLOGY)

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | | | 2 | | | 1 | 1 | | 1 |
| CO2 | 3 | 2 | | | | | 1 | 1 | | 1 |
| CO3 | 3 | | | 2 | | | 1 | 1 | | 1 |

CO Vs PO and CO Vs PSO Mapping (ELECTRONICS ENGINEERING)

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | | | 2 | | | 1 | | 1 | 1 |
| CO2 | 3 | 2 | | | | | 1 | | 1 | 1 |
| CO3 | 3 | | | 2 | | | 1 | | 1 | 1 |

CO Vs PO and CO Vs PSO Mapping (ELECTRICAL ENGINEERING)

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | | | 2 | | | 1 | | 1 | |
| CO2 | 3 | 2 | | | | | 1 | | 1 | |
| CO3 | 3 | | | 2 | | | 1 | | 1 | |

CO Vs PO and CO Vs PSO Mapping (INSTRUMENTATION ENGINEERING)

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| CO1 | 3 | | | 2 | | | 1 | 1 | 1 |
| CO2 | 3 | 2 | | | | | 1 | 1 | 1 |
| CO3 | 3 | | | 2 | | | 1 | 1 | 1 |

Industry Consultation Committee:

| Sr. No | Name | Designation | Institute/Organisation |
|--------|--------------------------|---|------------------------------------|
| 1 | Neelamkumar R. Sawant | State Head Technical Services for (Maharashtra and Goa) | JSW Cement ltd. Mumbai Head Office |
| 2 | Mrs. Deepawali S. kaware | Lecturer in Mathematics | Government polytechnic Vikaramgad |
| 3 | Mr. A.S.Patil | Lecturer in Mathematics | Government polytechnic Mumbai |
| 4 | Mr. V.S.Patil | Lecturer in Mathematics | Government polytechnic Mumbai |

Head of Department

Coordinator,
Curriculum Development,
Department of Science And Humanities

Department of Science And Humanities

I/C, Curriculum Development Cell

Principal

| | | | | | | | | | | |
|---|-----------|----------|-----------|---|---------------|--------------|------------|----------|-----------|------------|
| Programme : Diploma in CE/ME/IT/CO/IS/EE/EC/LG/LT (Sandwich Pattern) | | | | | | | | | | |
| Course Code: HU19101 | | | | Course Title: Communication Skills | | | | | | |
| Compulsory / Optional: Compulsory | | | | | | | | | | |
| Teaching Scheme and Credits | | | | Examination Scheme | | | | | | |
| L | P | TU | Total | TH (2 Hrs. 30 Min.) | TS1 (1 Hr) | TS2 (1Hr) | PR | OR | TW | Total |
| 02 | 02 | - | 04 | 60 | 20 | 20 | 25* | - | 25 | 150 |

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination

Note: For Minimum passing marks under various heads, refer, examination rule AR26. Two practical skill tests are to be conducted. First skill test at midterm and second skill test at the end of the term.

Rationale: Communication skills play a vital and decisive role in career development. In this age of globalization, competition is tough. Hence effective communication skills are important. The subject Communication Skills introduces basic concepts of communication. It also describes the verbal, non-verbal modes and techniques of oral & written communication.

In this context, it will help the engineering diploma students to select and apply the appropriate methods of communication in various situations and business communication. Students are also required basics of communication and use of different skills.

This course will guide and direct to develop a good personality and improve communication skills. It will enable the students to utilize the skills necessary to be a competent communicator.

Course Outcomes: Student should be able to

| | |
|------------|--|
| CO1 | Apply proper communication technique to cope up with the challenges of the modern world. |
| CO2 | Interpret feedback at various situations by using appropriate body language and avoid the barriers in effective communication. |
| CO3 | Able to participate in Group Discussion and Acquire the practical knowledge of an interview. |
| CO4 | Able to develop PowerPoint Presentation and Business correspondence. |
| CO5 | Write letters, circulars, memos, notices, reports and communicate effectively in written communication. |

Course Content Details:

| Unit No | Topics / Sub-topics |
|----------------|---|
| 1 | Introduction to Communication 1.1 Elements of Communication 1.2 Communication Cycle 1.3 Types of communication 1.4 Definition and Types of Barriers- a) Mechanical b) Physical c) Language d) Psychological 1.5 How to overcome Barriers Course Outcome: CO1 Teaching Hours :6 hrs Marks: 14 (R- 2, U-4, A-8) |
| 2 | Non- verbal Communication 2.1 Meaning and Importance of Non-verbal Communication 2.2 Body Language 2.3 Aspects of Body Language 2.4 Graphic language Course Outcome: CO2 Teaching Hours :6 hrs Marks: 12 (R- 4, U-4, A-4) |
| 3 | Group Discussion And Interview Skills 3.1 Need and Importance of Group Discussion 3.2 Use of Knowledge and Logical sequence. 3.3 Types of Interview 3.4 Preparing for an Interview Course Outcome: CO3 Teaching Hours :6 hrs Marks: 10 (R-2, U-4, A-4) |
| 4 | Presentation Skills 4.1 Presentation Skills - Tips for effective presentation 4.2 Guidelines for developing PowerPoint presentation Course Outcome: CO4 Teaching Hours :4 hrs Marks: 08 (R- 2, U-2, A-4) |
| 5 | Business Correspondence 5.1 Office Drafting – a) Notice b) Circular c) Memo d) Email-writing. 5.2 Job Application with resume. 5.3 Business Letters – a) Enquiry b) Order c) Complaint 5.4 Report Writing – a) Fall in Production b) Accident Report Course Outcome: CO5 Teaching Hours: 8 hrs Marks: 16 (R- 4, U-4, A-8) |

List of experiments: Any 10 experiments out of 15

| Sr. No. | Unit No | COs | List of Experiments | Hours |
|---------|---------|---------|---|-----------|
| 1 | 1 | CO1,CO4 | Conversation between students on various situations. | 02 |
| 2 | 3 | CO2,CO4 | Non- Verbal Communication. | 02 |
| 3 | 3 | CO3,CO4 | Group Discussion | 02 |
| 4 | 4 | CO3,CO4 | Mock Interview | 02 |
| 5 | 5 | CO4,CO5 | Business Communication a) Advertisement, Tender, Diary writing. b) Job Application With Resume. | 02 |
| 6 | 1 | CO1 | Communication Barriers | 02 |
| 7 | 5 | CO5 | Business Letters – a) Enquiry b)Order c)Complaint | 02 |
| 8 | 4 | CO1,CO4 | Speeches- a)Welcome Speech b)Farewell Speech c) Vote of Thanks | 02 |
| 9 | 5 | CO5 | Report Writing – a) Fall in Production b) Accident Report | 02 |
| 10 | All | CO4 | Showing Videos on different types of Communication. | 02 |
| 11 | | CO1 | *Articles | 02 |
| 12 | | CO1 | *Preposition and Conjunction | 02 |
| 13 | | CO1 | *Direct Indirect Speech | 02 |
| 14 | | CO1 | *Change the voice | 02 |
| 15 | | CO1 | *Vocabulary Building | 02 |
| | | | Total | 30 |

Note: Experiments No.1 to 10 are compulsory. Remaining experiments are to be performed on availability of time.* These experiments will be performed during practical hours only.

References/ Books:

| Sr. No. | Title | Author, Publisher, Edition and Year Of publication | ISBN |
|---------|--------------------------------|--|---------------------------|
| 1 | Communication Skills | Joyeeta Bhattacharya - Reliable Series | 9780000176981, 0000176982 |
| 2 | Communication Skills | Sanjay Kumar, PushpaLata- Oxford University Press | 13: 978-0199488803 |
| 3 | Successful presentation Skills | Andrew Brad bury- The Sunday Times | 13: 9780749456627 |

E-References:

- 1) Website: www.mindtools.com/page8.html-99k
- 2) Website: www.inc.com/guides/growth/23032.html-4
- 3) Website: www.khake.com/page66htm/-72k
- 4) Website: www.BMConsultantIndia.Com
- 5) <https://www.vedantu.com/ncert-solutions/ncert-solutions-class-12-English>
- 6) MYCBSEGUIDE
- 7) Website: www.letstak.co.in
- 8) <https://learnenglishteens.britishcouncil.org/>

CO Vs PO and CO Vs PSO Mapping (Civil Engineering)

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | 3 | 2 | 3 | 2 | 3 | 2 | 1 | 2 | 1 |
| CO2 | 3 | 3 | 2 | 3 | 2 | 3 | 2 | 1 | 2 | 1 |
| CO3 | 3 | 2 | 2 | 1 | 2 | 3 | 2 | 1 | 2 | 1 |
| CO4 | 3 | 3 | 2 | 1 | 2 | 3 | 2 | 1 | 2 | |
| CO5 | 3 | 3 | 2 | 1 | 2 | 3 | 2 | 1 | 2 | |

CO Vs PO and CO Vs PSO Mapping (Mechanical Engineering)

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| CO1 | 3 | 3 | 2 | 3 | 2 | 3 | 2 | 2 | 1 |
| CO2 | 3 | 3 | 2 | 3 | 2 | 3 | 2 | 2 | 1 |
| CO3 | 3 | 2 | 2 | 1 | 2 | 3 | 2 | 2 | 1 |
| CO4 | 3 | 3 | 2 | 1 | 2 | 3 | 2 | 2 | 1 |
| CO5 | 3 | 3 | 2 | 1 | 2 | 3 | 2 | 2 | 1 |

CO Vs PO and CO Vs PSO Mapping (Electronics Engineering)

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | 3 | 2 | 3 | 2 | 3 | 2 | 2 | 2 | |
| CO2 | 3 | 3 | 2 | 3 | 2 | 3 | 2 | 1 | 2 | 1 |
| CO3 | 3 | 2 | 2 | 1 | 2 | 3 | 2 | 1 | 1 | 1 |
| CO4 | 3 | 3 | 2 | 1 | 2 | 3 | 2 | 1 | | |
| CO5 | 3 | 3 | 2 | 1 | 2 | 3 | 2 | 1 | | |

CO Vs PO and CO Vs PSO Mapping (Electrical Engineering)

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | 3 | 2 | 3 | 2 | 3 | 2 | 1 | 2 | 3 |
| CO2 | 3 | 3 | 2 | 3 | 2 | 3 | 2 | 2 | | 3 |
| CO3 | 3 | 2 | 2 | 1 | 2 | 3 | 2 | 2 | | 3 |
| CO4 | 3 | 3 | 2 | 1 | 2 | 3 | 2 | 1 | | 2 |
| CO5 | 3 | 3 | 2 | 1 | 2 | 3 | 2 | | | |

CO Vs PO and CO Vs PSO Mapping (Instrumentation Engineering)

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| CO1 | 3 | 3 | 2 | 3 | 2 | 3 | 2 | 1 | 2 |
| CO2 | 3 | 3 | 2 | 3 | 2 | 3 | 2 | 1 | 2 |
| CO3 | 3 | 2 | 2 | 1 | 2 | 3 | 2 | 1 | 2 |
| CO4 | 3 | 3 | 2 | 1 | 2 | 3 | 2 | | 2 |
| CO5 | 3 | 3 | 2 | 1 | 2 | 3 | 2 | | |

CO Vs PO and CO Vs PSO Mapping (Computer Engineering)

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | 3 | 2 | 3 | 2 | 3 | 2 | 1 | 2 | 1 |
| CO2 | 3 | 3 | 2 | 3 | 2 | 3 | 2 | 1 | 2 | 1 |
| CO3 | 3 | 2 | 2 | 1 | 2 | 3 | 2 | 1 | 2 | 1 |
| CO4 | 3 | 3 | 2 | 1 | 2 | 3 | 2 | | 2 | |
| CO5 | 3 | 3 | 2 | 1 | 2 | 3 | 2 | | 2 | |

COVs PO and CO Vs PSO Mapping (Information Technology)

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | 3 | 2 | 3 | 2 | 3 | 2 | 2 | 1 | 1 |
| CO2 | 3 | 3 | 2 | 3 | 2 | 3 | 2 | 2 | 1 | 1 |
| CO3 | 3 | 2 | 2 | 1 | 2 | 3 | 2 | 1 | | 2 |
| CO4 | 3 | 3 | 2 | 1 | 2 | 3 | 2 | 1 | | |
| CO5 | 3 | 3 | 2 | 1 | 2 | 3 | 2 | 1 | | |

CO Vs PO and CO Vs PSO Mapping (LG/LT Engineering)

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | 3 | 2 | 3 | 2 | 3 | 2 | 1 | | 2 |
| CO2 | 3 | 3 | 2 | 3 | 2 | 3 | 2 | 1 | | 2 |
| CO3 | 3 | 2 | 2 | 1 | 2 | 3 | 2 | 1 | 1 | 2 |
| CO4 | 3 | 3 | 2 | 1 | 2 | 3 | 2 | 1 | | 2 |
| CO5 | 3 | 3 | 2 | 1 | 2 | 3 | 2 | 1 | | 2 |

Industry Consultation Committee:

| Sr. No | Name | Designation | Institute/Organisation |
|--------|-----------------------|---|------------------------------------|
| 1 | Neelamkumar R. Sawant | State Head Technical Services for (Maharashtra and Goa) | JSW Cement Ltd. Mumbai Head Office |
| 2 | Ms Shilpa D. Khune | Corporate Consultant Trainer | Mahindra Pride Classroom |
| 3 | Mrs.S.S. Kulkarni | Lecturer in English | Government Polytechnic Pune |
| 4 | Mrs. K.S.Pawar | Lecturer in English | Government polytechnic Mumbai |
| 5 | Ms.N.N.Dhake | Lecturer in English | Government polytechnic Mumbai |

Coordinator,

Head of Department

Curriculum Development,
Department of Science And Humanities

Department of Science And Humanities

I/C, Curriculum Development Cell

Principal



| | | | | | | | | | | |
|---|----------|-----------|----------|--|---------------|--------------|------------|-----------|-----------|------------|
| Programme : Diploma in Mechanical Engineering & Civil Engineering (Sandwich Pattern) | | | | | | | | | | |
| Course Code: ME19201 | | | | Course Title: Engineering Drawing-I | | | | | | |
| Compulsory / Optional: Compulsory | | | | | | | | | | |
| Teaching Scheme and Credits | | | | Examination Scheme | | | | | | |
| L | P | TU | Total | TH (2 Hrs) | TS1 (1 Hr) | TS2 (1Hr) | PR | OR | TW | Total |
| 2 | 4 | -- | 6 | -- | -- | - | 50* | -- | 50 | 100 |

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination

Note: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill test are to be conducted. First skill test at mid term and second skill test at the end of the term

Rationale:

Engineering drawing is the common graphical language of engineers, technicians and workers to express engineering ideas and concepts. Correct interpretation of engineering drawings is one of the basic duties of First Line Supervisors. Study of Engineering Drawing induces the concepts of accuracy and exactness of information necessary for the production of engineering component. It also develops judgements about distances and angles.

This basic course aims at building a foundation for the further courses in drawing and other allied subjects. This course is useful in developing imagination, drafting and sketching skills of the students.

Course Outcomes: Student should be able to

| | |
|-----|--|
| CO1 | Draw geometric figures and engineering curves using appropriate drawing instruments |
| CO2 | Draw views of line and plane, by applying principles of first angle method of projections |
| CO3 | Draw orthographic views of given object by applying principles of orthographic projections |
| CO4 | Draw isometric view from given orthographic views, by applying principles of isometric projections |
| CO5 | Draw the free hand sketches of given engineering objects/elements |

Course Content Details:

| Unit No | Topics / Sub-topics |
|----------|--|
| 1 | Principles of Drawing 1.1 Drawing instruments and their uses, Standard sizes of drawing sheets (ISO-A series), letters and numbers (single stroke vertical), Conventions of lines and their applications, Drawing Scales (reduced, enlarge and full size), Methods of Dimensioning: Chain, parallel and coordinate dimensioning (Refer SP-46 Code latest Edition) 1.2 Simple Geometrical Constructions, Redrawing figures using above geometrical constructions |
| | Course Outcome- CO1 Teaching Hours – 04 Marks –06 |

| | |
|---|--|
| 2 | <p>Engineering Curves and Loci of Points</p> <p>2.1 Method to draw Ellipse by Arcs of Circle Method and Concentric Circle Method.</p> <p>2.2 Method to draw Parabola and Hyperbola by Directrix and Focus Method.</p> <p>2.3 Methods to draw Involute of circle and pentagon,</p> <p>2.4 Methods to draw Cycloid,</p> <p>2.5 Loci of Points of Single Slider Crank Mechanism with given specifications.</p> <p>Course Outcome- CO1 Teaching Hours – 06 Marks –06</p> |
| 3 | <p>Projection of lines and planes</p> <p>3.1 Concepts of Reference Planes and Projections, Views – Top, Front, Side Views</p> <p>3.2 Projections of Line inclined to one reference plane (H.P/V.P) and limited to both ends in one quadrant only.</p> <p>3.3 Projections of simple planes of circular, square rectangular, rhombus, pentagonal and hexagonal shape, inclined to one reference plane and perpendicular to other</p> <p>Course Outcome- CO2 Teaching Hours – 06 Marks –10</p> |
| 4 | <p>Orthographic projections</p> <p>4.1 Introduction to orthographic projections, Symbol of First Angle Projection, Conversion of pictorial view into orthographic views –Top, Front and End View of objects containing plain surfaces, slant surfaces, slots, ribs, cylindrical surfaces. (First Angle Projection Method Only)</p> <p>4.2. Sectional Orthographic Views and conversion of pictorial view into sectional orthographic views</p> <p>(Objects involving plain surfaces, slant surfaces, slots, ribs, cylindrical surfaces, threads etc.)</p> <p>Course Outcome- CO3 Teaching Hours – 06 Marks –12</p> |
| 5 | <p>Isometric projections</p> <p>5.1 Isometric scale, Comparison of Natural Scale with Isometric Scale</p> <p>5.2 Conversion of Orthographic Views into Isometric View/Projection</p> <p>(Objects involving plain surfaces, slant surfaces, slots, ribs, cylindrical surfaces, holes etc)</p> <p>Course Outcome- CO4 Teaching Hours – 06 Marks –12</p> |
| 6 | <p>Freehand sketches</p> <p>6.1 Drawing of proportional freehand sketches of –</p> <p>Different types of thread forms, nuts, bolts, screws, washers and foundation bolts (Rag and Lewis type)</p> <p>(Teacher shall also explain use/ function of all the above elements)</p> <p>Course Outcome- CO5 Teaching Hours – 02 Marks –04</p> |

List of Sheets: All sheets compulsory

| Sr. No. | Unit No | List of Experiments | CO | Hours |
|--------------|---------|---|-----|-----------|
| 1 | 1 | Basics of Engineering Graphics Drawing sheet containing types of lines, Lettering, Redrawing given figure, dimensioning and geometrical constructions | CO1 | 08 |
| 2 | 2 | Engineering curves and loci points (minimum 4 problems) | CO1 | 08 |
| 3 | 3 | Projections of Lines and Planes Three cases on lines and three cases on planes | CO2 | 08 |
| 4 | 4 | Orthographic projections Using first angle method of projections (minimum 2 problems) | CO3 | 08 |
| 5 | 4 | Sectional Orthographic projections Using first angle method of projection (minimum 2 problems) | CO3 | 08 |
| 6 | 5 | Isometric Projection-I Using isometric scale (minimum 2 objects) | CO4 | 08 |
| 7 | 5 | Isometric Projection-II To draw isometric views of objects including slots, holes and sloping faces (minimum 2 objects) | CO4 | 08 |
| 8 | 6 | Free hand sketches To draw free hand sketches of different types of threads forms, nuts, bolts and screws, foundation bolts. | CO5 | 04 |
| Total | | | | 60 |

References/ Books:

| Sr. No. | Title | Author, Publisher, Edition and Year Of publication | ISBN |
|---------|--|--|------------------|
| 1 | Engineering drawing | N.D.Bhatt, Charotar Publishing House, 53 rd Edition, 2016 | 978-93-80358-178 |
| 2 | Engineering Graphics | P.J. Shah, S. Chand, revised edition, 2014 | 978-81-21929-679 |
| 3 | Engineering Drawing | Amar Pathak, Wiley Publication, 1 st Ed. 2010 | 978-93-50040-164 |
| 4 | Engineering drawing | D.Jolhe, Tata McGraw Hill Education, 2017 | 978-00-70648-371 |
| 5 | Textbook on engineering drawing | K.L.Narayan, P.Kannaiah, Scitech publications, 24 th reprint, 2010, | 978-81-83714-228 |
| 6 | Engineering drawing practice For school and colleges | IS Code SP-46 | - |

E-References:

1. <https://ocw.mit.edu/courses/drawing>
2. <https://nptel.in/courses/drawing>
3. <https://home.iiik.edp.ac.in>

CO VsPO and CO Vs PSOMapping

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| CO1 | 2 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 |
| CO2 | 2 | 2 | 2 | 1 | 1 | 1 | 2 | 1 | 1 |
| CO3 | 3 | 2 | 2 | 2 | 1 | 2 | 2 | 1 | 1 |
| CO4 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 1 |
| CO5 | 2 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 |

Industry Consultation Committee:

| Sr. No | Name | Designation | Institute/Organisation |
|--------|-------------------|---|------------------------------|
| 1 | Mr. U.A.Agnihotri | Sel. Grade Lecturer in Mechanical Engineering | Govt. Polytechnic, Mumbai |
| 2 | Mr. Ruhil Alwi | Sr. Executive | Coffee Day Beverages, Mumbai |
| 3 | Mr. A.S. Sangwkar | Sel. Grade Lecturer in Mechanical Engineering | Govt. Polytechnic, Thane |
| 4 | Mr. E.C. Dhembre | Lecturer in Mechanical Engineering | Govt. Polytechnic, Mumbai |

Coordinator,
Curriculum Development,
Department of Mechanical Engineering

Head of Departments
Department of Mechanical Engineering

I/C, Curriculum Development Cell

Principal

| | | | | | | | | | | |
|--|---|----|-------|--|---------------|--------------|----|----|----|-------|
| Programme : Diploma in ME/CE/IS/LG/LT/RT (Sandwich Pattern) | | | | | | | | | | |
| Course Code: WS19201 | | | | Course Title: Workshop Practice | | | | | | |
| Compulsory / Optional: Compulsory | | | | | | | | | | |
| Teaching Scheme and Credits | | | | Examination Scheme | | | | | | |
| L | P | TU | Total | TH (2 Hrs 30 minutes) | TS1 (1 Hr) | TS2 (1Hr) | PR | OR | TW | Total |
| -- | 4 | -- | 4 | -- | -- | -- | -- | -- | 50 | 50 |

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination

Note: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill test are to be conducted. First skill test at mid term and second skill test at the end of the term

Rationale:

Workshop practice is the backbone of the real industrial environment which helps to develop and enhance relevant technical hand skills required by the technician working in the various engineering industries and workshops. The knowledge of basic shops like Wood working, Fitting, Welding, Plumbing and Sheet Metal shop is essential for technicians to perform their duties in industries. Irrespective of engineering stream, the use of workshop practices in day to day industrial as well domestic life helps to solve various minor but critical problems. Working in workshop develops the attitude of working in a group and the basis for safety awareness is created. This foundation course intends to impart basic know-how of various hand tools and their use in different sections of manufacturing. The students are advised to undergo each skill experience with remembrance, understanding and application with special emphasis on attitude of enquiry to know why and how for the various instructions and practices imparted to them in each hop. Furthermore the demonstration of CNC Machine will give feel of advancement in industry.

Course Outcomes: Student should be able to

| | |
|-----|---|
| CO1 | Lay-outing of shop & Sketching of jobs, tools & equipment. |
| CO2 | Select appropriate tools, machinery, equipment and consumables for given application. |
| CO3 | Use & Operate hand tools, equipment and machinery in different shops. |
| CO4 | Prepare the simple jobs as per specification & drawing. |
| CO5 | Maintain workshop related tools, equipment and machineries. |

Course Content Details:

| Unit No | Topics / Sub-topics |
|---------|---------------------|
|---------|---------------------|

| | |
|---|--|
| 1 | <p>1.1 Introduction to workshop:-</p> <p>1.2 Workshop layout, Importance of various sections/shop of workshop, Types of jobs done in each shop.</p> <p>1.3 Causes of accidents, general safety rules and work procedure in workshop, Safety signs and symbols, First Aid.</p> <p>1.4 Fire, Causes of Fire, Basic ways of extinguishing the fire. Classification of fire, Firefighting equipment, fire Extinguishers and their types.</p> <p>1.5 Issue and return system of tools, equipment and consumables.</p> <p>Course Outcome: CO1,CO2 Teaching Hours : 06Marks: 05 (R-NA, U- NA , A-NA)</p> |
| 2 | <p>Smithy and Forging:-</p> <p>2.1 Sketching, understanding the specifications, materials, various applications and methods used in Smithy and Forging shop along with use of tools like anvil, hammers, Swage block, tongs, chisels, flatters etc;</p> <p>2.2 Demonstration of Smithy and Forging operations like bending, setting down, bulging, Upsetting etc;</p> <p>2.3 Preparation of smithy & forging, job.</p> <p>2.4 Safety precautions & Personal Protective Equipments.</p> <p>Course Outcome: CO2,CO3,CO4Teaching Hours :10 Marks: 08(R-NA, U- NA ,A-NA)</p> |
| 3 | <p>Carpentry Section :-</p> <p>3.1 Types of wood and their applications.</p> <p>3.2 Types of carpentry hardware's and their uses.</p> <p>3.3 Sketching, understanding the specifications, materials, various applications and Methods used in Carpentry shop along with use of tools like saws, planner, chisels, Hammers, mallet, marking gauge, Vice, try square, rule, etc;</p> <p>3.4 Demonstration of carpentry operations such as marking, sawing, planning, chiseling, Grooving, boring, joining, etc;</p> <p>3.5 Preparation of wooden joints.</p> <p>3.6 Safety precautions & Personal Protective Equipments.</p> <p>Course Outcome:CO2,CO3,CO4 Teaching Hours : 10 Marks: 08(R-NA ,U- NA, A-NA)</p> |
| 4 | <p>Welding Section :-</p> <p>4.1 Types, sketching, understanding the specifications, materials and applications of arc & Gas welding Accessories and consumables.</p> <p>4.2 Demonstration of metal joining operations like arc welding, soldering and brazing. Show effect of Current and speed. Also demonstrate various welding positions.</p> <p>4.3 Demonstrate gas cutting operation.</p> <p>4.4 Preparation of metal joints.</p> <p>4.5 Safety precautions & Personal Protective Equipments.</p> <p>Course Outcome:CO2,CO3,CO4 Teaching Hours : 10Marks: 08(R-NA, U- NA, A-NA)</p> |

| | |
|---|--|
| 5 | Fitting Section:- 5.1 Sketching, understanding the specifications, materials, various applications and methods used in fitting, Marking, measuring, work holding, cutting & finishing tools. 5.2 Demonstration of various fitting operations such as chipping, filing, scraping, grinding, Sawing, marking, Drilling ,tapping, etc; 5.3 Preparation of male, female joint. 5.4 Safety precautions & Personal Protective Equipments Course Outcome:CO2,CO3,CO4Teaching Hours :12 Marks:10(R-N , U- NA, A-NA) |
| 6 | Types, specification, material and applications of pipes. 6.2 Types, specification, material, applications and demonstration of pipe fitting tools. 6.3 Demonstration of pipe fitting operations such as marking, cutting, bending, threading, assembling, Dismantling etc; 6.4 Types and application of various spanners such as flat, fix, ring, bo, adjustable,etc. 6.5 Preparation of pipe fitting jobs. 6.6 Concept and conversions of SWG and other gauges in use. Use of wire gauge. 6.7 Safety precautions & Personal Protective Equipments Course Outcome:CO2,CO3,CO4Teaching Hours : 06 Marks: 06(R-NA,U- NA,A-NA) |
| 7 | Lathe and CNC Operations :- 7.1 Working principle of lathe along with sketch and procedure for its general mainte. 7.2 Demonstration of Lathe machine operation like plain turning, taper turning, threading, Chamfering, etc. 7.3 Simple job demonstration for a group on CNC Machine. Course Outcome:CO5Teaching Hours : 06 Marks: 05 (R-NA , U- NA , A-NA) |

List of experiments:

| Sr. No. | Unit No | List of Experiments | CO | Hours |
|---------|---------|--|--------------|-------|
| 1 | 1 | Causes of accidents, general safety rules and work procedure in workshop, Safety signs and symbols, First Aid. Perform mock drill session in group of minimum 10 students for Extinguishing fire. | CO1 | 06 |
| 2 | 2 | Prepare job involving operations like bending, setting down, bulging, upsetting etc; e.g. Pegs (Square/round), Hook, Hammer tongue, Agro equipment etc. (Individually) | CO2 | 10 |
| 3 | 3 | Prepare two wooden joints as per given drawings. (Individually) | CO2,CO3, CO4 | 10 |
| 4 | 4 | Prepare lap joint/butt joint using either arc / gas welding as per given drawing.(Individually) | CO2,CO3, CO4 | 10 |
| 5 | 5 | Prepare one Male- Female type fitting job as per given drawing. (Individually) | CO2,CO3, CO4 | 12 |
| 6 | 6 | Prepare two pipe joints as per given drawings. (Individually) | CO2,CO3, CO4 | 06 |

| | | | | |
|--------------|---|--|-----|-----------|
| 7 | 7 | Demonstration of Lathe machine & CNC machine operations. | CO5 | 06 |
| Total | | | | 60 |

SUGGESTED STUDENT ACTIVITIES :-List of proposed student activities like.

- Follow safety practices.
- Practice good housekeeping.
- Function as a team member.
- Maintain tools and equipment.
- Follow ethics & maintain discipline.
- Prepare work diary based on practical performed in workshop. Work diary consist of job drawing, operations to be Performed, required raw materials, tools, equipment, date of performance with signature of the teacher.
- Prepare journals consisting of free hand sketches of tools and equipment in each shop, detail specifications and Precautions to be observed while using tools and equipment.
- Prepare / Download specifications of following; i) various tools and equipment in various shop. ii) Precision Equipment in workshop iii) Various machineries in workshop.
- Undertake a market survey of local dealers for procurement of workshop tools, equipment machineries and raw material.
- Visit any fabrication / wood working / sheet metal / forging workshop and prepare a report.

References/ Books:

| Sr. No. | Title | Author, Publisher, Edition and Year Of publication | ISBN |
|---------|---|---|--------------------------|
| 1 | Workshop Technology - I | Hazra and Chaudhary Media promoters & Publisher private limited. | ISBN: 9788185099149 |
| 2 | Workshop Technology - I | W.A.J.Chapman Taylor & Francis. | SBN: 9780713132724 |
| 3 | Workshop Practice Manual for Engineering Diploma & ITI Students | Hegde.R .K Sapna Book House, 2012, | ISBN: 13 : 9798128005830 |
| 4 | Workshop familiarization. | E. Wilkinson Pitman engineering craft series. | ISBN: 0273316729 |
| 5 | Mechanical workshop practice. | K.C.John PHI. | ISBN 10: 8120337212 |
| 6 | Workshop practice manual | K. Venkata Reddy B. S. Publications. | ISBN-10: 8178001497 |
| 7 | A Course in Workshop Technology | Raghuwanshi, B.S Dhanpat Rai sons, New Delhi | ISBN: 10 - 0000017108 |

E-References:

- <http://www.asnu.com.nu/b.c>.
- <http://www.abmttools.com/downloads/Woodworking%20Carpentry%20Tools.pdf> d.

3. <http://www.weldingtechnology.org> e.<http://www.newagepublishers.com>
4. <http://www.youtube.com/watch?v=TeBX6cKKHWY> g
5. <http://www.youtube.com/watch?v=QHF0sNHnttw&feature=related> h
6. <http://www.youtube.com/watch?v=Kv1zo9CAxt4&feature=relmfu> i.
7. <http://sourcing.indiamart.com/engineerig/articles/materials-used-hand-tools/>

CO VsPO and CO Vs PSOMapping

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| CO1 | 1 | 1 | 2 | 1 | 2 | 2 | 1 | 2 | 2 |
| CO2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| CO3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 |
| CO5 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |

Industry Consultation Committee:

| Sr. No | Name | Designation | Institute/Organisation |
|--------|-----------------|--------------------------|---|
| 1 | S. V. Joshi | Lecturer | G. P. Mumbai |
| 2 | N. M. Ambadekar | Workshop Superintendent, | G. P. Thane |
| 3 | D. B. Jadhav | Senior Manager | Auto. Division, Mahindra and Mahindra Ltd., Kandivali |

Coordinator,
Curriculum Development,
Department of _____

Head of Departments
Department of _____

I/C, Curriculum Development Cell

Principal

| | | | | | | | | | | |
|--|----|----|-----------|---|---------------|--------------|----|----|----|------------|
| Programme : Diploma in Civil Engineering (Sandwich Pattern) | | | | | | | | | | |
| Course Code: CE19101 | | | | Course Title: Construction Materials | | | | | | |
| Compulsory / Optional: Compulsory | | | | | | | | | | |
| Teaching Scheme and Credits | | | | Examination Scheme | | | | | | |
| L | P | TU | Total | TH (2 Hrs 30 min) | TS1 (1 Hr) | TS2 (1Hr) | PR | OR | TW | Total |
| 03 | -- | -- | 03 | 60 | 20 | 20 | -- | -- | -- | 100 |

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination
 Note: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill test are to be conducted. First skill test at mid term and second skill test at the end of the term

Rationale:

Construction material is the key element in the construction project. A diploma engineer has to constantly deal with selection of materials for various engineering projects of constructions such as residential or commercial buildings, roads, metro, railways, bridges, dams, tunnels and fly-over. Modern techniques are developed to handle and use materials for economic and safer designs of engineering structures. At diploma level, students are expected to study about these aspects so as to develop their understanding, performance oriented abilities in order to apply their knowledge in construction industry.

Course Outcomes: Student should be able to

| | |
|-----|--|
| CO1 | Identify relevant construction materials. |
| CO2 | Identify relevant natural and artificial construction materials. |
| CO3 | Select relevant special type construction materials. |
| CO4 | Select relevant finishing materials for construction. |
| CO5 | Identify relevant processed construction materials. |

Course Content Details:

| Unit No | Topics / Sub-topics |
|----------|---|
| 1 | Introduction : 1.1 Scope of construction materials in Construction Technology, Transportation Engineering, Environmental Engineering, Irrigation Engineering. (Applications only) 1.2 Selection of materials for different civil engineering structures on the basis of strength, durability, ecofriendly and economy. 1.3 Broad classification of materials – Sources, Natural, Artificial – special, finishing and recycled. Course Outcome: CO1 Teaching Hours : 4 hrs Marks: 08 (R-4, U-4, A-0) |

| | |
|---|--|
| 2 | Natural Construction Materials: 2.1 Stone : Requirements of good building stone, characteristics, tools for stone 2.2 Timber : Structure, properties, seasoning, preservation, defects 2.3 Asphalt, bitumen and tar : properties, uses 2.4 Lime : types, uses 2.5 Soil : types, suitability in construction 2.6 Sand : properties, uses 2.7 Course aggregate : classification according to size , uses Course Outcome: CO2 Teaching Hours : 12 hrs Marks: 14 (R-6, U-6, A-2) |
| 3 | Construction of Road Pavement Artificial Construction Materials : 3.1 Brick: Conventional/Traditional bricks, modular and standard bricks, characteristics, classification, field tests on bricks. 3.2 Flooring tiles : types, uses 3.3 Cement : types, uses 3.4 Pavement blocks, pre-cast concrete block 3.5 Glass : soda lime glass, lead glass and borosilicate glass and their uses 3.6 Plywood, particle board, veneers, laminated board and their uses 3.7 Ferrous and non-ferrous metals and their uses Course Outcome: CO2 Teaching Hours : 14 hrs Marks: 14 (R-6, U-6, A-2) |
| 4 | Special Construction Materials: 4.1 Waterproofing materials, Termite proofing materials, Thermal & Sound insulating materials : types, suitability in construction 4.2 Fibers : types – jute, glass, plastic asbestos fibers – uses 4.3 Geopolymer cement : properties, applications Course Outcome: CO3 Teaching Hours : 6 hrs Marks: 08 (R-4, U-4, A-0) |
| 5 | Finishing Materials : 5.1 Plastering materials : lime mortar, cement mortar – uses 5.2 Plaster of Paris (POP) : constituents, uses 5.3 Paints : oil paints, distempers, varnishes- uses Course Outcome: CO4 Teaching Hours : 6 hrs Marks: 08 (R-4, U-4, A-0) |
| 6 | Processed Construction Materials : 6.1 Industrial waste materials : fly ash, blast furnace slag, granite, marble polishing waste – uses 6.2 Agro waste materials : Rice husk, bagasse, coir fibres – uses 6.3 Special processes construction materials : Geosynthetic, ferrocrete, artificial timber, artificial sand – uses Course Outcome: CO5 Teaching Hours : 6 hrs Marks: 08 (R-2, U-2, A-4) |

Suggested Specifications Table (Theory):

| Unit No | Topic Title | Distribution of Theory Marks | | | |
|---------|--------------------------------|------------------------------|---------|---------|-------------|
| | | R Level | U Level | A Level | Total Marks |
| 1 | Introduction | 4 | 4 | -- | 08 |
| 2 | Natural Construction Materials | 6 | 6 | 2 | 14 |

| | | | | | |
|--------------|--------------------------------------|-----------|-----------|-----------|-----------|
| 3 | Artificial Construction Materials | 6 | 6 | 2 | 14 |
| 4 | Special Construction Materials | 4 | 4 | -- | 08 |
| 5 | Finishing Materials for Construction | 4 | 4 | -- | 08 |
| 6 | Processed Construction Materials | 2 | 2 | 4 | 08 |
| Total | | 26 | 26 | 08 | 60 |

References/ Books:

| Sr. No. | Title | Author, Publisher, Edition and Year Of publication | ISBN |
|---------|-----------------------------|--|--------------------------|
| 1 | Construction Materials | Ghose D.N., Tata MacGraw Hill, New Delhi | ISBN : 0074516477 |
| 2 | Building Materials | Varghese P.C., PHI Learning, New Delhi | ISBN-10: 9788120350915 |
| 3 | Engineering Materials | Rangwala S.C., Charator Publisher, Ahemadabad | ISBN : 978-93-85039-17-1 |
| 4 | Civil Engineering Materials | Somayaji, Shah, Pearson education, New Delhi | ISBN 10: 0131776436 |

E-References:

- 1) <https://www.engineeringcivil.com>
- 2) www.youtube.com/
- 3) <http://civildigital.com>
- 4) <http://www.quora.com>
- 5) <http://www.nationallibrary.gov.in>

CO Vs PO and CO Vs PSO Mapping

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | 3 | -- | 1 | 3 | -- | 2 | -- | 3 | -- |
| CO2 | 3 | 3 | -- | 1 | 3 | -- | 2 | -- | 3 | -- |
| CO3 | 3 | 2 | -- | 1 | 3 | -- | 2 | -- | 3 | -- |
| CO4 | 3 | 2 | -- | 1 | 3 | -- | 2 | -- | 3 | -- |
| CO5 | 3 | 3 | -- | 1 | 3 | -- | 2 | -- | 3 | -- |

Industry Consultation Committee:

| Sr. No | Name | Designation | Institute/Organisation |
|--------|---------------------|-------------------------|------------------------|
| 1 | Mr. Rohan Deokar | Deputy Engineer | MMRDA |
| 2 | Mr. Sanjay Kulkarni | Surveyor and Consultant | SRKulkarni Pvt.Firm |

| | | | |
|---|--------------------|-----------------------------|--------------------------|
| 3 | Mr. K.V. Kelgandre | Sr. Lecturer in Civil Engg. | K.J. Somaiya Polytechnic |
| 4 | Ms. S. M. Male | Lecturer in Civil Engg. | Govt. Polytechnic Mumbai |

Coordinator,
Curriculum Development,
Department of Civil Engg.

Head of Department
Department of Civil Engg.

I/C, Curriculum Development Cell

Principal



CE 19102 Libre Office Calc

1. Introduction to Libre Office Calc (Foss: *LibreOffice Calc on BOSS Linux – English*)

Outline: Introduction to LibreOffice Calc What is Calc, Who should use Calc, What can be done using Calc. About spreadsheets, sheets and cells. Basic features – parts of main Ca.

2. Working with Cells

Outline: Working with Cells How to enter numbers, text, numbers as text, date and time in Calc. How to Navigate between cells and in between sheets. How to select items in row.

3. Working with Sheets

Outline: Working with Sheets Inserting and Deleting rows and columns Calc. Inserting and Deleting Sheets in Calc. Renaming Sheets

4. Formatting Data

Outline: Formatting Data Borders, Color, Formatting Text, Increasing Cell Size Formatting multiple lines of text, numbers, fonts, cell borders, cell background Automatic Wrappi.

5. Basic Data Manipulation

Outline: Basic Data Manipulation Paste and paste special (values, transpose), pasting a spread sheet into writer as a table Introduction to Formulas – Sum, Average, basic formula.

6. Working with Data

Outline: Working with data Speed up using Fill tools and Selection lists. Sharing content between sheets Remove data, Replace data, Change part of a data.

7. Using Charts & Graphs

Outline: Using Charts and graphs in Calc Creating, Editing and Formatting Charts Types of charts Resizing and moving of charts

8. Formulas & Functions

Outline: Formulas and Functions Creating formulas, operator types and referencing Basic arithmetic and statistic functions - relative and fixed (\$) referencing in a function .

9. Linking Calc Data

Outline: Linking Calc Data Referencing other sheets and documents Working with Hyperlinks



Government Polytechnic, Mumbai

Department of Civil Engineering

**P-19 Curriculum
(Sandwich Pattern)**

**Semester-II
(Course Contents)**

GOVERNMENT POLYTECHNIC MUMBAI
(Academically Autonomously Institute, Government of Maharashtra)
Teaching and Examination Scheme (P19)
With effect from AY 2019-20

Programme: Diploma in Civil Engineering (Sandwich Pattern)

Term / Semester - II

| Course Code | Course Title | Teaching Hours/Contact Hours | | | | Credits | Examination Scheme (Marks) | | | | | | |
|--------------------------------|---|------------------------------|----------------|----|-------|----------------|----------------------------|-----|-----|-----|----|-----|-------|
| | | L | P | TU | Total | | Theory | | | PR | OR | TW | Total |
| | | | | | | | TH | TS1 | TS2 | | | | |
| SC19102 | Engineering Physics | 3 | 2 | -- | 5 | 5 | 60 | 20 | 20 | 25* | -- | 25 | 150 |
| SC19110 | Engineering Mathematics | 4 | -- | -- | 4 | 4 | 60 | 20 | 20 | -- | -- | | 100 |
| CE19201 | Building Drawing | 1 | 4 | -- | 5 | 5 | -- | -- | -- | 50* | -- | 50 | 100 |
| CE19202 | Surveying I | 3 | 4 | -- | 7 | 7 | 60 | 20 | 20 | 50* | -- | 50 | 200 |
| AM19201 | Engineering Mechanics | 3 | 2 | -- | 5 | 5 | 60 | 20 | 20 | 25 | -- | 25 | 150 |
| CE19203 | Libre Office Draw (Spoken Tutorials) | -- | 4 [#] | -- | 4 | 4 [#] | -- | -- | -- | -- | -- | -- | -- |
| | Total | 14 | 16 | -- | 30 | 30 | 240 | 80 | 80 | 150 | -- | 150 | 700 |
| Student Centered Activity(SCA) | | | | | 05 | | | | | | | | |
| Total Contact Hours | | | | | 35 | | | | | | | | |

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment)

* Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination

Note: Duration of Examination--TS1&TS2 -1 hour , TH- 2 hours 30 minutes, PR/OR – 3 hours per batch , SCA- Library - 1 hour, Sports- 2 hours, Creative Activity-2 hours
Self, on- line learning Mode through MOOCs /Spoken Tutorials / NPTEL / SWAYAM / FOSSEE etc.

Department Coordinator,
Curriculum Development,
Dept. of Civil Engineering

Head of Department
Dept. of Civil Engineering

In-Charge
Curriculum Development Cell

Principal

| | | | | | | | | | | |
|---|---|----|-------|--|----------------|---------------|-----|----|----|-------|
| Programme : Diploma in CE/ ME (Sandwich pattern) | | | | | | | | | | |
| Course Code: SC19102 | | | | Course Title: Engineering Physics | | | | | | |
| Compulsory / Optional: Compulsory | | | | | | | | | | |
| Teaching Scheme and Credits | | | | Examination Scheme | | | | | | |
| L | P | TU | Total | TH (2Hrs.30 minutes) | TS1 (1 Hr.) | TS2 (1Hr.) | PR | OR | TW | Total |
| 3 | 2 | -- | 5 | 60 | 20 | 20 | 25* | -- | 25 | 150 |

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination

Note: For Minimum passing marks under various heads, refer, examination rule AR26. Two practical skill tests are to be conducted. First skill test at midterm and second skill test at the end of the term

Rationale:

The subject is included under the category of science. The special feature of the subject is to develop the laboratory skill using principles of scientific phenomenon. This course will serve to satisfy the need of the technical students for their development in technical field. The course is designed by selecting the topics which will develop intellectual skills of the students and will guide students to solve broad based engineering problems. Ultimately the focus of the course is to develop psychomotor skills in the Students.

Course Outcomes: Student should be able to

| | |
|-----|---|
| CO1 | State the different physical quantities identify the proper unit of it and to estimate in the measurement of physical quantities. |
| CO2 | Apply laws of motion in various engineering applications |
| CO3 | Identify the properties of solid , liquid such as elasticity, liquid friction ,viscosity and surface tension |
| CO4 | Analyze types of waves and acoustics of good building. |
| CO5 | Create awareness about the properties and application of light, LASER in engineering field. |

Course Content Details:

| Unit No | Topics / Sub-topics |
|---------|--|
| 1 | Units and Measurements 1.1 Fundamental Physical quantities, examples. 1.2 Derived physical quantities, examples. 1.3 Definition and requirements of unit 1.4 System of units, C. G. S., M. K. S. and S. I. units. 1.5 Rules to write the unit and conventions of units and Significant figures, rules to write significant figures. 1.6 Error – Definition, types of errors and estimation of errors 1.7 Numerical Course Outcome: CO1 Teaching Hours : 8 hrs. Marks: 6 (R- 2, U-2, A-2) |
| 2 | Motions 2.1 Linear motion –Definition – distance, displacement, velocity, equation of motions, acceleration due to gravity and under gravity, numerical 2.2 Periodic motions : a)Oscillatory motion, b)Vibratory motion, c) S.H.M d) Circular motion. (only definition and examples), 2.3 Angular motion: a) Definition: Time period, frequency, amplitude, wavelength, and phase. Uniform circular motion, Radius vector, linear velocity, Angular velocity , Angular acceleration,Numerical. b) Relation between linear velocity and angular Velocity (derivation), Radial or centripetal acceleration, Three equations of motion (no derivations) Centripetal and Centrifugal force, examples and applications. 2.4 Kinetics 2.4.1 Definition Kinetics , momentum, impulse, impulsive force 2.4.2 Newton's laws of motion with equation 2.4.3 Application of Newton's laws of motion 2.4.4 Definition and unit - work power energy 2.4.5 Work energy principle 2.4.6 Numerical. Course Outcome: CO2 Teaching Hours :10 hrs. Marks: 10 (R- 2 , U-4 , A-4) |
| 3 | General Properties of Matter 3.1 Elasticity: 3.1.1 Deforming force, restoring force, Elastic, plastic and rigid substances, and their examples. 3.1.2 Definition of elasticity, stress, strain and its types. 3.1.3 Hooke's Law and elastic limit. 3.1.4 Stress - Strain curve, yield point, breaking point. 3.1.5 Young's Modulus, Bulk modulus and Modulus of rigidity |

| | |
|---|--|
| | <p>Definition and relation among them.</p> <p>3.1.6 Factor of safety.</p> <p>3.1.7 Applications of elasticity</p> <p>3.1.8 Numerical.</p> <p>3.2 Liquid Friction</p> <p>3.2.1 Friction liquid, pressure</p> <p>3.2.2 pressure height relation</p> <p>3.3.3 Pascal's law, Archimedes' Principle and application of it.</p> <p>3.3 Viscosity</p> <p>3.3.1 Concept and Definition of viscosity, velocity gradient.</p> <p>3.3.2 Newton's law of viscosity, Co-efficient of viscosity, unit of viscosity</p> <p>3.3.3 Stokes' law, terminal velocity, derivation of Stokes' formula.</p> <p>3.3.4 Streamline flow, turbulent flow, critical velocity, examples.</p> <p>3.3.5 Reynolds' number and its significance.</p> <p>3.3.6 Applications of viscosity.</p> <p>3.3.7 Numerical.</p> <p>3.4 Surface Tension :</p> <p>3.4.1 Concept of surface tension.</p> <p>3.4.2 Adhesive and cohesive forces, examples.</p> <p>3.4.3 Laplace's Molecular theory of surface tension</p> <p>3.4.4 Angle of contact, its significance.</p> <p>3.4.5 Expression for surface tension by capillary rise method.</p> <p>3.4.6 Effect of impurity and temperature.</p> <p>3.4.7 Applications of surface tension.</p> <p>3.4.8 Numerical.</p> <p>Course Outcome: CO3 Teaching Hours: 12 hrs. Marks: 18 (R- 4 , U- 6 , A- 8)</p> |
| 4 | <p>Sound and Acoustic</p> <p>4.1 Sound Waves :</p> <p>4.1.1 Wave motion, types of waves – progressive, longitudinal and transverse waves.</p> <p>4.1.2 Characteristics of longitudinal and transverse waves and comparison.</p> <p>4.1.3 Free or natural vibrations and forced vibrations, resonance – definition and examples.</p> <p>4.1.4 Determination of velocity of sound by resonance method.</p> <p>4.1.5 Numerical.</p> <p>4.2 Acoustics :</p> <p>4.2.1 Definition of echo, reverberation , reverberation time and acoustic</p> <p>4.2.2 Sabine's formula for reverberation time (no derivation)</p> <p>4.2.3 Factors affecting acoustics of sound.</p> <p>4.2.4 Acoustical planning of building.</p> <p>4.2.5 Numerical.</p> <p>Course Outcome: CO4 Teaching Hours: 8 hrs. Marks: 10 (R- 2 , U- 4 , A- 4)</p> |

| | |
|---|---|
| 5 | Optics and Optical Fiber 5.1 Optics : 5.1.1 Revision of reflection and refraction of light. 5.1.2 Laws of refraction, Snell's law. 5.1.3 Determination of refractive index. 5.1.4 Dispersion, dispersive power, Prism formula (derivation) 5.1.5 Critical angle, Total internal reflection. Examples and applications. 5.1.6 Numerical. 5.2 Optical Fiber : 5.2.1 Principle of propagation of light through optical fiber. 5.2.2 Structure of optical fiber. 5.2.3 Applications. 5.2.4 Difference between optical fiber cable and electric cable wire Course Outcome: CO5 Teaching Hours : 4 hrs. Marks: 10 (R- 2 , U- 4 , A- 4) |
| 6 | LASER 6.1 LASER introduction, 6.2 Properties of laser, 6.3 Spontaneous and stimulated emission, 6.4 Population inversion, Optical pumping, 6.5 Applications of LASER. Course Outcome: CO5 Teaching Hours : 3 hrs. Marks: 6 (R- 2 , U- 2 , A-2) |

Suggested Specifications Table (Theory):

| Unit No | Topic Title | Distribution of Theory Marks | | | |
|--------------|-------------------------------------|------------------------------|-----------|-----------|-------------|
| | | R Level | U Level | A Level | Total Marks |
| 1 | Units and Measurements | 2 | 2 | 2 | 6 |
| 2 | Motion | 2 | 4 | 4 | 10 |
| 3 | General properties of matter | 4 | 6 | 8 | 18 |
| 4 | Sound and Acoustic | 2 | 4 | 4 | 10 |
| 5 | Optics and Optical fiber | 2 | 4 | 4 | 10 |
| 6 | LASER | 2 | 2 | 2 | 6 |
| Total | | 14 | 22 | 24 | 60 |

List of experiments:

| Sr. No. | Unit No | CO | List of Experiments | Hours |
|--------------|---------|------|--|-----------|
| 1 | 1 | CO 1 | To know your Physics laboratory and use of scientific calculator. | 2 |
| 2 | 1 | CO 1 | To measure the dimensions of given objects and to determine their Volume using Vernier caliper. | 2 |
| 3 | 2 | CO 2 | To determine Acceleration due to gravity by simple pendulum | 2 |
| 4 | 3 | CO 3 | To determine coefficient of viscosity of liquid by Stokes' method | 2 |
| 3 | 3 | CO 3 | To determine the surface tension of liquid using capillary rise method. | 2 |
| 6 | 4 | CO 4 | To determine velocity of sound by resonance method. | 2 |
| 7 | 5 | CO 5 | To determine refractive index by using pin method | 2 |
| 8 | 1 | CO 1 | To measure the dimensions of given objects and to determine their Volume using micrometer screw gauge. | 2 |
| 9 | 2 | CO 2 | To determine stiffness constant by using helical spring | 2 |
| 10 | 3 | CO 3 | To determine the Young's modulus of elasticity of wire using Young's apparatus | 2 |
| 11 | 3 | CO 3 | To verify the relation between radius of capillary tube and height of liquid in a capillary tube. | 2 |
| 12 | 4 | CO 4 | To determine velocity of sound by using sonometer. | 2 |
| 13 | 6 | CO 5 | Experiment on LASER | 2 |
| 14 | 5 | CO 5 | To demonstrate spectrometer | 2 |
| 15 | ALL | CO 1 | Showing Video on different applications related to units, | 2 |
| Total | | | | 30 |

Note: Experiments No. 1 to 10 are compulsory and should map all units and Cos. Remaining 5 experiments are to be performing on the importance of topic.

References/ Books:

| Sr. No. | Title | Author, Publisher, Edition and Year Of publication | ISBN |
|---------|-------------------------|--|-----------------------------------|
| 1 | Applied Physics | Manikpure & Deshpande, S.Chand & Company | 10:8121919541 13:9788121919548 |
| 2 | Applied Physics | B.G.Bhandarkar, Vrinda Publication | 0071779795 |
| 3 | Optics & Optical Fibers | Brijlal Subhramanyan | 978-3-662-52764-1 |
| 4 | Engineering Physics | Gaur and S.L.Gupta S.Chand & Company | 0-07-058502 |
| 5 | Physics | Resnick and Halliday Tata McGraw Hills | 978-0-07-1755487-3 |
| 6 | Physics part I & II | H.C .Varma | 9788177091878 |
| 7 | Properties of Matter | D.S .Mathur | 13: 978-8121908153 |

E-References:

1. www.physics.org
2. www.physicsclassroom.com
3. www.youtube/physics
4. www.ferrophysics.com
5. <http://hperphysics.phastr.gsu.edu/hbase/hph.htm>
6. www.sciencejoywagon.com/physicszone
7. <https://www.vedantu.com/ncert-solutions/ncert-solutions-class-12-physics>
8. MYCBSEGUIDE
9. <https://ndl.iitkgp.ac.in/>

CO Vs PO and CO Vs PSO Mapping (CIVIL ENGINEERING)

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | 1 | 1 | 2 | 1 | 1 | 1 | 2 | 1 | |
| CO2 | 3 | -- | 1 | --- | 1 | 1 | 1 | 2 | 1 | 1 |
| CO3 | 3 | 1 | 1 | --- | 1 | 1 | 1 | 1 | 1 | |
| CO4 | 3 | 1 | 1 | 2 | 1 | 1 | 1 | 2 | 1 | 1 |

CO Vs PO and CO Vs PSO Mapping (MECHANICAL ENGINEERING)

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| CO1 | 3 | 1 | 1 | 2 | 1 | 1 | 1 | 2 | --- |
| CO2 | 3 | 1 | 1 | --- | 1 | 1 | 1 | 1 | 1 |
| CO3 | 3 | 1 | 1 | --- | 1 | 1 | 1 | 2 | 1 |
| CO4 | 3 | --- | 1 | 2 | 1 | 1 | 1 | 2 | --- |

Industry Consultation Committee:

| Sr. No | Name | Designation | Institute/organization |
|--------|--------------------|---------------------|--------------------------|
| 1 | Mr. Rajesh Masane | Sr. Engineer | L and T Mumbai |
| 2 | Mrs B.J. Choudhary | Lecturer in Physics | Govt. Polytechnic Thane |
| 3 | Mrs S.A. Thorat | Lecturer in Physics | Govt. Polytechnic Mumbai |
| 4 | Dr. D.S. Nikam | Lecturer in Physics | Govt. Polytechnic Mumbai |

Coordinator,
Curriculum Development,
Department of Sci. & Humanities

Head of Departments
Department of Sci. & Humanities

I/C, Curriculum Development Cell

Principal

| | | | | | | | | | | |
|--|----|----|----------|--|---------------|--------------|----|----|----|------------|
| Programme : Diploma in CE/ME/CO/IF/EC/EE/IS(Sandwich Pattern) | | | | | | | | | | |
| Course Code: SC19110 | | | | Course Title: ENGINEERING MATHEMATICS | | | | | | |
| Compulsory / Optional: Compulsory | | | | | | | | | | |
| Teaching Scheme and Credits | | | | Examination Scheme | | | | | | |
| L | P | TU | Total | TH (2 Hrs 30 Min.) | TS1 (1 Hr) | TS2 (1Hr) | PR | OR | TW | Total |
| 4 | -- | -- | 4 | 60 | 20 | 20 | -- | -- | -- | 100 |

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination Note: For Minimum passing marks under various heads, refer, examination rule AR26. Two practical skill tests are to be conducted. First skill test at midterm and second skill test at the end of the term

Rationale:

This subject is kept under the branch of sciences. This subject intends to teach student basic facts ,concepts, principles, and procedure of mathematics as a tool to analyze engineering problems and as such lays down foundation for understanding the engineering and core technology subject.

Course Outcomes: Student should be able to

| | |
|-----|---|
| CO1 | Define the basic principles of function, limits, derivatives, complex number and relations between two variables. |
| CO2 | Apply rules, concept and properties to solve the problems |
| CO3 | Solve the given problems of integration using suitable method. |

Course Content Details:

| Unit No | Topics / Sub-topics |
|---------|---|
| 1 | 1. Function 1.1 Definition of variable, constant, intervals such as open, closed, semi-open etc 1.2 Definition of function, value of function and types of functions and simple examples Course Outcome: CO1 Teaching Hours : 10 hrs Marks: 10 (R- 4, U-4, A-2) |
| 2 | 2. Limits 2.1 Definition of neighbourhood, concept and definition of limit 2.2 Limits of Algebraic function 2.3 Limits of Trigonometric Functions with simple examples Course Outcome: CO1 Teaching Hours : 10 hrs Marks: 10 (R- 2, U-4, A-4) |
| 3 | 3. Derivatives & Application of derivative 3.1 Definition of the derivative. 3.2 Derivatives of standard function. (No proof by first principle) 3.3 Differentiation of sum, difference, product and quotient of two or more functions 3.4 Differentiation of composite function with simple example. 3.5 Second order derivative. 3.6 Geometrical Meaning of Derivative 3.7 Tangents & Normals to the curve, 3.8 Maxima & minima of the function 3.9 Radius of curvature Course Outcome: CO2 Teaching Hours : 10 hrs Marks: 10 (R-4, U-4, A-2) |
| 4 | 4. Integration & Application of integration 4.1 Definition of integration as antiderivative, Integration of standard function 4.2 Rules of integration (Integration of sum, difference, scalar multiplication) without proof 4.3 Integration by substitution 4.4 Integration of composite function 4.5 Definition of definite integral 4.6 Properties of definite integral with simple problems 4.7 Area under the curve 4.8 Area bounded by two curves Course Outcome: CO3 Teaching Hours : 10 hrs Marks: 10 (R-4, U-4, A-2) |
| 5 | 5. Complex Number:- 5.1 Definition of complex number Cartesian, Polar, Exponential form of complex number 5.2 Algebra of complex number :- Equality, addition, Subtraction, Multiplication & Division with simple examples Course Outcome: CO2 Teaching Hours : 10 hrs Marks: 10 (R- 2, U-4, A-4) |
| 6 | 6. Numerical Analysis 6.1 Solution of Algebraic equations using – i) Bisectional method ii) Regular – Falsi method, iii) Newton- Raphson method 6.2 Solution of simultaneous equation (i) Gauss elimination method (ii) Jacobi's method (iii) Gauss-Seidal method Course Outcome: CO2 Teaching Hours : 10 hrs Marks: 10 (R- 2, U-4, A-4) |

Suggested Specifications Table (Theory):

| Unit No | Topic Title | Distribution of Theory Marks | | | |
|--------------|---|------------------------------|-----------|-----------|-------------|
| | | R Level | U Level | A Level | Total Marks |
| 1 | Function | 04 | 04 | 02 | 10 |
| 2 | Limits | 02 | 04 | 04 | 10 |
| 3 | Derivatives & Application of Derivatives | 04 | 04 | 02 | 10 |
| 4 | Integration & Application of Integration | 04 | 04 | 02 | 10 |
| 5 | Complex Number | 02 | 04 | 04 | 10 |
| 6 | Numerical Analysis | 02 | 04 | 04 | 10 |
| Total | | 18 | 24 | 18 | 60 |

References/ Books:

| Sr. No. | Title | Author, Publisher, Edition and Year Of publication | ISBN |
|---------|---|--|--------------------------------|
| 1 | Mathematics for Polytechnic Students | S.P.Deshpande, Pune Vidyavardhini Graha Prakashan | - |
| 2 | Mathematics for Polytechnic Students (Volume I) | H.K.Dass, S.Chand Prakashan | 9788121935241 |
| 3 | Companions to Basic Maths | G.V.Kumbhojkar, Phadke Prakashan | 10-B07951HJDQ 13-B07951HJDQ |
| 4 | Applied Mathematics | N.Raghvendra Bhatt late, Tata McGraw Hill Publication Shri R Mohan Singh | 9789339219567, 9339219562 |

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2. www.Scilab.org/-SCI Lab
3. www.mathworks.com/Products/Matlab/-MATLAB
4. www.wolfram.com/mathematica/-Mathematica
5. <https://www.khanaacademy.org/math?gclid=CNqHuabCys4CFdoJaAoddHoPig>
6. www.dplot.com/-Dplot
7. www.allmathcad.com/-Math CAD
8. www.easycalculation.com
9. <https://www.vedantu.com/ncert-solutions/ncert-solutions-class-12-maths>
10. MYCBSEGUIDE

CO Vs PO and CO Vs PSO Mapping (CIVIL ENGINEERING)

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | | | 1 | | | 1 | 1 | | 1 |
| CO2 | 3 | | | 1 | | | 1 | 1 | | 1 |
| CO3 | 3 | | | 1 | | | 1 | 1 | | 1 |

CO Vs PO and CO Vs PSO Mapping (MECHANICAL ENGINEERING)

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| CO1 | 3 | | | 1 | | | 1 | 1 | |
| CO2 | 3 | | | 1 | | | 1 | 1 | |
| CO3 | 3 | | | 1 | | | 1 | 1 | |

CO Vs PO and CO Vs PSO Mapping (COMPUTER ENGINEERING)

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | | | 1 | | | 1 | 1 | 1 | |
| CO2 | 3 | | | 1 | | | 1 | 1 | 1 | |
| CO3 | 3 | | | 1 | | | 1 | 1 | 1 | |

CO Vs PO and CO Vs PSO Mapping (INFORMATION TECHNOLOGY)

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | | | 1 | | | 1 | 1 | | 1 |
| CO2 | 3 | | | 1 | | | 1 | 1 | | 1 |
| CO3 | 3 | | | 1 | | | 1 | 1 | | 1 |

CO Vs PO and CO Vs PSO Mapping (ELCTRONICS ENGINEERING)

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | | | 1 | | | 1 | | 1 | 1 |
| CO2 | 3 | | | 1 | | | 1 | | 1 | 1 |
| CO3 | 3 | | | 1 | | | 1 | | 1 | 1 |

CO Vs PO and CO Vs PSO Mapping (ELECTRICAL ENGINEERING)

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | | | 1 | | | 1 | | 1 | |
| CO2 | 3 | | | 1 | | | 1 | | 1 | |
| CO3 | 3 | | | 1 | | | 1 | | 1 | |

CO Vs PO and CO Vs PSO Mapping (INSTRUMENTATION ENGINEERING)

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| CO1 | 3 | | | 1 | | | 1 | 1 | 1 |
| CO2 | 3 | | | 1 | | | 1 | 1 | 1 |
| CO3 | 3 | | | 1 | | | 1 | 1 | 1 |

Industry Consultation Committee:

| Sr. No | Name | Designation | Institute/Organisation |
|--------|--------------------------|---|------------------------------------|
| 1 | Neelamkumar R. Sawant | State Head Technical Services for (Maharashtra and Goa) | JSW Cement Ltd. Mumbai Head Office |
| 2 | Mrs. Deepawali S. kaware | Lecturer in Mathematics | Government polytechnic Vikaramgad |
| 3 | Mr. A.S.Patil | Lecturer in Mathematics | Government polytechnic Mumbai |
| 4 | Mr.V.S.Patil | Lecturer in Mathematics | Government polytechnic Mumbai |

Coordinator,
Curriculum Development,
Department of Sci. & Humanities

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Department of Science & Humanities

I/C, Curriculum Development Cell

Principal

| | | | | | | | | | | |
|--|----------|-----------|----------|---------------------------------------|---------------|--------------|------------|-----------|-----------|------------|
| Programme : Diploma in Civil Engineering (Sandwich Pattern) | | | | | | | | | | |
| Course Code: CE19201 | | | | Course Title: BUILDING DRAWING | | | | | | |
| Compulsory / Optional: Compulsory | | | | | | | | | | |
| Teaching Scheme and Credits | | | | Examination Scheme | | | | | | |
| L | P | TU | Total | TH (2 Hrs 30 min) | TS1 (1 Hr) | TS2 (1Hr) | PR | OR | TW | Total |
| 1 | 4 | -- | 5 | -- | -- | -- | 50* | -- | 50 | 100 |

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination

Note: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill test are to be conducted. First skill test at mid term and second skill test at the end of the term

Rationale:

Drawing is a universal language of Engineers. It is the language through which Engineers can communicate with skilled, semiskilled and unskilled labours. The students have to use this subject to develop ability to read, understand and prepare drawings, to use it for different subjects during diploma course. Student will be taught to draw building structures and its various parts using conventions and symbols as per IS 962. Civil Engineer has to convert design parameters, process details into pictorial views. Therefore it is required to understand and prepare the drawings and interpret the drawings, so that, the work can be executed. Civil engineer should be competent to convert his ideas into the drawing. Drawings are essential for drafting specifications and tender documents. The knowledge of this course is useful for construction technology, estimating and costing, design of structure, surveying, and projects.

Course Outcomes: Student will

| | |
|-----|---|
| CO1 | Interpret and Draw the conventions, signs and symbols. |
| CO2 | Know and apply basic rules & bylaws governing the planning of building and calculate different areas such as plinth area, floor area, built-up area, carpet area. |
| CO3 | Know the different agencies involved in building construction works. |
| CO4 | Draw line plan, developed plan, elevation, section, site plan, location plan and foundation plan and measured drawing of residential building. |
| CO5 | Draw line plans of public building. |
| CO6 | Draw perspective drawing of object. |

Course Content Details:

| Unit No | Topics / Sub-topics |
|----------|--|
| 1 | Introduction : 1.1 Purpose of drawing, primary requirements of good drawing. Conventions as per IS 962:1989. |

| | |
|---|--|
| | <p>1.2 Symbols for different materials such as earthwork, brickwork, stonework, concrete, woodwork etc. used in civil engineering construction, graphical symbols for door and window, Abbreviations, symbols for sanitary and electrical installations.</p> <p>1.3 Types of lines- visible lines, centre line, hidden line, section line, dimension line, extension line, pointers, arrow head or dots, Appropriate lettering and numbering.</p> <p>1.4 Types of scale- Monumental, Intimate, criteria for Proper Selection of scale for various types of drawing</p> <p>Course Outcome: CO1 Teaching Hours : 2 hrs Marks: 04 (R- 4, U-0, A-0)</p> |
| 2 | <p>Principles of Planning :</p> <p>2.1 Principles of Planning of building : aspect, prospect, orientation, privacy, circulation, grouping, roominess, furniture requirements, sanitation, elegance, economy.</p> <p>2.2 Space requirement and norms for minimum dimension of different units in the residential and public buildings.</p> <p>2.3 Rules and building bylaws of plan sanctioning authority for residential and public building regarding plot area, built up area, super built up area, plinth area, carpet area, floor area, FAR (Floor Area Ratio) / FSI, RERA Carpet Area, Volume plot ratio.</p> <p>Course Outcome: CO2 Teaching Hours : 3 hrs Marks:08 (R- 4 , U-4 , A-0)</p> |
| 3 | <p>Agencies in Building Construction work :</p> <p>3.1 Functions of different agencies involved in construction work such as owner, Project Manager, Geotechnical Engineer, Architects, Structural Engineer, Contractor, Promoter, Quantity surveyor, Supervisor, HVAC services, Arbitrator, Safety Engineer, QA/QC team, Third party Audit.</p> <p>Course Outcome: CO3 Teaching Hours : 1 hrs Marks: 04 (R- 4, U-0, A-0)</p> |
| 4 | <p>Residential building :</p> <p>4.1 Line plans for residential building of minimum three rooms including w/c, bath and staircase as per principles of planning.</p> <p>4.2 Development of line plan, drawing of plan, elevation, sections, site plan, location plan, Block Plan, foundation plan, preparing schedule of openings, construction notes, Area statement. Global Co-ordinates, Bench mark</p> <p>4.3 Measured drawing, Submission drawing and working drawing and its significance.</p> <p>Course Outcome: CO4 Teaching Hours : 4 hrs Marks:14 (R- 0 , U- 10 , A-14)</p> |
| 5 | <p>Public Building :</p> <p>5.1 Data required for planning public building such as Library, community centre, post office, high school, primary health centre, market, hospital, bank, hostel, Bus Depot.</p> <p>5.2 Line plans for public building: school building, primary health centre, hospital building, bank, post office, hostel, canteen, Restaurant, Industrial building with monitor roof, Ware house.</p> <p>Course Outcome: CO5 Teaching Hours : 3 hrs Marks:10 (R- 0 , U- 2 , A-8)</p> |

| | |
|---|---|
| 6 | Perspective Drawing : |
| | 6.1 Definition, Types of perspective, terms used in perspective drawing, principles used in perspective drawing. 6.2 One Point and Two Point Perspective of small objects such as steps, monuments, pedestals, Concept of Bird's Eyeview. Course Outcome: CO6 Teaching Hours : 2 hrs Marks:10 (R- 0 , U- 4 , A-6) |

Suggested Specifications Table (Practical):

| Unit No | Topic Title | Distribution of Theory Marks | | | |
|--------------|---|------------------------------|-----------|-----------|-------------|
| | | R Level | U Level | A Level | Total Marks |
| 1 | Introduction | 04 | -- | -- | 04 |
| 2 | Principles of Planning | 04 | 04 | -- | 08 |
| 3 | Agencies in Building Construction work | 04 | -- | -- | 04 |
| 4 | Residential building | -- | 04 | 10 | 14 |
| 5 | Public Building | -- | 02 | 08 | 10 |
| 6 | Perspective Drawing | -- | 04 | 06 | 10 |
| Total | | 12 | 14 | 24 | 50 |

List of experiments:

| Sr. No. | Unit No | COs | Title of the Experiments | Hours |
|---------|---------|-----|---|-------|
| 1 | 1 | CO1 | Draw various types of lines, Legends-graphical symbols for materials, doors, windows, sanitary and water supply installations, electrical installations, abbreviations as per IS 962:1989 (on A3 paper) | 08 |
| 2 | 2 | CO2 | Assignment on Principles of planning | 04 |
| 3 | 3 | CO3 | Visit to Construction sites and write assignment on Agencies involved in Building Construction work | 04 |
| 4 | 4 | CO4 | Submission drawing, to the scale 1:100, of (G+1) Residential Building Framed Structure (2 BHK with attached toilet to 1 bedroom showing the position of European type WC pan) showing developed plan, elevation, section passing through staircase, site plan (1:200), foundation plan (1:50), area statement, schedule of openings, Construction Notes, Reference Note, Revision History and Cloud marks.(on A1 paper) | 12 |
| 5 | 4 | CO4 | Measured Drawing of small residential building or flat with minimum two rooms, kitchen, sanitary block consisting of plan, elevation, section, opening schedule, site plan, construction notes. .(on A1 paper) | 12 |
| 6 | 5 | CO5 | To draw line plans of at least five public buildings, Industrial | 10 |

| | | | | |
|--------------|---|-----|--|-----------|
| | | | buildings on A3 paper. (Visit to Public building to be arranged.) | |
| 7 | 5 | CO5 | Visit to Pre-Engineered Building. | 04 |
| 8 | 6 | CO6 | One point and Two Point Perspective Drawing of small objects - steps, monuments, pedestals (any one) scale 1:50. (on A1 paper) | 06 |
| Total | | | | 60 |

Note: All Experiments are compulsory.

References/ Books:

| Sr. No. | Title | Author, Publisher, Edition and Year Of publication | ISBN |
|---------|---------------------------------|--|-----------------|
| 1 | Building Drawing | Shah, Kale, Patki, Tata McGraw Hill, New Delhi | 0-07-460378-7 |
| 2 | Planning and Design of building | Y.S.Sane, Allies bookstall Poona – 4 & Engineering Book publishers, Company Pune - 16. | ASIN B0007JVH92 |
| 3 | Civil Engineering Drawing | Malik & Mayo, New Asian Publishers, Nai Sadak, New Delhi - 6 | 978-8173180026 |
| 4 | IS code 962:1989 | | |

E-References:

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2. [www. google.com](http://www.google.com)
3. www.youtube/
4. <http://www.nationallibrary.gov.in>

CO Vs PO and CO Vs PSO Mapping

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | 1 | -- | -- | 3 | 3 | 3 | 3 | 3 | 1 |
| CO2 | 3 | 3 | 3 | -- | 3 | 3 | 3 | 1 | 3 | 1 |
| CO3 | 2 | 1 | 2 | -- | 3 | 3 | 3 | 1 | 2 | -- |
| CO4 | 3 | 1 | 1 | -- | 3 | 3 | 3 | 3 | 3 | 1 |
| CO5 | 3 | 1 | 1 | -- | 2 | 3 | 3 | 3 | 2 | 1 |
| CO6 | 3 | 1 | -- | -- | 2 | 1 | 3 | 3 | 1 | -- |

Industry Consultation Committee:

| Sr. No | Name | Designation | Institute/Organisation |
|--------|--------------------|-----------------------|-------------------------|
| 1 | Mr. Shivkumar Aade | Deputy Chief Engineer | MHADA |
| 2 | Mr.Sharad Sonawane | Director | Om Ajay Constructions |
| 3 | Mr. K.V. Kelgandre | Sr.Lecturer | K.J.Somaiya Polytechnic |
| 4 | Ms. S.M. Male | Lecturer | G.P.Mumbai |

Coordinator,
Curriculum Development,
Department of Civil Engineering

Head of Department
Department of Civil Engineering

I/C, Curriculum Development Cell

Principal



| | | | | | | | | | | |
|--|-----------|-----------|-----------|----------------------------------|---------------|--------------|------------|----------|-----------|------------|
| Programme : Diploma in Civil Engineering (Sandwich Pattern) | | | | | | | | | | |
| Course Code: CE19202 | | | | Course Title: Surveying-I | | | | | | |
| Compulsory / Optional: Compulsory | | | | | | | | | | |
| Teaching Scheme and Credits | | | | Examination Scheme | | | | | | |
| L | P | TU | Total | TH (2 Hrs 30 min) | TS1 (1 Hr) | TS2 (1Hr) | PR | OR | TW | Total |
| 03 | 04 | -- | 07 | 60 | 20 | 20 | 50* | - | 50 | 200 |

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination
 Note: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill test are to be conducted. First skill test at mid term and second skill test at the end of the term

Rationale:

Development and planning process for any civil engineering project needs survey of that area to be carried out and various types of survey maps are to be prepared. These maps and drawing are used for taking various decisions regarding the planning, designing, estimation, execution and construction process. The diploma pass outs/technicians should therefore know the various methods and instruments required for surveying. They should also have the skill and information to handle and operate the needed survey instruments. This course is therefore one of the core courses required for Civil Engineers.

Course Outcomes: Student should be able to

| | |
|-----|---|
| CO1 | Select the type of survey required for given situation. |
| CO2 | Compute area of open field using chain, tape and cross staff. |
| CO3 | Conduct traversing in the field using chain and compass. |
| CO4 | Use plane Table to prepare plans. |
| CO5 | Use leveling instruments to determine reduced level of ground points. |
| CO6 | Draw/interpret contour maps of an area collecting field data. |

Course Content Details:

| Unit No | Topics / Sub-topics |
|----------|--|
| 1 | Introduction. 1.1 Definition of Surveying, Object of Surveying, Purpose and Uses of Surveying 1.2 Classification of surveying- Primary and Secondary classification 1.3 Principles of Survey Course Outcome: CO1 Teaching Hours :3 hrs Marks: 04 (R- 2, U-2, A- 0) |
| 2 | Chain And Cross Staff Survey 2.1 Principle of Chain Surveying, Well Conditioned and Ill-Conditioned Triangles 2.2 Instruments used in chain survey - Metric Chain, Tapes, Arrow, Ranging rod, Line ranger, Offset rod, Open cross staff, optical square Principle of optical square 2.3 Selection of survey station, Subsidiary station, Tie station, Base line, Check line, Tie |

| | |
|---|--|
| | <p>line, Offset- Perpendicular and Oblique</p> <p>2.4 Location Sketch of survey station and running measurements of building</p> <p>2.5 Conventional symbols, recording of measurements in a field book.</p> <p>2.6 Ranging: Direct Ranging and Indirect Ranging</p> <p>Course Outcome: CO2 Teaching Hours :8 hrs Marks:10 (R-2 , U- 4 , A- 4)</p> |
| 3 | <p>Chain and Compass traverse Survey</p> <p>3.1 Principle of compass survey, Traversing- closed traverse, open traverse</p> <p>3.2 Technical Terms: True, Magnetic and Arbitrary Meridians and Bearings, Fore Bearing and Back Bearing, Whole Circle Bearing System and Reduced Bearing System, Examples on conversion of WCB in to RB and vice versa, Calculation of internal and external angles from bearings at a station. Dip of Magnetic needle, Magnetic Declination.</p> <p>3.3 Components of Prismatic Compass and their Functions, Method of using Prismatic Compass- temporary adjustments and observing bearings</p> <p>3.4 Local attraction, Methods of correction of observed bearings-Correction at station and correction to included angles,</p> <p>3.5 Methods of plotting a traverse and closing error, Graphical adjustment of closing error.</p> <p>Course Outcome:CO3 Teaching Hours :12 hrs Marks:14 (R- 2, U- 6 , A- 6)</p> |
| 4 | <p>Plane Table Survey</p> <p>4.1 Principle of plane table survey.</p> <p>4.2 Accessories of plane table and their use, Telescopic alidade.</p> <p>4.3 Setting of plane table; Orientation of plane table - Back sighting and Magnetic meridian method.</p> <p>4.4 Methods of plane table surveys- Radiation, Intersection and Traversing. Merits and demerits of plane table survey.</p> <p>Course Outcome:CO4 Teaching Hours :5 hrs Marks:08 (R-4 , U-4, A- --)</p> |
| 5 | <p>Levelling</p> <p>5.1 Definitions: Levelling, Level surface, Level line, Horizontal plane, Horizontal line, Vertical line and vertical plane, Datum surface, Reduced Level, Line of collimation, Axis of telescope, Axis of bubble tube, Bench Marks- GTS, Permanent, Arbitrary and Temporary, Back sight, Fore sight, intermediate sight, Change point, Height of instruments .</p> <p>5.2 Types of levels: Dumpy, Tilting, Auto level, Digital level, Components of Dumpy Level and its fundamental axes. Temporary adjustments of Dumpy and Auto Level.</p> <p>5.3 Types of Levelling: Simple, Differential, Fly, Profile and Reciprocal Levelling</p> <p>5.4 Types of Levelling Staffs: Self-reading staff and Target staff.</p> <p>5.5 Reduction of level by Line of collimation method and Rise/ Fall Method</p> <p>5.6 Numerical examples to find the R. L. by H.I.Method and Rise and Fall Method with necessary checks</p> <p>5.7 Errors in Levelling</p> <p>Course Outcome:CO5 Teaching Hours :12 hrs Marks:16 (R- 4 , U- 4 , A-8)</p> |
| 6 | <p>Contouring</p> <p>6.1 Definitions: Contour, contour interval, horizontal equivalent.</p> <p>6.2 Uses of contour maps, Characteristics of contours, methods of Contouring: Direct and</p> |

| | |
|--|--|
| | indirect 6.3 Interpolation of contours by Approximate method and Arithmetic method. Course Outcome:CO6 Teaching Hours :5 hrs Marks:08 (R- 2 , U- 4 , A- 2) |
|--|--|

Suggested Specifications Table (Theory):

| Unit No | Topic Title | Distribution of Theory Marks | | | |
|--------------|-----------------------------------|------------------------------|-----------|-----------|-------------|
| | | R Level | U Level | A Level | Total Marks |
| 1 | Introduction | 2 | 2 | -- | 04 |
| 2 | Chain And Cross Staff Survey | 2 | 4 | 4 | 10 |
| 3 | Chain and Compass traverse Survey | 2 | 6 | 6 | 14 |
| 4 | Plane Table Survey | 4 | 4 | -- | 08 |
| 5 | Levelling | 4 | 4 | 8 | 16 |
| 6 | Contouring | 2 | 4 | 2 | 08 |
| Total | | 16 | 24 | 20 | 60 |

List of experiments:

| Sr. No. | Unit No | COs | Title of the Experiments | Hours |
|---------|---------|-----|--|--------------------|
| 1 | 1 | CO1 | Select the type of survey to measure distance between two points in the field. | 2 |
| 2 | 2 | CO2 | Determine area of open field using chain & cross staff survey | 2 |
| 3 | 3 | CO3 | Measure Fore Bearing and Back Bearing of survey lines of open traverse using Prismatic Compass. | 2 |
| 4 | 4 | CO4 | Use Plane Table Survey to prepare plans of a 5 sided closed traverse by Radiation Method. | 2 |
| 5 | 5 | CO5 | Undertake simple leveling using dumpy level/ Auto level and leveling staff and find reduced levels of ground points and bottom of chajja/slab. | 2 |
| 6 | 6 | CO6 | Conduct block contouring for the area of 40m x 40m and grid 10m x 10m to draw its contour plan. | 4 |
| 7 | 3 | CO3 | Measure Fore Bearing and back bearing of a closed traverse of 5or 6 sides and correct the bearings and included angles for the local attraction | 4 |
| 8 | 4 | CO4 | Use plane table survey to prepare plans locate details by Traversing Method | 2 |
| 9 | 5 | CO5 | Undertake differential leveling and determine Reduced Levels by Height of Instrument method and Rise and Fall method using dumpy /auto level and leveling staff. | 4 |
| 10 | 3 | CO3 | Undertake Survey Project with chain and compass for closed traverse for minimum 5 sides (Compulsory) | 1 Full Day (8 hrs) |

| | | | | |
|--------------|---|-----|--|--------------------|
| 11 | 3 | CO3 | Plot the traverse on A1 size imperial drawing sheet for data collected in Survey Project mentioned at practical no.10 | 4 |
| 12 | 5 | CO5 | Undertake Survey Project with Leveling instrument for Profile leveling and cross-sectioning for a road length of 500 m with cross-section at 30 m interval. (Compulsory) . | 1 Full Day (8 hrs) |
| 13 | 5 | CO5 | Plot the L-section with minimum 3 cross-sections on A1 size imperial sheet for data collected in Survey Project mentioned at practical no.12 | 4 |
| 14 | 6 | CO6 | Undertake Survey Project for plotting contour map using block contouring method for a block of 150m x 150m with grid of 10m x 10m. (Compulsory) | 1 Full Day (8 hrs) |
| 15 | 6 | CO6 | Plot the contours on A1 size imperial drawing sheet for data collected in Survey Project mentioned at practical no.14 | 4 |
| Total | | | | 60 |

Note: All experiments are compulsory.

References/ Books:

| Sr. No. | Title | Author, Publisher, Edition and Year Of publication | ISBN |
|---------|----------------------------------|---|------------------------|
| 1 | Surveying and Levelling | N. N. Basak Tata McGraw Hill Education Private Ltd. New Delhi , 33 rd reprint2010 | ISBN 93-3290-153-8 |
| 2 | Surveying and Levelling volume I | Kanetkar, T. P.; Kulkarni, S. V. Pune Vidyarthi Gruh Prakashan | ISBN 978-81-858-2511-3 |
| 3 | Survey I | Duggal, S. K. McGraw Hill Education Private Ltd. New Delhi, | ISBN 978-00-701-5137-6 |
| 4 | Surveying I | Punmia B.C., Jain Ashok Kumar; Jain Arun Kumar Laxmi Publications., New Delhi. | ISBN: 8-17-008853-4 |

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- <http://www.mtu.edu/technology/undergrad>
- <http://www.wb.psu.edu/Academics/Degrees>
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- https://youtu.be/e_yabRh5GY
- <https://youtu.be/Z4yYHHX8N0>
- <https://youtu.be/2hL4wWUUSFc>
- <https://youtu.be/j8poe2vvD2Q>
- https://youtu.be/chhuq_t40rY
- <https://youtu.be/L54T4uvpMTg>
- <https://youtu.be/NdNEy-HBsoA>
- <https://youtu.be/7dN3Iku0Bns>
- <http://www.nationallibrary.gov.in>

CO Vs PO and CO Vs PSO Mapping

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | 3 | 3 | 1 | 1 | 3 | 2 | 2 | 2 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 3 |
| CO3 | 3 | 3 | 2 | 3 | 2 | 3 | 2 | 2 | 2 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 2 | 2 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 2 | 2 | 3 |
| CO6 | 3 | 2 | 3 | 3 | 2 | 3 | 2 | 2 | 2 | 2 |

Industry Consultation Committee:

| Sr. No | Name | Designation | Institute/Organisation |
|--------|---------------------|-----------------------------|--------------------------|
| 1 | Mr. Rohan Deokar | Deputy Engineer | MMRDA |
| 2 | Mr. Sanjay Kulkarni | Surveyor and Consultant | SRKulkarni Pvt.Firm |
| 3 | Mr. K.V. Kelgandre | Sr. Lecturer in Civil Engg. | K.J. Somaiya Polytechnic |
| 4 | Mr. D. K. Fad | Sr. Lecturer in Civil Engg. | Govt. Polytechnic Mumbai |

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Department of Civil Engg.

Head of Department
Department of Civil Engg.

I/C, Curriculum Development Cell

Principal

| | | | | | | | | | | |
|---|----|----|-------|--|--------------|--------------|----|----|----|-------|
| Programme : Diploma in Civil Engineering & Mechanical Engineering (Sandwich Pattern) | | | | | | | | | | |
| Course Code:AM19201 | | | | Course Title: Engineering Mechanics | | | | | | |
| Compulsory / Optional: Compulsory | | | | | | | | | | |
| Teaching Scheme and Credits | | | | Examination Scheme | | | | | | |
| L | P | TU | Total | TH (2Hrs 30min) | TS1 (1Hr) | TS2 (1Hr) | PR | OR | TW | Total |
| 03 | 02 | -- | 05 | 60 | 20 | 20 | 25 | -- | 25 | 150 |

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination
 Note: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill test are to be conducted. First skill test at mid term and second skill test at the end of the term

Rationale :

In day to day life we come across different structures, at the time of design of structures, analysis plays an important role. Perfect analysis is possible only when one knows the types and effect of forces acting on the structure. This course provides knowledge about the different types of forces/loads, their effects while acting in different conditions/systems. The course also provides the knowledge about basic concepts of laws of engineering, their application to different engineering problem. The principles of mechanics are fundamental to Mechanical and Civil Engineering and related programs such as Mechatronic Engineering, Naval Architecture, Aerospace, Manufacturing as well as Biomedical engineering. This course is needed as a prerequisite for the courses at higher level such as Mechanics of Structures, Strength of Materials, Design of Structures, Theory of Machines, etc.

Course Outcomes: Student should be able to

| | |
|-----|---|
| CO1 | Apply principles of simple machines. |
| CO2 | Determine unknown forces of various force system. |
| CO3 | Apply the principles of equilibrium to engineering problems. |
| CO4 | Apply the principle of friction in various conditions. |
| CO5 | Calculate centroid and center of gravity for various geometrical figures. |
| CO6 | Apply the principles of dynamics. |

Course Content Details:

| Unit No | Topics / Sub-topics |
|----------|---|
| 1 | Simple Machines: 1.1 Definitions 1.2 Simple machine, compound machine , load , effort , mechanical advantage , velocity ratio , input of a machine ,output of a machine efficiency of a machine , ideal machine, |

| | |
|---|--|
| | <p>ideal effort and ideal load, load lost in friction, effort lost in friction</p> <p>1.3 Analysis: Law of machine, maximum mechanical advantage and maximum efficiency of a machine, reversibility of a machine, condition for reversibility of a machine, self-locking machine, simple numerical problems.</p> <p>1.4 Velocity Ratio for simple machines :</p> <p>Simple axle and wheel, differential axle and wheel, Weston's differential pulley block, single purchase crab, double purchase crab, worm and worm wheel, geared pulley block, screw jack, calculation of mechanical advantage, efficiency, identification of type such as Reversible or not etc.</p> <p>Course Outcome: CO1 Teaching Hours : 6 hrs Marks: 12 (R- 2, U-4, A-6)</p> |
| 2 | <p>Force systems:</p> <p>2.1 Fundamentals and Force systems: Definitions engineering mechanics, statics, Dynamics. Classification of force system according to plane coplanar and non-coplanar, sub classification of coplanar force system- collinear, concurrent, non-concurrent, parallel, Definition of a force, representation of a force by vector and by Bow's notation method. Characteristics of a force, effects of a force, principle of transmissibility.</p> <p>2.2 Resolution of a force and Moment of a force: Definition, Method of resolution, along mutually perpendicular direction and along two given direction. Definition of moment, classification of moments, sign convention, law of moments, Varignon's theorem of moment and its use, definition of couple, properties of couple</p> <p>2.3 Composition & resolution of forces : Definition of Resultant force, methods of composition of forces, Law of parallelogram of forces, Algebraic method for determination of resultant for various force system.</p> <p>2.4 Graphical method: Space diagram, vector diagram, polar diagram, and funicular polygon. Resultant of concurrent and parallel force system only.</p> <p>Course Outcome: CO2 Teaching Hours: 10 hrs Marks: 12 (R -4, U- 4, A- 4)</p> |
| 3 | <p>Equilibrium:</p> <p>3.1 Equilibrant and Lami's Theorem: Definition of equilibrant, relation between resultant and equilibrant, equilibrant of concurrent and non-concurrent force system. Analytical, free body and free body diagram. Statement and explanation of Lami's theorem and Application.</p> <p>3.2 Beams: Definition, Types of beams (cantilever, simply supported, overhanging, fixed, continuous), Types of end supports (simple support, hinged, roller), classification of loads, point load, inclined point load, uniformly distributed load. Analytical method to determine reactions of simply supported, cantilever and over hanging beam subjected to point loads and UDL and graphical method to determine reactions for beams subjected to vertical point loads & UDL only</p> <p>Course Outcome: CO3 Teaching Hours:8 hrs Marks: 10 (R- 2, U- 4, A- 4)</p> |

| | |
|---|--|
| 4 | <p>Friction: 4.1 Definition: Friction, Types of friction, limiting frictional force, coefficient of friction, angle of friction, angle of repose, relation between angle of friction, angle of repose and coefficient of friction. Cone of friction, advantages and disadvantages of friction. 4.2 Equilibrium of body on Horizontal and inclined plane: Equilibrium of body on horizontal plane subjected to horizontal and inclined force. Equilibrium of body on inclined plane subjected to forces applied parallel to the plane only. Concept of ladder friction. 4.3 Introduction (only) - Dynamic friction Course Outcome: CO4 Teaching Hours: 8 hrs Marks: 10 (R- 2 ,U- 4, A- 4)</p> |
| 5 | <p>Centroid and Centre Of Gravity: 5.1 Centroid: Definition of centroid. Moment of an area about an axis. Centroid of basic geometrical figures such as square, rectangle, triangle, circle, semicircle and quarter circle. Centroid of composite figure with not more than three geometrical figures. 5.2 Center of gravity: Definition, center of gravity of simple solids such as cylinder, sphere, hemisphere, cone, cube, and rectangular block. Centre of gravity of composite solids with not more than Two simple solids. (Hollow solids are expected.) Course Outcome: CO5 Teaching Hours: 8 hrs Marks: 10 (R- 2, U- 2, A- 6)</p> |
| 6 | <p>Dynamics : 6.1 Kinetics : Definition of kinetics, Newton's laws of motion and its applications. 6.2 Kinematics : Definition of kinematics, Basic concepts of motion, rectilinear motion, displacement, velocity, speed, acceleration. 6.3 Angular motion : Introduction, definition of angular velocity, angular acceleration, angular displacement, (Simple Numericals) 6.4 Motion under gravity. (No numerical on this subtopic) Course Outcome: CO6 Teaching Hours: 5 hrs Marks: 6 (R-2, U- 0, A- 4)</p> |

Suggested Specifications Table (Theory):

| Unit No | Topic Title | Distribution of Theory Marks | | | |
|--------------|--------------------------------|------------------------------|-----------|-----------|-------------|
| | | R Level | U Level | A Level | Total Marks |
| 1 | Simple Machines | 2 | 4 | 6 | 12 |
| 2 | Force Systems | 4 | 4 | 4 | 12 |
| 3 | Equilibrium | 2 | 4 | 4 | 10 |
| 4 | Friction | 2 | 4 | 4 | 10 |
| 5 | Centroid and Centre Of Gravity | 2 | 2 | 6 | 10 |
| 6 | Dynamics | 2 | -- | 4 | 6 |
| Total | | 14 | 18 | 28 | 60 |

List of experiments:

| Sr. No. | Unit No | COs | Title of the Experiments | Hours |
|---------|---------|--------------|---|-----------|
| 1 | 01 | CO1 | To determine MA, VR, Efficiency, Ideal Effort, Effort lost in friction for Differential axle & wheel and for Simple screw jack. | 02 |
| 2 | 01 | CO1 | To determine MA, VR, Efficiency, Ideal Effort, Effort lost in friction for single purchase crab and for double purchase crab. | 02 |
| 3 | 02 | CO2 | Verify law of polygon of forces | 02 |
| 4 | 02 | CO2 | Graphically determine resultant of concurrent and non-concurrent force system. | 04 |
| 5 | 02 | CO2 | Graphically determine resultant of parallel force system. | 02 |
| 6 | 02 | CO2 | To verify law of moments. | 02 |
| 7 | 03 | CO3 | To verify of Lami's theorem | 02 |
| 8 | 03 | CO3 | To verify the Equilibrium of parallel forces – simply supported beam reactions | 02 |
| 9 | 04 | CO4 | To determine coefficient of friction for motion on horizontal plane. | 04 |
| 10 | 05 | CO5 | Determination of Centroid of basic geometrical figures such as square, rectangle, triangle, circle & Centre of gravity of simple solids such as cylinder, sphere, cone, cube. | 04 |
| 11 | 06 | CO6 | Numericals on Angular motion | 04 |
| | | Total | | 30 |

Note: All experiments are compulsory**References/ Books:**

| Sr. No. | Title | Author, Publisher, Edition and Year Of publication | ISBN |
|---------|-----------------------|--|-------------------|
| 1 | Engineering Mechanics | R.S.Khurmi, S. Chand & Company Ltd. | 10-9352833961 |
| 2 | Engineering Mechanics | Shames and Rao, Pearson Education. | 13-978-0133569087 |
| 3 | Engineering Mechanics | R.C.Hibbeler, Pearson Education. | 13-978-0133073577 |
| 4 | Applied Mechanics | S. Ramamrutham, Dhanpat Rai & Sones, Delhi. | 10-935216427X |

E-References:

1. support@swayam.gov.in
2. arunasis@iitg.ernet.in
3. www.google.com
4. www.youtube.com
5. <http://www.nationallibrary.gov.in>

CO Vs PO and CO Vs PSO Mapping (CIVIL ENGINEERING)

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | 3 | 3 | 2 | 1 | 2 | 2 | 3 | 2 | -- |
| CO2 | 3 | 3 | 3 | 2 | 1 | 1 | 2 | 3 | -- | -- |
| CO3 | 3 | 3 | 3 | 2 | 1 | 1 | 2 | 3 | -- | -- |
| CO4 | 3 | 3 | 3 | 2 | 1 | 1 | 2 | 3 | -- | -- |
| CO5 | 3 | 3 | 3 | 2 | 1 | 1 | 2 | 3 | -- | -- |
| CO6 | 3 | 3 | 3 | 2 | 1 | 1 | 2 | 3 | -- | -- |

CO Vs PO and CO Vs PSO Mapping (MECHANICAL ENGINEERING)

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| CO1 | 3 | 3 | 3 | 2 | 1 | 2 | 2 | 3 | 2 |
| CO2 | 3 | 3 | 3 | 2 | 1 | 1 | 2 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 2 | 1 | 1 | 2 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 2 | 1 | 1 | 2 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 2 | 1 | 1 | 2 | 3 | 3 |
| CO6 | 3 | 3 | 3 | 2 | 1 | 1 | 2 | 3 | 3 |

Industry Consultation Committee:

| Sr. No | Name | Designation | Institute/Organisation |
|--------|----------------------|------------------------------------|------------------------|
| 1 | Shri Shivkumar Aade | Deputy Chief Engineer | Mhada |
| 2 | Shri Sharad Sonawane | Director | Om Ajay Constructions |
| 3 | Smt Yaxika Soni | Sr.Lecturer in Civil Engineering | S.B.M.Polytechnic |
| 4 | Smt Sanjana Male | Lecturer in Civil Engineering | G.P.Mumbai |
| 5 | Smt Ashwini Hagawane | Lecturer in Mechanical Engineering | G.P.Mumbai |

Coordinator,
Curriculum Development,
Department of Civil Engineering

Head of Department
Department of Civil Engineering

I/C, Curriculum Development Cell

Principal

CE 19203 Libre Office Draw

1. Promo of LibreOffice Suite (Foss: *LibreOffice Suite Draw – English*)

Outline: LibreOffice promo - Features of LibreOffice - Uses of LibreOffice - LibreOffice formats - LibreOffice tutorials in Spoken Tutorial - Applications of LibreOffice - LibreOffi.

2. Introduction

Outline: Introduction to LibreOffice Draw LibreOffice Draw Create and save an Impress Draw file LibreOffice Draw Workspace Graphics - Bitmap or raster image - Vector graphics.

3. Create simple drawings

Outline: Create simple drawings Basic shapes (lines, arrows, rectangles and squares, circles) (How to improve upon a water cycle diagram by adding shapes and so on.) Geometric shapes (basic..

4. Basics of working with objects

Outline: Basics of working with objects Cut, copy, paste objects Resize objects dynamically using handles Object Arrangement Adding a new page to a file Group and ungroup objects Edit.

5. Fill objects with color

Outline: Fill objects with color, gradients, hatching and bitmaps Making outlines invisible Adding a shadow to the objects Creating new colors How to import a bitmap into Draw. Set...

6. Insert text in drawings

Outline: Insert text in drawings Insert text directly inside an object Changing the text color Working with text boxes and formatting text in objects Making the line wider. Set prefere..

7. Common editing and print functions

Outline: Common editing and print functions Set the draw page for page size and margins Paper size, page count, page numbers, date, and time Undo and redo actions Rename a page Print a..

8. Polygons and Curves

Outline: Curves and Polygons Various types of Polygons Draw directions using arrows Flow charts Insert tables and graphs Page Margins and Orientation Font Type and Size modification ..

9. Edit Curves and Polygons

Outline: Use the Edit Points toolbar Insert new points Move existing points Using control lines to change the shape of the objects Group the objects together

10. Flow Charts Connectors Glue Points

Outline: Draw Flowcharts To Draw Beizer curve Insert text in flow charts Various text insertion options -Resizing shape to fit text width -Word wrap text in shape What is Flowcha..

11. Working with Objects

Outline: What are Grids? What are Guides? What are Snap Lines? Position objects with grids, guides and snap lines Resize objects exactly and duplicate objects Distribute objects ..

12. Import and Export Images

Outline: Import images into a Draw page *as a link * as an embedded image Edit Links Remove links Automatic embedding of images Delete the picture Export the whole Draw file or one ..

13. Basics of Layers Password Encryption PDF

Outline: Basics-of-Layers-Password-Encryption-PDF Layers -Layout -Controls -Dimensions How to protect a Draw file Using password encryption Export it as..

14. Working with 3D objects

Outline: Enable the grids and the guide lines How to create 3D objects Extrusion(Creating 3D objects, using 2D objects) 3D Toolbar 3D Rotation Object Typing text in 3D objects using Te..

15. Set Draw preferences

Outline: Learn how to set the following preferences: **Properties **Create versions **View in color/grayscale/black-and-white Setting Title, Subject, Keywords and Comments of a file..



Government Polytechnic, Mumbai

Department of Civil Engineering

**P-19 Curriculum
(Sandwich Pattern)**

**Semester-III
(Course Contents)**

GOVERNMENT POLYTECHNIC MUMBAI
 (Academically Autonomously Institute, Government of Maharashtra)
Teaching and Examination Scheme (P19)
With effect from AY 2019-20

Programme: Diploma in Civil Engineering (Sandwich Pattern)

Term / Semester - III

| Course Code | Course Title | Teaching Hours/Contact Hours | | | | Credits | Examination Scheme (Marks) | | | | | | |
|--------------------------------|---------------------------------|------------------------------|----------------|----|-------|----------------|----------------------------|-----|-----|-----|-----|-----|-------|
| | | L | P | TU | Total | | Theory | | | PR | OR | TW | Total |
| | | | | | | | TH | TS1 | TS2 | | | | |
| CE19301 | Construction Technology | 3 | 2 | -- | 5 | 5 | 60 | 20 | 20 | -- | 25* | -- | 125 |
| CE19302 | Transportation Engineering | 3 | -- | -- | 3 | 3 | 60 | 20 | 20 | -- | -- | -- | 100 |
| CE19303 | Surveying II | 2 | 4 | -- | 6 | 6 | 60 | 20 | 20 | 50* | -- | 25 | 175 |
| AM19301 | Mechanics of Structures | 3 | 2 | -- | 5 | 5 | 60 | 20 | 20 | -- | -- | 25 | 125 |
| AM19302 | Soil Mechanics | 3 | 2 | -- | 5 | 5 | 60 | 20 | 20 | -- | -- | 25 | 125 |
| HU19102 | Environmental Studies | -- | 2 | -- | 2 | 2 | -- | -- | -- | -- | 25 | 25 | 50 |
| CE19304 | QGIS (16) (Spoken Tutorials) | -- | 4 [#] | -- | 4 | 4 [#] | -- | -- | -- | -- | -- | -- | -- |
| | Total | 14 | 16 | -- | 30 | 30 | 300 | 100 | 100 | 50 | 50 | 100 | 700 |
| Student Centered Activity(SCA) | | | | | 05 | | | | | | | | |
| Total Contact Hours | | | | | 35 | | | | | | | | |

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment)

* Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination

Note: Duration of Examination--TS1&TS2 -1 hour , TH- 2 hours 30 minutes, PR/OR – 3 hours per batch , SCA- Library - 1 hour, Sports- 2 hours, Creative Activity-2 hours
 Self, on- line learning Mode through MOOCs /Spoken Tutorials / NPTEL / SWAYAM / FOSSEE etc.

Department Coordinator,
 Curriculum Development,
 Dept. of Civil Engineering

Head of Department
 Dept. of Civil Engineering

In-Charge
 Curriculum Development Cell

Principal

| | | | | | | | | | | |
|--|-----------|-----------|-----------|--|---------------|--------------|-----------|------------|-----------|------------|
| Programme : Diploma in Civil Engineering (Sandwich Pattern) | | | | | | | | | | |
| Course Code: CE19301 | | | | Course Title: Construction Technology | | | | | | |
| Compulsory / Optional: Compulsory | | | | | | | | | | |
| Teaching Scheme and Credits | | | | Examination Scheme | | | | | | |
| L | P | TU | Total | TH (2 Hrs 30 min) | TS1 (1 Hr) | TS2 (1Hr) | PR | OR | TW | Total |
| 03 | 02 | -- | 05 | 60 | 20 | 20 | -- | 25* | -- | 125 |

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination
 Note: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill test are to be conducted. First skill test at mid term and second skill test at the end of the term.

Rationale:

Building construction is a core course in civil engineering. This course is intended for gaining useful knowledge with respect to facts, concepts, principles and procedures related to building construction system so that student can effectively plan, execute quality building construction work.

The course helps to learn building materials required for construction. It provides necessary knowledge about properties, uses of building materials.

Course Outcomes: Student should be able to

| | |
|-----|--|
| CO1 | Identify components of building structures. |
| CO2 | Propose suitable type of foundation for building structures. |
| CO3 | Select suitable type of masonry for building structures. |
| CO4 | Propose relevant means of communications for different types of buildings. |
| CO5 | Select relevant material for finishing works. |
| CO6 | Select appropriate formwork. |

Course Content Details:

| Unit No | Topics / Sub-topics |
|---------|---|
| 1 | Introduction : 1.1 Classification of Buildings as per National Building Code Group A to I, As per Types of Constructions- Load Bearing Structure, Framed Structure, Composite Structure. 1.2 Building Components - Functions of Building Components, Substructure – Foundation, Plinth. 1.3 Superstructure – Walls, Partition wall, Cavity wall, Sill, Lintel, Doors and Windows, Floor, Mezzanine floor, Roof, Columns, Beams, Parapet. Course Outcome: CO1 , Teaching Hours : 4 hrs Marks: 04 (R- 2, U-2, A- 0) |
| 2 | Construction of Substructure : 2.1 Job Layout: Site Clearance, Layout for Load Bearing Structure and Framed Structure by Center Line and Face Line Method, Precautions. 2.2 Earthwork: Excavation for Foundation, Timbering and Strutting, Earthwork for embankment, Material for plinth Filling, Tools and plants used for earthwork. 2.3 Foundation: Functions of foundation, Types of foundation – Shallow Foundation, |

| | |
|---|--|
| | <p>Stepped Footing, Wall Footing, Column Footing, Isolated and Combined Column Footing, Raft Foundation, Grillage Foundation. Deep Foundation - Pile Foundation, Well foundation and Caissons, Pumping Methods of Dewatering, Deep wells, Well points, Cofferdams (Introduction only)</p> <p>Course Outcome: CO2 Teaching Hours : 8 hrs Marks:12 (R-4 , U- 4 , A- 4)</p> |
| 3 | <p>Construction of Superstructure :</p> <p>3.1 Stone Masonry: Terms used in stone masonry- facing, backing, hearting, Through stone, corner stone, cornice. Types of stone masonry: Rubble masonry, Ashlar Masonry and their types. Joints in stone masonry and their purpose. Selection of Stone Masonry, Precautions to be taken in Stone Masonry Construction</p> <p>3.2 Brick masonry: Terms used in brick masonry- header, stretcher, closer, quoins, course, face, back, hearting, bat bond, joints, lap, frog line, level and plumb. Bonds in brick masonry- header bond, stretcher bond, English bond and Flemish bond. Requirements of good brick masonry. Junctions in brick masonry and their purpose and procedure.</p> <p>3.3 Precautions to be observed in Brick Masonry Construction.</p> <p>3.4 Comparison between stone and Brick Masonry. Tools and plants required for construction of stone and brick masonry. Hollow concrete block masonry and composite masonry.</p> <p>Course Outcome:CO3 Teaching Hours :12 hrs Marks:14 (R- 4 , U- 6 , A- 4)</p> |
| 4 | <p>Building Communication and Ventilation :</p> <p>4.1 Horizontal Communication: Doors –Components of Doors, Full Panelled Doors, Partly Panelled and Glazed Doors, Flush Doors, Collapsible Doors, Rolling Shutters, Revolving Doors, Glazed Doors. Sizes of Door recommended by BIS.</p> <p>4.2 Windows: Component of windows, Types of Windows - Full Panelled, Partly Panelled and Glazed, wooden, Steel, Aluminium windows, Sliding Windows, Louvered Window, Bay window, Corner window, clear-storey window, Gable and Dormer window, Skylight. Sizes of Windows recommended by BIS. Ventilators.</p> <p>4.3 Fixtures and fastenings for doors and windows- Material used and functions of Window Sill and Lintels, Shed / Chajja.</p> <p>4.4 Vertical Communication: Means of Vertical Communication- Stair Case, Ramps, Lift, Elevators and Escalators. Terms used in staircase-steps, tread, riser, nosing, soffit, waist slab, baluster, balustrade, scotia, hand rails, newel post, landing, headroom, winder. Types of staircase (On the basis of shape): Straight, dog-legged, open well, Spiral, quarter turn, bifurcated, Three quarter turn and Half turn, (On the basis of Material): Stone, Brick, R.C.C., wooden and Metal.</p> <p>Course Outcome:CO4 Teaching Hours :12 hrs Marks:12 (R- 4 , U- 4 , A-4)</p> |
| 5 | <p>Building Finishes and Wall Finishes :</p> <p>5.1 Floors : Types of Floor Finishes and its suitability- Kota, Marble, Granite, Ceramic Tiles, Vitrified, Chequered Tiles, Paver Blocks, Concrete Floors, wooden Flooring, Skirting and Dado. Process of Laying and Construction, Finishing and Polishing of Floors.</p> <p>5.2 Roofs : Roofing Materials- RCC, Mangalore Tiles, AC Sheets, G.I. sheets, Corrugated G.I. Sheets, Plastic and Fibre Sheets. Types of Roof: Flat roof, Pitched Roof-King Post truss, Queen Post Truss, terms used in roofs.</p> <p>5.3.Plastering : Necessity of Plastering, Procedure of Plastering, Single Coat Plaster, Double Coat Plaster, Rough finish, Neeru Finishing and Plaster of Paris (POP). Special 5.4 Plasters- Stucco plaster, sponge finish, pebble finish. Plaster Board and Wall Claddings. Precautions to be taken in plastering, defects in plastering.</p> |

| | |
|---|--|
| | 5.4 Pointing: Necessity, Types of pointing and procedure of Pointing. Painting –Necessity, Surface Preparation for painting, Methods of Application. Course Outcome:CO5 Teaching Hours : 6 hrs Marks: 12 (R- 4, U- 4, A- 4) |
| 6 | Scaffolding and Shoring: 6.1 Scaffolding: Purpose, Types of Scaffolding, Process of Erection and Dismantling. 6.2 Shoring: Purpose and Types of Shoring, Underpinning. 6.3 Formwork: Definition of Formwork, Requirements of Formwork, Materials used in Formwork, Types of Formwork, Removal of formwork. Scaffolding and Shoring Course Outcome: CO6 Teaching Hours : 3 hrs Marks: 06 (R- 2 , U- 2, A- 2) |

Suggested Specifications Table (Theory):

| Unit No | Topic Title | Distribution of Theory Marks | | | |
|--------------|--|------------------------------|-----------|-----------|-------------|
| | | R Level | U Level | A Level | Total Marks |
| 1 | Introduction | 2 | 2 | -- | 04 |
| 2 | Construction of Substructure | 4 | 4 | 4 | 12 |
| 3 | Construction of Superstructure | 4 | 6 | 4 | 14 |
| 4 | Building Communication and Ventilation | 4 | 4 | 4 | 12 |
| 5 | Building Finishes Floors and Roofs | 4 | 4 | 4 | 12 |
| 6 | Scaffolding and Shoring | 2 | 4 | -- | 06 |
| Total | | 22 | 24 | 18 | 60 |

List of experiments:

| /Sr. No. | Unit No | COs | Title of the Experiments | Hours |
|----------|---------|----------------|--|-------|
| 1 | 2 | CO1 | To visit the institute building to study different components of building, types of Structures, etc. | 2 |
| 2 | 2 | CO2 | Observing the models, specimen of different types of foundations. | 2 |
| 3 | 2 | CO2 | To set out Foundation Plan on ground for load bearing structure. | 4 |
| 4 | 3 | CO2 | To set out foundation plan on ground for framed structure. | 4 |
| 5 | 3 | CO2 | To visit building construction site to understand construction of substructure. | 6 |
| 6 | 3 | CO3, CO5 | To visit building construction site to understand construction of super structure, plastering and painting work. | 6 |
| 7 | 2&3 | CO2, CO3, CO4 | To draw different components of building observed in site visit (as built drawing) | 2 |
| 8 | 3 | CO2, CO3, CO4, | Sketches to be drawn on drawing sketch book(any TWO) A. Brick masonry - Plans & elevation of English bond and Flemish bond for one, one & half, two brick thick wall. | 2 |

| | | | | |
|--------------|--|-----|--|-----------|
| | | CO5 | B. Doors - Plan, elevation & section of fully panelled, glazed, flush, collapsible, revolving doors, rolling shutters C. Window - elevation and section of a louvered window-centrally hung ventilator, glazed window and window with aluminum frame and sliding glass shutter D. Stairs (Plans only) : straight, quarter turn, half turn, open well, doglegged, spiral, bifurcated, circular. | |
| | | CO6 | Group activity of model making like scaffolding, formwork, centering. (Any one) | 2 |
| Total | | | | 30 |

Note : All experiments are compulsory.

References/ Books:

| Sr. No. | Title | Author, Publisher, Edition and Year Of publication | ISBN |
|---------|-----------------------|---|-------------------------|
| 1 | Building Construction | S. P. Arora and Bindra., N. N. Basak, Dhanpat Rai Publication, Delhi Edition 2013 | ISBN: 9788189928803 |
| 2 | Building Construction | Sushil Kumar. Standard Publication.edition 2006 | ISBN: 8186308024 |
| 3 | Building Construction | Rangawala, S. C., Charotar Publication, Anand. | ISBN-13: 978-8185594859 |
| 4 | Building Construction | Punmia B. C., and Jain A. K., ,Firewall Media., 2005 | ISBN 9788170080534 |

E-Reference :

1. <http://www.learningconstruction.com/>
2. <http://www.understandconstruction.com/>
3. <http://www.constructionknowledge.net/>

CO Vs PO and CO Vs PSO Mapping :

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 2 | 3 | 3 | 3 | 2 | 3 | 2 | 2 | 3 | 1 |
| CO2 | 2 | 3 | 3 | 3 | 2 | 3 | 2 | 1 | 3 | 1 |
| CO3 | 2 | 3 | 3 | 3 | 2 | 3 | 2 | 1 | 3 | 1 |
| CO4 | 2 | 3 | 3 | 3 | 2 | 3 | 2 | 1 | 3 | 1 |
| CO5 | 2 | 3 | 3 | 3 | 2 | 3 | 2 | 1 | 3 | 1 |
| CO6 | 2 | 3 | 3 | 3 | 2 | 3 | 2 | 1 | 3 | 1 |

Industry Consultation Committee:

| Sr. No | Name | Designation | Institute/Organisation |
|--------|------------------------|-----------------------------|--------------------------|
| 1 | Mr. Rohan Deokar | Deputy Engineer | MMRDA |
| 2 | Mr. Sanjay Kulkarni | Surveyor and Consultant | SRKulkarni Pvt.Firm |
| 3 | Mr. K.V. Kelgandre | Sr. Lecturer in Civil Engg. | K.J. Somaiya Polytechnic |
| 4 | Smt.Meera Anserwadekar | Sr. Lecturer in Civil Engg. | Govt. Polytechnic Mumbai |

Coordinator,
Curriculum Development,
Department of _____

Head of Department
Department of _____

I/C, Curriculum Development Cell

Principal



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|--|----|----|-----------|---|---------------|--------------|----|----|----|------------|
| Programme : Diploma in Civil Engineering (Sandwich Pattern) | | | | | | | | | | |
| Course Code: CE19302 | | | | Course Title: Transportation Engineering | | | | | | |
| Compulsory / Optional: Compulsory | | | | | | | | | | |
| Teaching Scheme and Credits | | | | Examination Scheme | | | | | | |
| L | P | TU | Total | TH (2 Hrs 30 min) | TS1 (1 Hr) | TS2 (1Hr) | PR | OR | TW | Total |
| 03 | -- | -- | 03 | 60 | 20 | 20 | -- | -- | -- | 100 |

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination
 Note: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill test are to be conducted. First skill test at mid term and second skill test at the end of the term

Rationale:

This is a core technology subject which is intended to teach students facts, concepts, principles, procedures, of transportation engineering. system. (Roads, Railways) so that students can use this knowledge to identify types of roads as per IRC recommendations, geometric design features of highways, different tests on road materials, components of railway tracks.

Course Outcomes: Student should be able to

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|-----|---|
| CO1 | Identify the types of roads as per IRC recommendations. |
| CO2 | Understand geometrical design features of different highways. |
| CO3 | Know different tests on road materials. |
| CO4 | Understand the components of railway tracks. |
| CO5 | Know the defects in railway tracks. |
| CO6 | Understand importance of waterways & airways. |

Course Content Details:

| Unit No | Topics / Sub-topics |
|---------|--|
| 1 | Overview of Highway Engineering 1.1 Role of transportation in the development of nation, Scope and Importance of roads in India and its' Characteristics. 1.2 Different modes of transportation – land way, waterway, airway. Merits and demerits. 1.3 General classification of roads. 1.4 Selection and factors affecting road alignment. 1.5 Metro : types, necessity, advantages & disadvantages, layout of metro station, high speed metro. |
| | Course Outcome: CO1 Teaching Hours : 4 hrs Marks: 06 (R-4, U-2, A-0) |
| 2 | Geometric Design of Highway 2.1 Camber: Definition, purpose, types as per IRC – recommendations. 2.2 Kerbs: Road margin, road formation, right of way. 2.3 Design speed and various factors affecting design speed as per IRC – recommendations. 2.4 Gradient: Definition, types as per IRC – Recommendations. |

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| | <p>2.5 Sight distance (SSD): Definition, types as per IRC – recommendations.</p> <p>2.6 Curves: Necessity, types: Horizontal, vertical curves.</p> <p>2.7 Necessity of Extra widening of roads.</p> <p>2.8 Super elevation: Definition, formula for calculating minimum and maximum Super elevation and method of providing super-elevation</p> <p>2.9 Standards cross-sections of national highway in embankment and cutting.</p> <p>Course Outcome: CO2 Teaching Hours : 10 hrs Marks: 14 (R-4, U-6, A-4)</p> |
| 3 | <p>Construction of Road Pavements</p> <p>3.1 Types of road materials and their Tests – Test on aggregates-Flakiness and Elongation Index tests, Angularity Number test, test on Bitumen- penetration, Ductility, Flash and Fire point test and Softening point test.</p> <p>3.2 Pavement – Definition, Types, Structural Components of pavement and their functions.</p> <p>3.3 Construction of WBM road. Merits and demerits of WBM & WMM road.</p> <p>3.4 Construction of Flexible pavement / Bituminous Road, Types of Bitumen and its properties, Emulsion, Cutback, Tar, Terms used in BR-prime coat, tack coat, seal coat, Merits and Demerits of BR.</p> <p>3.5 Cement concrete road -methods of construction, Alternate and Continuous Bay Method, joints, filler and sealers, merits and demerits of concrete roads. Types of joints.</p> <p>Course Outcome:CO3 Teaching Hours : 10 hrs Marks:10 (R-2, U-4, A-4)</p> |
| 4 | <p>Basics of Railway Engineering</p> <p>4.1 Classification of Indian Railways, zones of Indian Railways.</p> <p>4.2 Permanent way: Ideal requirement, Components; Rail Gauge, types, factors affecting selection of a gauge.</p> <p>4.3 Rail, Rail Joints - requirements, types.</p> <p>4.4 Creep of rail: causes and prevention.</p> <p>4.5 Sleepers - functions and Requirement, types - concrete sleepers and their density.</p> <p>4.6 Ballast - function and types, suitability.</p> <p>4.7 Rail fixtures and fastenings – fish plate, spikes, bolts, keys, bearing plates, chairs-types of anchors and anti-creepers.</p> <p>Course Outcome:CO4 Teaching Hours : 8 hrs Marks:12 (R-5, U-5, A-2)</p> |
| 5 | <p>Track geometrics, Construction and Maintenance</p> <p>5.1 Alignment- Factors governing rail alignment.</p> <p>5.2 Track Cross sections – standard cross section of single and double line in cutting and embankment. Important terms-permanent land, formation width, side drains.</p> <p>5.3 Railway Track Geometrics: Gradient, curves- types and factors affecting, grade compensation, super elevation, limits of Super elevation on curves, cant deficiency, negative cant, coning of wheel, tilting of rail.</p> <p>5.4 Branching of Tracks, Points and crossings, Turn out- types, components, functions and inspection. Track junctions: crossovers, scissor cross over, diamond crossing, track triangle.</p> <p>5.5 Station -Purpose, requirement of railway station, important technical terms, types of railway station, factors affecting site selection for railway station.</p> <p>5.6 Station yard: Classification- Passenger, goods, locomotive and marshalling yards. Function & drawbacks of marshalling yards.</p> <p>5.7 Track Maintenance- Necessity, Classification, Tools required for track maintenance with their functions, Organisation of track maintenance, Duties of permanent way</p> |

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| | inspector, gang mate |
| | Course Outcome:CO5 Teaching Hours : 10 hrs Marks:12 (R-4, U-4, A-4) |
| 6 | Waterway & Airways : 6.1 Scope of waterways & airways 6.2 Importance of waterways & airways 6.3 Uses of waterways & airways 6.4 Route alignment, Signaling system. Course Outcome:CO6 Teaching Hours : 3 hrs Marks: 06 (R-2, U-4, A-0) |

❖ **Note : Students should visit roads, railway station and road material testing laboratory and prepare a report based on site visit.**

Suggested Specifications Table (Theory):

| Unit No | Topic Title | Distribution of Theory Marks | | | |
|--------------|--|------------------------------|-----------|-----------|-------------|
| | | R Level | U Level | A Level | Total Marks |
| 1 | Overview of Highway Engineering | 4 | 2 | 0 | 06 |
| 2 | Geometric Design of Highway | 4 | 6 | 4 | 14 |
| 3 | Construction of Road Pavements | 2 | 4 | 4 | 10 |
| 4 | Basics of Railway Engineering | 5 | 5 | 2 | 12 |
| 5 | Track geometrics, Construction and Maintenance | 4 | 4 | 4 | 12 |
| 6 | Waterways & Airways | 2 | 4 | 0 | 06 |
| Total | | 21 | 25 | 14 | 60 |

References/ Books:

| Sr. No. | Title | Author, Publisher, Edition and Year Of publication | ISBN |
|---------|--|--|------------------------------------|
| 1 | Transportation Engineering | L.R. Kadiyali Khanna Publishing House, New Delhi | ISBN: 978-9382609-858 Edition 2018 |
| 2 | Highway Engineering | Khanna S.K., Justo, C E G and Veeraragavan Nem Chand and Brothers, Roorkee. | ISBN : 8185240779, 9788185240770 |
| 3 | Transportation Engineering | Arora, N. L. Khanna Publishers, Delhi. | ISBN-13 978-93-87394-29-2 |
| 4 | A Textbook of Railway Engineering | Saxena S. C. and Arora S. P. Dhanpat Rai Publication. | ISBN-13: 978-8189928834 |
| 5 | Road, Railways, Bridge and Tunnel Engg | Birdi, Ahuja Standard Book House, New Delhi. | ISBN-13: 978-8189401337 |

E-References:

- 1) <https://www.engineeringcivil.com>
- 2) www.youtube.com/watch?v=2g6s4euVoWo&list
- 3) <http://civildigital.com>
- 4) <http://www.quora.com>
- 5) www.railway-technical.com
- 6) <http://www.nationallibrary.gov.in>

CO Vs PO and CO Vs PSO Mapping

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | -- | -- | 1 | 3 | 2 | 2 | 3 | 1 | -- |
| CO2 | 3 | 2 | 3 | -- | 3 | 2 | 3 | 3 | 2 | 2 |
| CO3 | 3 | 3 | 1 | 3 | -- | 1 | 3 | 3 | 2 | 3 |
| CO4 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | 3 | 2 | 2 |
| CO5 | 3 | 3 | 3 | 1 | 3 | 3 | 3 | 3 | 3 | 3 |

Industry Consultation Committee:

| Sr. No | Name | Designation | Institute/Organisation |
|--------|---------------------|-----------------------------|--------------------------|
| 1 | Mr. Rohan Deokar | Deputy Engineer | MMRDA |
| 2 | Mr. Sanjay Kulkarni | Surveyor and Consultant | SRKulkarni Pvt.Firm |
| 3 | Mr. K.V. Kelgandre | Sr. Lecturer in Civil Engg. | K.J. Somaiya Polytechnic |
| 4 | Ms. S. M. Male | Lecturer in Civil Engg. | Govt. Polytechnic Mumbai |

Coordinator,
Curriculum Development,
Department of Civil Engg.

Head of Department
Department of Civil Engg.

I/C, Curriculum Development Cell

Principal

| | | | | | | | | | | |
|--|-----------|-----------|-----------|-----------------------------------|---------------|--------------|------------|-----------|-----------|------------|
| Programme : Diploma in Civil Engineering (Sandwich Pattern) | | | | | | | | | | |
| Course Code: CE19303 | | | | Course Title: Surveying II | | | | | | |
| Compulsory / Optional: Compulsory | | | | | | | | | | |
| Teaching Scheme and Credits | | | | Examination Scheme | | | | | | |
| L | P | TU | Total | TH (2 Hrs 30 min) | TS1 (1 Hr) | TS2 (1Hr) | PR | OR | TW | Total |
| 02 | 04 | -- | 06 | 60 | 20 | 20 | 50* | -- | 25 | 175 |

Abbreviations: TH- Theory; PR-Practical; TU-Tutorial; TS1 and TS2- Term Tests; OR-Oral Exam; TW: Term Work (progressive assessment), * Indicates assessment by External Examiner else internal assessment
 Note: For Minimum passing marks under various heads, refer, examination rule AR26.

Rationale:

Development and planning process for any civil engineering project needs survey of that area to be carried out and various types of survey maps are to be prepared. In the era of globalization today, the technology has brought the significant advancements in surveying instruments and techniques. This results in the availability of the precise digital surveying instruments like Electronic Distance Meter (EDM), Micro Optic Theodolite, Total Station Instrument, and Global positioning System (GPS) which are being used currently due to its accuracy, speed and easy operation of the same. Since, Remote sensing and Geographic Information System (GIS) is a vital discipline and being widely used for plotting and storing spatial information, it is expected the students should know the basics of the same to apply it in field. Therefore, the content of this course are designed to deal with the concepts and the principles related to the various advanced digital surveying instruments and the techniques to operate the same to get the desired out put in a short period with highest accuracy. Through this course students will develop the desired skills and competencies which are expected from them for survey related works. This course is therefore one of the core courses required for Civil Engineers.

Course Outcomes: Student should be able to

| | |
|-----|--|
| CO1 | Use Theodolite to perform survey. |
| CO2 | Prepare plan of the areas using Theodolite |
| CO3 | Find distance and elevations using Tacheometer |
| CO4 | Set out simple circular curves |
| CO5 | Prepare plan of the areas using Total Station instrument |
| CO6 | Locate coordinates of stations using GPS |

Course Content Details:

| Unit No | Topics / Sub-topics |
|----------|---|
| 1 | Theodolite Surveying : 1.1 Types and uses of Theodolite; Component parts of transit Theodolite and their functions, Reading the Vernier of transit Theodolite 1.2 Technical terms- Swinging, Transiting, Face left, Face right 1.3 Fundamental axes of transit Theodolite and their relationship 1.4 Temporary adjustment of transit Theodolite 1.5 Measurement of horizontal angle- Direct and Repetition method, Measurement of |

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| | <p>vertical Angle. 1.6 Measurement of magnetic bearing of a line, deflection angle.</p> <p>Course Outcome: CO1 , Teaching Hours : 5 hrs Marks: 10 (R-4, U-6, A- --)</p> |
| 2 | <p>Theodolite Traversing And Computations 2.1 Traverse Parameters- Open Traverse, Closed Traverse. 2.2 Theodolite traversing by included angle method and deflection angle method. Check in open and closed traverse, Calculations of bearing from angles. 2.3 Traverse computation-Latitude, Departure, Consecutive coordinates, Independent coordinates, Balancing the traverse by Bowditch's rule and Transit rule. 2.4 Gale's Traverse table computation. 2.5 Calculation of area from total Latitudes and Departures.</p> <p>Course Outcome: CO2 Teaching Hours :8 hrs Marks:14 (R-2 , U- 4 , A- 8)</p> |
| 3 | <p>Tacheometric surveying : 3.1 Definition , Principle of tacheometry, tacheometer and its component parts, Characteristics of tacheometer. 3.2 Tacheometric formula for horizontal distance with telescope horizontal and staff vertical. 3.3 Field method for determining constants of tacheometer, 3.4 Determining horizontal and vertical distances with tacheometer by fixed hair method when line of sight is inclined and staff held vertical.(Simple Numerical Problems) 3.5 Limitations of tacheometry.</p> <p>Course Outcome:CO3 Teaching Hours : 4 hrs Marks:10 (R- 2, U- 2 , A- 6)</p> |
| 4 | <p>Curve setting : 4.1 Introduction, Types of curves used in roads and railway alignments. Relation between degree and radius of curve. 4.2 Elements of simple circular curve. Designation of curve by radius and degree of curve. 4.3 Setting of simple circular curve by offsets from long chord and Rankine's method of deflection angle. 4.4 Simple numerical problems on above.</p> <p>Course Outcome:CO4 Teaching Hours : 4 hrs Marks:10 (R-2 , U-2, A-6)</p> |
| 5 | <p>Advanced surveying equipment : 5.1 Principle of Electronic Distance Meter (E.D.M), use of E.D.M., Construction and use of One Second Micro Optic Theodolite, Electronic Digital Theodolite. 5.2 Construction and Use of Total Station. Temporary adjustments of Total Station. 5.3 Use of function keys. Measurements of Horizontal angles, vertical angles, distances and Coordinates using Total Station. 5.4 Traversing, Profile Survey and Contouring with Total Station. 5.5 LiDAR survey (introduction) 5.6 Study and use of Digital Planimeter.</p> <p>Course Outcome:CO5 Teaching Hours :6 hrs Marks:10 (R- 2 , U- 4 , A- 4)</p> |
| 6 | <p>Remote sensing and GIS : 6.1 Introduction to Remote sensing, Remote sensing system- Active and Passive system, Applications of remote sensing. 6.2 Construction and Use of Global Positioning System (G.P.S.) 6.3 Geographic Information System (GIS): Definition, Components and Applications in</p> |

| | | | | |
|------------|---------------------------|------------------------------|-----------------|-------------------------------|
| surveying. | Course Outcome:CO6 | Teaching Hours :3 hrs | Marks:06 | (R- 2 , U- 4 , A- --) |
|------------|---------------------------|------------------------------|-----------------|-------------------------------|

Suggested Specifications Table (Theory):

| Unit No | Topic Title | Distribution of Theory Marks | | | |
|--------------|--|------------------------------|-----------|-----------|-------------|
| | | R Level | U Level | A Level | Total Marks |
| 1 | Theodolite Surveying | 4 | 6 | - | 10 |
| 2 | Theodolite Traversing And Computations | 2 | 4 | 8 | 14 |
| 3 | Tacheometric surveying | 2 | 2 | 6 | 10 |
| 4 | Curve setting | 2 | 2 | 6 | 10 |
| 5 | Advanced surveying equipment | 2 | 4 | 4 | 10 |
| 6 | Remote sensing and GIS | 2 | 4 | - | 06 |
| Total | | 14 | 22 | 24 | 60 |

List of experiments:

| Sr. No. | Unit No | COs | Title of the Experiments | Hours |
|---------|---------|-----|--|-------|
| 1 | 1 | CO1 | Demonstrate the functional utility of Transit Theodolite and Perform temporary adjustments of Transit Theodolite | 2 |
| 2 | 2 | CO2 | Use transit theodolite to carry out Survey Project for closed traverse having minimum 5 sides. | 8 |
| 3 | 3 | CO3 | Use theodolite as a tachometer to compute reduced levels and horizontal distances correctly | 2 |
| 4 | 4 | CO4 | Set out a circular curve by offsets from long chord method. | 2 |
| 5 | 5 | CO5 | Demonstrate the functional utility of the components of Total Station and the function of keys and perform its temporary adjustments. | 2 |
| 6 | 6 | CO6 | Use GPS to locate the coordinates of a station correctly | 2 |
| 7 | 1 | CO1 | Use transit theodolite to measure Horizontal and Vertical angle correctly by direct method | 2 |
| 8 | 1 | CO1 | Use transit theodolite to measure Horizontal angle correctly by method of Repetition | 6 |
| 9 | 2 | CO2 | Prepare Gale's traverse table and Plot the traverse on A1 size imperial drawing sheet for the output of Survey Project mentioned at practical no.2 | 6 |
| 10 | 4 | CO4 | Set out a circular curve by Rankine's method of Deflection angles | 2 |
| 11 | 5 | CO5 | Use Total station instrument to measure horizontal distance, horizontal angle and vertical angle. | 6 |
| 12 | 5 | CO5 | Use Total station instrument to carry out Survey Project for closed traverse having minimum 5 sides. | 8 |
| 13 | 5 | CO5 | Plot the traverse on A1 size imperial drawing sheet for the output | 6 |

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| | | | of Survey Project mentioned at practical no.12 | |
| 14 | 5 | CO5 | Use One Second Micro Optic Theodolite / Digital Theodolite to Measure Horizontal angle by direct method | 4 |
| 15 | 5 | CO5 | Use Digital Planimeter to measure area of any irregular figure. | 2 |
| Total | | | | 60 |

Note : All experiments are compulsory.

References/ Books:

| Sr. No. | Title | Author, Publisher, Edition and Year Of publication | ISBN |
|---------|---------------------------------------|---|--|
| 1 | Surveying and Levelling | N. N. Basak Tata McGraw Hill Education Private Ltd. New Delhi , 33 rd reprint2010 | ISBN 93-3290-153-8 |
| 2 | Surveying and Levelling volume I & II | Kanetkar, T. P.; Kulkarni, S. V. Pune Vidyarthi Gruh Prakashan | ISBN 978-81-858-2511-3 & ISBN 13: 9788185825007 |
| 3 | Surveying and Levelling | Subramanian, R. Oxford University Press. | ISBN 13:978-0-19-808542-3 |
| 4 | Survey I and Surveying II | Duggal, S. K. McGraw Hill Education Private Ltd. New Delhi, | ISBN 978-00-701-5137-6 and ISBN-13: 978-1259029837 |
| 5 | Surveying Vol.I and Vol. II | Punmia B.C., Jain Ashok Kumar; Jain Arun Kumar Laxmi Publications., New Delhi. | ISBN: 8-17-008853-4 ISBN 13: 9788170088837 |

E-References:

- https://www.youtube.com/watch?v=n_EMrTbDZak
- <https://www.youtube.com/watch?v=H2AQq2jshgg>
- <https://www.youtube.com/watch?v=C8UKJtZIAWE>
- https://www.youtube.com/watch?v=J6j_sJyyudI
- <http://www.asnu.com.au>
- www.oupinheonline.com
- <http://www.nationallibrary.gov.in>

CO Vs PO and CO Vs PSO Mapping

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | 3 | 3 | 2 | 1 | 1 | 2 | 2 | 2 | 3 |
| CO2 | 3 | 3 | 3 | 2 | 2 | 1 | 2 | 2 | 2 | 3 |
| CO3 | 3 | 3 | 2 | 2 | 2 | 1 | 2 | 2 | 2 | 3 |
| CO4 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 3 |

| | | | | | | | | | | |
|------------|---|---|---|---|---|---|---|---|---|---|
| CO5 | 3 | 3 | 3 | 3 | 2 | 1 | 2 | 2 | 2 | 3 |
| CO6 | 3 | 2 | 3 | 3 | 2 | 1 | 2 | 2 | 2 | 2 |

Industry Consultation Committee:

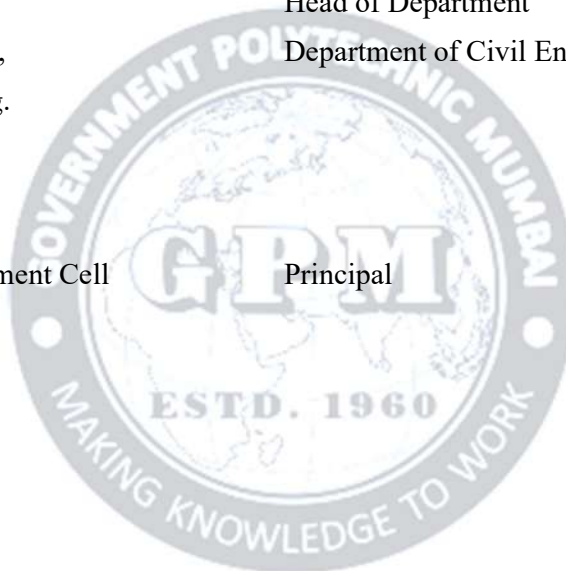
| Sr. No | Name | Designation | Institute/Organisation |
|---------------|---------------------|-----------------------------|-------------------------------|
| 1 | Mr. Rohan Deokar | Deputy Engineer | MMRDA |
| 2 | Mr. Sanjay Kulkarni | Surveyor and Consultant | SRKulkarni Pvt.Firm |
| 3 | Mr. K.V. Kelgandre | Sr. Lecturer in Civil Engg. | K.J. Somaiya Polytechnic |
| 4 | Mr. D. K. Fad | Sr. Lecturer in Civil Engg. | Govt. Polytechnic Mumbai |

Coordinator,
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Department of Civil Engg.

I/C, Curriculum Development Cell

Principal



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|---|-----------|-----------|-----------|--|----------------|---------------|-----------|-----------|-----------|------------|
| Programme: Diploma in Civil Engineering (Sandwich Pattern) | | | | | | | | | | |
| Course Code: AM19301 | | | | Course Title: Mechanics of Structures | | | | | | |
| Compulsory / Optional: Compulsory | | | | | | | | | | |
| Teaching Scheme and Credits | | | | Examination Scheme | | | | | | |
| L | P | TU | Total | TH (2 Hrs 30 min) | TS1 (1 Hrs) | TS2 (1Hrs) | PR | OR | TW | Total |
| 03 | 02 | -- | 05 | 60 | 20 | 20 | -- | -- | 25 | 125 |

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination
 Note: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill test are to be conducted. First skill test at mid term and second skill test at the end of the term

Rationale:

Understanding the concept and approach of strength of Material is to induce the knowledge of loading applied and corresponding deformation by the students. In addition to analysis and design of structure, it is needs to understand the material properties and their behaviour. The students enable to analyse the structures/bodies under the action of direct and transverse loading and stress condition. The approach of teaching this course is to think critically and apply their skills while solving the problems. The experiments are expected to perform in the laboratory by acquiring knowledge with required skill of material features.

Course Outcomes: Student should be able to

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| CO1 | Compute the Moment of Inertia of symmetrical and asymmetrical structural sections. |
| CO2 | Know the material properties, deformation and stress induced under different loadings |
| CO3 | Determine the elastic constants and volumetric strain subjected to different loadings |
| CO4 | Compute shear force and bending moment along with their distribution diagrams. |
| CO5 | Estimate the shear and bending stresses along with their distribution diagrams. |
| CO6 | Calculate the combined stresses subjected to direct load and bending moment. |

Course Content Details:

| Unit No | Topics / Sub-topics |
|---------|--|
| 1 | Moment of Inertia 1.1 Concept of moment of inertia for plane bodies, radius of gyration, section modulus, expression for moment of inertia about centroidal axes for regular plane figures such as rectangular, triangular, circular, semicircular and quarter circular sections. 1.2 Theorems of Moment of Inertia, Parallel axis theorem, perpendicular axis theorem, polar moment of inertia, Numerical problems on Moment of inertia of composite sections for sections as mentioned in sub-topics 1.1 only. Course Outcome: CO1, Teaching Hours: 06 hrs, Marks:10 (R-2, U-4, A- 4) |
| 2 | Simple Stresses and Strains 2.1. Definition of elastic, plastic and rigid bodies, concept of deformation, stresses and strains, different properties of Engineering materials. 2.2. Axial tensile and compressive load, Hooke's Law, Young's modulus, axial stress, axial |

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| | <p>strain, lateral strain, modulus of elasticity, Poisson's ratio, problems on bars of uniform and stepped cross section.</p> <p>2.3. Behavior of mild steel under tensile loading, stress-strain curve along with important points such as limit of proportionality, yield stress, ultimate stress, breaking stress. Factor of safety, safe stress, working stress.</p> <p>2.4. Concept of composite section, conditions for composite sections, advantages and limitations of composite section (Simple numerical problems asked in the examination).</p> <p>2.5. Concept of temperature stresses and strains, nature of stresses, simple problems on temperature stresses on homogenous sections only.</p> <p>Course Outcome: CO2, Teaching Hours: 10 hrs, Marks:10 (R-2, U-4, A-4)</p> |
| 3 | <p>Elastic Constants and Strain Energy</p> <p>3.1. Concept of shear load, shear stress & strain, modulus of rigidity, simple shear, complementary shear, punching shear.</p> <p>3.2. Volumetric strain, bulk modulus, Concept of "uni-axial stress, equation of total strain in Uni-axial direction, elastic constants, relation between elastic moduli (No derivations of these relations). Simple numerical problems.</p> <p>3.4. Concept of strain energy, resilience, proof resilience, modulus of resilience, strain energy stored due to gradual, sudden and impact loadings, simple numerical problems.</p> <p>Course Outcome:CO3, Teaching Hours :06 hrs, Marks:10 (R-2, U-4, A-4)</p> |
| 4 | <p>Shear Force and Bending Moment</p> <p>4.1 Concept and definition of shear force and bending moment, sign convention, relation between bending moment, shear force and rate of loading.</p> <p>4.2 Shear force and bending moment diagram for simply supported, cantilever and overhanging beams subjected to concentrated load, uniformly distributed load and couple, point of zero shear, point of contra flexure, simple numerical problems.</p> <p>Course Outcome:CO4, Teaching Hours: 08 hrs, Marks:12 (R-2, U-4, A-6)</p> |
| 5 | <p>Shear and Bending Stresses</p> <p>5.1 Concept of pure bending, assumptions in pure bending theory, stress distribution diagram, bending or flexure equation (derivation not required), section modulus, moment of resistance.</p> <p>5.2 Numericals on moment of resistance for symmetrical beam sections. Simple numerical problems on standard sections (No problems built up section)</p> <p>5.3 Shear stress equation with meaning of each terms (Derivation not required)</p> <p>5.4 Shear stress distribution for solid and hollow rectangular section, solid and hollow circular section, I section, T section, Numerical problems on circular and rectangular section only.</p> <p>Course Outcome:CO5, Teaching Hours: 08 hrs, Marks:10 (R-0, U-2, A-8)</p> |
| 6 | <p>Direct and Bending Stresses</p> <p>6.1 Concept of direct and eccentric load, eccentricity about one principal axis, different nature of stresses, stress distribution diagram.</p> <p>6.2 Condition for no tension, limit of eccentricity, maximum and minimum stresses core section for rectangular and circular sections, stress distribution diagram at base.</p> <p>6.3 Numerical problems on rectangular and circular column sections subjected to eccentric load on any one principal axis.</p> <p>Course Outcome:CO6, Teaching Hours :07 hrs, Marks:08 (R-0, U-2, A-6)</p> |

Suggested Specifications Table (Theory):

| Unit No | Topic Title | Distribution of Theory Marks | | | |
|--------------|--------------------------------|------------------------------|-----------|-----------|-------------|
| | | R Level | U Level | A Level | Total Marks |
| 1 | Moment of Inertia | 2 | 4 | 4 | 10 |
| 2 | Simple Stresses and Strains | 2 | 4 | 4 | 10 |
| 3 | Elastic Constants | 2 | 4 | 4 | 10 |
| 4 | Shear Force and Bending Moment | 2 | 4 | 6 | 12 |
| 5 | Shear and Bending Stresses | -- | 2 | 8 | 10 |
| 6 | Direct and Bending Stresses | -- | 2 | 6 | 08 |
| Total | | 08 | 20 | 32 | 60 |

List of experiments:

| Sr. No. | Unit No | COs | Title of the Experiments | Hours |
|---------|---------|-----------|--|-------|
| 1 | 2 | CO2 | List the various parts and their functions of Universal Testing Machine along with brief introduction of other test to be conducted on UTM. | 2 |
| 2 | 2 | CO2 | Tension test on mild steel or TMT specimen as per IS 432 (part I) or HYSD or Fe500 steel specimen as per IS 1608 & 1139. Also, draw the stress strain curve by showing important points on it. | 2 |
| 3 | 2 | CO2 | Hardness test on mild steel, Aluminium, copper, brass, cast iron (any two metals). | 2 |
| 4 | 2 | CO2 | Compression test on timber along the grain and cross the grain as per IS 2408. | 2 |
| 5 | 5 | CO1 & CO5 | Flexure test on timber beam of rectangular section as per IS 1708 and IS 2408. | 2 |
| 6 | 3 | CO3 | Izod impact load test & Charpy impact test on aluminium, copper, mild steel, brass, cast iron as per IS 1598 (any two metals). | 2 |
| 7 | 5 | CO2 & CO5 | Water absorption and flexural test on flooring or roofing tiles as per IS 1237, IS 13630, IS 654, IS 2690. | 3 |
| 8 | 2 | CO2 | Water absorption and compression test on wet bricks as per IS 3495 (part II), IS 1077. | 3 |
| 9 | 2 | CO2 | Abrasion test on flooring tiles as per IS 13630 (part 7). | 2 |
| 10 | 3 | CO3 | Shear test on mild steel, Aluminium, copper, brass, cast iron as per IS 5242 (any two metals). | 2 |
| 11 | 2 | CO2 | Neoprin test on rubber to check deformation of rubber. | 2 |

| | | | | |
|--------------|---|-----------------|--|-----------|
| 12 | 4 | CO4 & CO6 | a) Plot shear force and bending moment diagram for cantilever, simply supported and overhanging beams loaded by concentrated and uniformly distributed loads (two problem on each beam types on A4 graph paper). b) Draw the labeled core section diagram for rectangular and circular sections (use A4 graph paper) c) Draw the three probable labeled stress distribution diagrams at base of a rectangular section subjected to eccentric load about one principal axis (use A4 graph paper). | 6 |
| Total | | | | 30 |

Note : All experiments are compulsory.

References/ Books:

| Sr. No. | Title | Author, Publisher, Edition and Year Of publication | ISBN |
|---------|-----------------------------------|---|--|
| 1 | Mechanics of Material | Beer and Jonson Tata McGraw hill | ISBN 9781259097171 |
| 2 | Strength of material | Singer and Pytel Harper &Raw | ISBN-10 0060453133 |
| 3 | Mechanics of structures, Volume-I | Junnarkar, S. B. , Charotar Publishing House, Anand. | ISBN :9789385039270988 ISBN 978-93-85039-02-7 |
| 4 | Strength of Material | S. Ramamurtham Dhanpat Rai and sons | ISBN-10: 818743354X |
| 5 | Strength of Material | R. K. Bansal S Chand | ISBN 9789385401961 |
| 6 | Strength of Material | B. K. Sarkar Tata McGraw hill | ISBN 0070494843 |
| 7 | Mechanics of structure | Y. N Walavalker Everest pub-House, Pune 30 | ISBN NO: EPH-0-89-890925-17 |
| 8 | Strength of Material | S.S Bhavikatti Vikas Publishing House Pvt.Ltd | ISBN 8125912193 |

CO-PO and CO-PSO Mapping

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | 2 | 2 | 2 | 1 | -- | 3 | 2 | 2 | 3 |
| CO2 | 3 | 2 | 2 | 2 | 2 | 1 | 2 | 3 | 2 | 3 |
| CO3 | 2 | 3 | 3 | 3 | 2 | 1 | 2 | 2 | 2 | 2 |
| CO4 | 3 | 2 | 3 | 2 | -- | -- | 3 | 3 | 2 | 2 |
| CO5 | 3 | 3 | 3 | 3 | -- | -- | 2 | 2 | 2 | 3 |
| CO6 | 3 | 3 | 3 | 3 | -- | -- | 3 | 2 | 3 | 2 |

Industry Consultation Committee:

| Sr. No | Name | Designation | Institute/Organisation |
|--------|---------------------|-----------------------------|---------------------------|
| 1 | Mr. Rohan Deokar | Deputy Engineer | MMRDA |
| 2 | Mr. Sanjay Kulkarni | Surveyor and Consultant | SRKulkarni Pvt.Firm |
| 3 | Mr. K.V. Kelgandre | Sr. Lecturer in Civil Engg. | K.J. Somaiya Polytechnic |
| 4 | Dr. S.M. Dumne | Sr. lecturer in APM | Govt. Polytechnic Avasari |

Coordinator,
Curriculum Development,
Department of Civil Engineering

Head of Department
Department of Civil Engineering.

I/C, Curriculum Development Cell

Principal



| | | | | | | | | | | |
|--|-----------|-----------|-----------|-------------------------------------|---------------|--------------|-----------|-----------|-----------|------------|
| Programme : Diploma in Civil Engineering (Sandwich Pattern) | | | | | | | | | | |
| Course Code: AM19302 | | | | Course Title: Soil Mechanics | | | | | | |
| Compulsory / Optional: Compulsory | | | | | | | | | | |
| Teaching Scheme and Credits | | | | Examination Scheme | | | | | | |
| L | P | TU | Total | TH (2Hrs 30 min) | TS1 (1 Hr) | TS2 (1Hr) | PR | OR | TW | Total |
| 03 | 02 | -- | 05 | 60 | 20 | 20 | -- | -- | 25 | 125 |

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination
 Note: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill test are to be conducted. First skill test at mid term and second skill test at the end of the term

Rationale :

Soil Mechanics engineering is important for every structure, since all structures rest on soil. The stability of these structures depends upon behavior of soil and bearing capacity of soil to carry loads under different loading conditions.

The design of foundation of buildings, dams, Tower, embankments, roads, railways retaining walls, bridges is mainly governed by the knowledge of soil characteristics, stress distribution under loading on soil. Bearing capacity of soil etc. The content of this subject are useful to every engineer in the design, execution and stability analysis of structures.

Course Outcomes: Student should be able to

| | |
|-----|---|
| CO1 | Know the Origin & Field applications of Soil. |
| CO2 | Know the physical properties and behavior of Soils. |
| CO3 | Classify the soil as per IS classification and to know grading & consistency of Soil. |
| CO4 | State the necessity of compaction and consolidation of soil with it techniques. |
| CO5 | Know & understand factors affecting permeability of soil, and Shear Strength of Soil. |
| CO6 | Know importance of bearing capacity and Know the techniques of stabilization of soil. |

Course Content Details:

| Unit No | Topics / Sub-topics |
|----------|--|
| 1 | Introduction to Soil Mechanics : 1.1 IS definition of soil, Origin of soil, Formation of soil, Soil-formation in Geological cycle 1.2 General characteristics of different types of soils, Overview of different types of soils in India. 1.3 Importance of soil in Civil Engineering as construction material in Civil Engineering Structures, such as foundation bed for structures. 1.4 Field application of Soil Mechanics for foundation design pavement design, design of earth retaining structures, applications in design of earthen dams in Maharashtra and India. Course Outcome: CO1 Teaching Hours : 3 hrs Marks: 4 (R- 2, U-2, A-0) |

| | |
|---|--|
| 2 | <p>Physical Properties of Soil :</p> <p>2.1 Soil as Three Phase System. Water content, determination of Water Content by oven drying method as per IS 2720 (part II).</p> <p>2.2 Physical properties: Void ratio, porosity & degree of saturation, density index, unit wt. of Soil mass - Sp. Gravity, bulk density, dry density, Water content</p> <p>2.3 Relation between: Void ratio and porosity. Void ratio, sp. gravity & degree of saturation. (No derivations) .Concept of various index properties of soil for the Purpose of their classification & Use.</p> <p>2.4 Determination of specific gravity by Pycnometer.</p> <p>2.5 Determination of bulk unit weight and dry unit weight by Core Cutter method (Simple Numerical problems on physical properties only)</p> <p>Course Outcome: CO2 Teaching Hours: 8 hrs Marks: 12 (R -4, U- 4, A- 4)</p> |
| 3 | <p>Grading & Consistency of soil :</p> <p>3.1 Particle size distribution, mechanical sieve analysis as per IS code, partial distribution curve, Uniformity coefficient and coefficient of curvature graded and uniformly graded soils, IS. Classification of soil. IS : 460</p> <p>3.2 Consistency of soil: stages of consistency, Atterberg's limits of consistency viz. Liquid limit, plastic limit and shrinkage limit, Plasticity index, Consistency index.</p> <p>3.3 Determination of Liquid limit, Plastic limit and Shrinkage limit as per IS code.</p> <p>Course Outcome: CO3 Teaching Hours: 9 hrs Marks: 12 (R- 2, U- 6, A- 4)</p> |
| 4 | <p>Compaction & Consolidation :</p> <p>4.1 Concept of compaction & consolidation, difference between consolidation and compaction.</p> <p>4.2 Compaction: Light and Heavy compaction, zero air void line, O.M.C, Std. Proctor test. Modified Proctor test. Factors affecting compaction.</p> <p>4.3 Field methods of Compaction – rolling, ramming and vibration and Suitability of various compaction equipment's-smooth wheel roller, sheep foot roller, pneumatic typed roller, Rammer and Vibrator.</p> <p>Course Outcome: CO4 Teaching Hours: 10 hrs Marks: 12 (R-4 ,U- 4, A- 4)</p> |
| 5 | <p>Permeability & Shear strength of soil :</p> <p>5.1 Definition & concept of permeability. Darcy's law of permeability, coefficient of permeability, factors affecting permeability, determination of coefficient of permeability by constant head and falling head Permeability tests.</p> <p>5.2 Types of Filters. Use of Geofabric as Filters.</p> <p>5.3 Concept and definition of shear strength of soil. Constituents of shear resistance of soil, definition of Cohesion, internal friction. Angle of shearing resistance.</p> <p>5.4Coulomb's equation & failure envelope, significance of "C" and "φ" soils. Types of soil C-soil, φ-soil, C-φ soil.</p> <p>5.5 Introduction to determination of shearing strength of soil in laboratory by direct Shear test (drained & un drained).</p> <p>Course Outcome: CO5 Teaching Hours: 10 hrs Marks: 12 (R- 2, U- 6, A- 4)</p> |
| 6 | <p>Bearing Capacity and Stabilization of Soil :</p> <p>6.1 Concept & definition of bearing capacity, ultimate bearing capacity, safe bearing capacity and allowable bearing Capacity, effect of water table on bearing capacity.(No Numerical)</p> <p>6.2 Factors effecting bearing capacity and methods to improve Bearing capacity of soil.</p> <p>6.3 Explain the concept & occurrence mechanism& effect of 'Liquefaction' of soil.</p> <p>6.3 Dynamic Plate load test - procedure, and limitations of test only.</p> |

| |
|--|
| 6.4 Soil stabilization: Scope & purpose. |
| 6.5 Methods of soil stabilization – Mechanical soil stabilization – GGBS, fly ash, glass slag, lime stabilization, cement stabilization, bitumen stabilization, fly-ash stabilization. California bearing ratio. |
| 6.6 Uses of Geosynthetic. |
| Course Outcome: CO6 Teaching Hours: 5 hrs Marks: 8 (R- 4, U- 2, A- 2) |

Suggested Specifications Table (Theory):

| Unit No | Topic Title | Distribution of Theory Marks | | | |
|--------------|--|------------------------------|-----------|-----------|-------------|
| | | R Level | U Level | A Level | Total Marks |
| 1 | Introduction to Soil Mechanics | 2 | 2 | -- | 04 |
| 2 | Physical Properties of Soil | 4 | 4 | 4 | 12 |
| 3 | Grading & Consistency of soil | 2 | 6 | 4 | 12 |
| 4 | Compaction & Consolidation | 4 | 4 | 4 | 12 |
| 5 | Permeability & Shear strength of soil | 2 | 6 | 4 | 12 |
| 6 | Bearing Capacity and Stabilization of Soil | 4 | 2 | 2 | 08 |
| Total | | 18 | 24 | 18 | 60 |

List of experiments:

| Sr. No. | Unit No | COs | Title of the Experiments | Hours |
|---------|---------|--------------|--|-----------|
| 1 | 02 | CO2 | Determine water content of given soil sample by oven drying method as per I.S. 2720 part- II | 04 |
| 2 | 01 | CO1 | Introduction to Soil Mechanics and study various field application. | 02 |
| 3 | 02 | CO1 | Determine specific gravity of soil by pycnometer method as per I.S. 2720 part- III | 02 |
| 4 | 03 | CO2 | Determine grain size distribution of given soil sample by Mechanical sieve analysis as per I.S.. 2720 part- IV | 02 |
| 5 | 04 | CO4 | Determine MDD and OMC by Standard proctor test (OR Study of Modified proctor test). | 04 |
| 6 | 05 | CO5 | To determine Coefficient of permeability by Constant head method (OR Falling head test as per I.S. | 04 |
| 7 | 06 | CO6 | Determine shear strength of soil by direct shear test (OR Vane Shear Test) | 04 |
| 8 | 02 | CO2 | Determine bulk dry unit weight of soil by core cutter method as per I.S. 2720 part-XXIX. | 02 |
| 9 | 03 | CO3 | Determine Liquid Limit of given soil sample as per I.S. 2720 part- V. | 02 |
| 10 | 03 | CO3 | Determine Plastic Limit of given soil sample as per I.S.. 2720 part- V. | 02 |
| 11 | 04 | CO4 | Study of Shrinkage Limit. | 02 |
| | | Total | | 30 |

Note : All experiments are compulsory.

References/ Books:

| Sr. No. | Title | Author, Publisher, Edition and Year Of publication | ISBN |
|---------|---|---|--|
| 1 | Soil Mechanics & Foundations Engg. | K.R Arora , Standard Publisher Distributors | ISBN-10: 8180141128; ISBN-13: 978-8180141126 |
| 2 | Introduction to Soil Mechanics | B.J.Kasmalkar Pune Vidyarthi Grila Prekashan | ISBN 9781407029252 |
| 3 | Soil Mechanics & Foundations Engg | Gopal Rajan & A.S.R.Rao. New Age international Publisher | ISBN. 978-81-224-1223-9 |
| 4 | Soil Mechanics | B.C. Punmia Standard Book House, New Delhi | ISBN-10: 8180141128; ISBN-13: 978-8180141126 |
| 5 | Soil Mechanics | V.N.S Murthy Sai Kripa Technical Consultants | ISBN-10: 8180141128; ISBN-13: 978-8180141126 |
| 6 | Geotechnical Engineering (Soil Mechanics) | T.N.Ramanurthy & T.G.Sitharam S Chand and Company Ltd. | ISBN 10: 812192457X |
| 7 | Is 2809-1972-Glossary of Terms and Symbols Relating To Soil Engineering. | BIS, New Delhi | |
| 8 | Is 1892-1979-Code of Practice For Sub Surface Investigation of Foundation | BIS, New Delhi | |
| 9 | Is 2720-Test For Soil Part 1-1983 | BIS, New Delhi | |

E-References:

1. https://en.wikipedia.org/wiki/Soil_mechanics
2. <https://www.nap.edu/read/11558/chapter/9>
3. <https://ascelibrary.org/doi/pdf/10.1061/9780784412886.bm02>
4. <https://www.springer.com/journal/11204>
5. <http://www.nationallibrary.gov.in>

CO Vs PO and CO Vs PSO Mapping (CIVIL ENGINEERING)

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 2 | 3 | 1 | 1 | 1 | 1 | 1 | -- | 2 | 1 |
| CO2 | 2 | 3 | 3 | 3 | 2 | 2 | 2 | -- | 2 | 1 |
| CO3 | 2 | 3 | 3 | 3 | 2 | 2 | 2 | -- | 2 | 1 |
| CO4 | 1 | 3 | 2 | 2 | 2 | 1 | 1 | -- | 2 | 1 |
| CO5 | 2 | 3 | 3 | 2 | 2 | 1 | 1 | -- | 2 | 1 |

| | | | | | | | | | | |
|-----|---|---|---|---|---|---|---|----|---|---|
| CO6 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | -- | 2 | 1 |
|-----|---|---|---|---|---|---|---|----|---|---|

Industry Consultation Committee:

| Sr. No | Name | Designation | Institute/Organisation |
|--------|---------------------|-------------------------------|---------------------------|
| 1 | Mr. Rohan Deokar | Deputy Engineer | MMRDA |
| 2 | Mr. Sanjay Kulkarni | Surveyor and Consultant | SRKulkarni Pvt.Firm |
| 3 | Mr. K.V. Kelgandre | Sr. Lecturer in Civil Engg. | K.J. Somaiya Polytechnic |
| 4 | Ms. S. S. Ekbote | Lecturer in Applied Mechanics | Govt. Polytechnic Solapur |

Coordinator,
Curriculum Development,
Department of Civil Engineering

Head of Department
Department of Civil Engineering

I/C, Curriculum Development Cell

Principal



| | | | | | | | | | | |
|--|-----------|----|-----------|--|---------------|--------------|----|-----------|-----------|-----------|
| Programme : Diploma in CE/EE/EC/CO/IT/IS/LG/LT (Sandwich pattern) | | | | | | | | | | |
| Course Code: HU19102 | | | | Course Title: Environmental Studies | | | | | | |
| Compulsory / Optional: Compulsory | | | | | | | | | | |
| Teaching Scheme and Credits | | | | Examination Scheme | | | | | | |
| L | P | TU | Total | TH (2 Hrs 30 min) | TS1 (1 Hr) | TS2 (1Hr) | PR | OR | TW | Total |
| -- | 02 | -- | 02 | -- | -- | -- | -- | 25 | 25 | 50 |

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination
 Note: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill test are to be conducted. First skill test at mid term and second skill test at the end of the term

Rationale:

Technicians working in industries or elsewhere essentially require the knowledge of environmental Studies so as to enable them to work and produce most efficient, economical and eco-friendly finished products. Solve various engineering problems applying ecosystem to produce eco – friendly products. Use relevant air and noise control method to solve domestic and industrial problems. Use relevant water and soil control method to solve domestic and industrial problems. To recognize relevant energy sources required for domestic and industrial problems. Solve local solid and e-waste problems.

Course Outcomes: Student should be able to

| | |
|-----|--|
| CO1 | Understand the ecosystem and terminology and solve various engineering problems applying ecosystem knowledge to produce eco – friendly products. |
| CO2 | Understand the suitable air, extent of noise pollution, and control measures and acts. |
| CO3 | Understand the water and soil pollution, and control measures and acts. |
| CO4 | Understand different renewable energy resources and efficient process of harvesting. |
| CO5 | Understand Solid Waste Management & E Waste Management, ISO 14000, 45001 & Environmental Management. |

Course Content Details:

| Unit No | Topics / Sub-topics |
|----------|--|
| 1 | Ecosystem 1.1 Structure of ecosystem, biotic & Abiotic components 1.2 Food chain and food web 1.3 Aquatic (Lentic and Lotic) and terrestrial ecosystem 1.4 Carbon, Nitrogen, Sulphur, Phosphorus cycle 1.5 Global warming -Causes, effects, process, Green House Effect, Ozone depletion Course Outcome: CO1 Teaching Hours : 6 hrs Marks: 03 (R- NA, U-NA, A- NA) |
| | Air and Noise Pollution 2.1 Definition of pollution and pollutant, Natural and manmade sources of air pollution (Refrigerants, I.C., Boiler) 2.2 Air Pollutants: Types, Particulate Pollutants: Effects and control (Bag filter, Cyclone |

| | |
|---|---|
| | separator, Electrostatic Precipitator) 2.3 Gaseous Pollution Control: Absorber, Catalytic Converter, Effects of air pollution due to Refrigerants, I.C., Boiler 2.4 Noise pollution: sources of pollution, measurement of pollution level, Effects of Noise pollution Course Outcome: CO2 Teaching Hours : 6 hrs Marks: 05 (R- NA, U-NA, A- NA) |
| 3 | Water and Soil Pollution 3.1 Sources of water pollution, Types of water pollutants, Characteristics of water pollutants Turbidity, pH, total suspended solids, total solids BOD and COD: Definition 3.2 Waste Water Treatment: Primary methods: sedimentation, froth floatation, Secondary methods: Activated sludge treatment, Trickling filter, Bioreactor, Tertiary Method: Membrane separation technology, RO (reverse osmosis) 3.3 Causes, Effects and Preventive measures of Soil Pollution : Causes – Excessive use of Fertilizers, Pesticides and Insecticides, Irrigation, E-waste 3.4 Mangroves : Importance, benefits. Course Outcome:CO3 Teaching Hours : 6 hrs Marks: 05 (R- NA, U-NA, A- NA) |
| 4 | Renewable sources of Energy 4.1 Solar Energy: Basics of Solar energy. Flat plate collector (Liquid & Air). Theory of flat plate collector. Importance of coating. Advanced collector. Solar pond. Solar water heater, solar dryer. Solar stills. 4.2 Biomass: Overview of biomass as energy source. Thermal characteristics of biomass as fuel. Anaerobic digestion. Biogas production mechanism. Utilization and storage of biogas 4.3 Wind energy: Current status and future prospects of wind energy. Wind energy in India. Environmental benefits and problem of wind energy 4.4 New Energy Sources: Need of new sources. Different types new energy sources. Applications of (Hydrogen energy, Ocean energy resources, Tidal energy conversion) Concept, origin and power plants of geothermal energy Course Outcome:CO4 Teaching Hours : 6 hrs Marks:05 (R- NA, U-NA, A- NA) |
| 5 | Solid Waste Management OR E- Waste Management, ISO 14000 & Environmental Management For Civil Engineering : 5.1 Solid waste generation- Sources and characteristics of : Municipal solid waste, E- waste, biomedical waste. 5.2 Metallic wastes and Non-Metallic wastes (lubricants, plastics, rubber) from industries. Collection and disposal: MSW (3R, principles, energy recovery, sanitary landfill), Hazardous waste 5.3 Air quality act 2004, air pollution control act 1981 and water pollution and control act1996. Structure and role of Central and state pollution control board. 5.4 Concept of Carbon Credit, Carbon Footprint. 5.5 Environmental management in fabrication industry. 5.6 ISO14000: Implementation in industries, Benefits, ISO 45001:2018 5.7 Role of MPCB in factory permit. 5.8 Green pro IGBC certification, its benefits OR For Computer Engineering & Information Technology : 5.1 E-Waste Electronic products which have become unwanted, non-working, obsolete 5.2 E-Waste Management Services 5.3 Separation of E-Waste from other waste |

| | |
|--|---|
| | 5.4 Categorization of E-Waste into old working equipments, old computers, non-working components |
| | 5.5 Authorized Recycling Facilities |
| | 5.6 Refurbishing |
| | OR |
| | For Electrical Engineering : |
| | 5.1 Various e-waste sources, their constituents, and health impacts |
| | 5.2 e-Waste Problem in India |
| | 5.3 Initiatives on building awareness in e-waste management. |
| | 5.4 Current Status of e-Waste Management & Environmental (Protection) Act 1986 |
| | 5.5 Development of waste recycling technologies. |
| | 5.6 Opportunities of e-Waste Management in India |
| | 5.7 e-Waste Management techniques |
| | OR |
| | For Electronics Engineering & Instrumentation Engineering : |
| | 5.1 Solid waste generation- Sources and characteristics of : E- waste, biomedical waste. |
| | 5.2 Toxicity due to hazardous substances in E waste and their impact |
| | 5.3 Metallic wastes and Non-Metallic wastes (lubricants, plastics, rubber) from industries. |
| | Collection and disposal: MSW (3R, principles, energy recovery, sanitary landfill), Hazardous waste |
| | 5.4 Domestic E waste disposal and E waste management |
| | 5.5 Air quality act 2004, air pollution control act 1981 and water pollution and control act 1996. Structure and role of Central and state pollution control board. |
| | 5.6 Concept of Carbon Credit, Carbon Footprint. |
| | OR |
| | For Leather Technology/ Leather Goods & Footware Technology : |
| | 5.1 Solid waste generation- Sources and characteristics of : Municipal solid waste, E- waste, biomedical waste. |
| | 5.2 Metallic wastes and Non-Metallic wastes (lubricants, plastics, rubber) from industries. |
| | Collection and disposal: MSW (3R, principles, energy recovery, sanitary landfill), Hazardous waste |
| | 5.3 Air quality act 2004, air pollution control act 1981 and water pollution and control act 1996. Structure and role of Central and state pollution control board. |
| | 5.4 Concept of Carbon Credit, Carbon Footprint. |
| | 5.5 Environmental management in fabrication industry. |
| | 5.6 ISO14000: Implementation in industries, Benefits. |
| | 5.7 Solid waste management in leather and footwear industries |
| | Course Outcome:CO5 Teaching Hours : 6 hrs Marks:07(R- NA, U-NA, A- NA) |

Note : Chapter 5 should be teach as per department mentioned.

List of tutorials:

| Sr. No. | Unit No | COs | Title of the Experiments | Hours |
|---------|------------|-----------------------|--|-------|
| 1 | 1,2,3, 4,5 | CO1,CO2, CO3,CO4, CO5 | Prepare a write up on each unit (altogether 5 in number) that summarizes the whole unit and presents important points on it. | 14 |
| 2 | 2,3 | CO2,CO3 | Visit to a local polluted site : Urban/Rural/Industrial/Agricultural and prepare a report | 4 |

| | | | | |
|--------------|---|-----|---|-----------|
| | | | based on visit. | |
| 3 | 4 | CO4 | Visit to biomass plant and prepare a report based on visit. | 6 |
| 4 | 5 | CO5 | Visit to municipal solid waste management organization or an authorized e-waste recycling plant and prepare a report based on visit. | 6 |
| Total | | | | 30 |

References/ Books:

| Sr. No. | Title | Author, Publisher, Edition and Year Of publication | ISBN |
|---------|---|--|-------------------------|
| 1 | Environmental Studies | S.C. Sharma & M.P. Poonia Khanna Publishing House, New Delhi | ISBN: 978-93-86173-09-6 |
| 2 | Understanding Chemistry | C.N.Rao Universities Press(India) Pvt. Ltd. 2011 | ISBN:13-9788173712500 |
| 3 | Waste water treatment for pollution control and reuse | Arceivala, Soli Asolekar, Shyam Mc-Graw Hill Education India Pvt. Ltd. New york, 2007 | ISBN:978-07-062099 |
| 4 | Elements of Environmental Pollution control | O.P.Gupta Khanna Publishing House, New Delhi | ISBN:13-9789382609667 |

E-References:

- 1) www.eco-prayer.org
- 2) www.teriin.org
- 3) www.cpcp.nic.in
- 4) www.cpcp.gov.in
- 5) www.indiaenvironmentportal.org.in
- 6) www.whatis.techtarget.com
- 7) www.sustainabledevelopment.un.org
- 8) www.conserve-energy-future.com
- 9) <http://www.nationallibrary.gov.in>

CO Vs PO and CO Vs PSO Mapping (Civil Engineering)

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|------------|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | 2 | 2 | 1 | 3 | 3 | 3 | -- | -- | 1 |
| CO2 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | -- | 1 | 1 |
| CO3 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | -- | 1 | 1 |
| CO4 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | -- | 1 | 1 |
| CO5 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | -- | 1 | 1 |

CO Vs PO and CO Vs PSO Mapping (Electrical Engineering)

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | 2 | 2 | 1 | 3 | 3 | 3 | -- | -- | 3 |
| CO2 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | -- | -- | 2 |
| CO3 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | -- | -- | 2 |
| CO4 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | -- | -- | 2 |
| CO5 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | -- | -- | 2 |

CO Vs PO and CO Vs PSO Mapping (Electronics Engineering)

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | 2 | 2 | 1 | 3 | 3 | 3 | -- | -- | 2 |
| CO2 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | -- | -- | -- |
| CO3 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | -- | -- | -- |
| CO4 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | -- | -- | 2 |
| CO5 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | -- | -- | 1 |

CO Vs PO and CO Vs PSO Mapping (Instrumentation Engineering)

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| CO1 | 3 | 2 | 2 | 1 | 3 | 3 | 3 | -- | -- |
| CO2 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | -- | -- |
| CO3 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | -- | -- |
| CO4 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | -- | -- |
| CO5 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | -- | -- |

CO Vs PO and CO Vs PSO Mapping (Computer Engineering)

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | 2 | 2 | 1 | 3 | 3 | 3 | -- | -- | -- |
| CO2 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | -- | -- | -- |
| CO3 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | -- | -- | -- |
| CO4 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | -- | -- | -- |
| CO5 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | -- | -- | -- |

CO Vs PO and CO Vs PSO Mapping (Information Technology)

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | 2 | 2 | 1 | 3 | 3 | 3 | -- | 3 | -- |
| CO2 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | -- | 2 | -- |
| CO3 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | -- | 2 | -- |
| CO4 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | -- | 2 | -- |
| CO5 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | -- | 3 | -- |

CO Vs PO and CO Vs PSO Mapping (Leather Technology)

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | 2 | 2 | 1 | 3 | 3 | 3 | -- | -- | 1 |
| CO2 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | -- | -- | -- |
| CO3 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | -- | -- | -- |
| CO4 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | -- | -- | -- |
| CO5 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | -- | -- | -- |

CO Vs PO and CO Vs PSO Mapping (Leather Goods & Footware Technology)

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | 2 | 2 | 1 | 3 | 3 | 3 | -- | -- | 1 |
| CO2 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | -- | -- | -- |
| CO3 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | -- | -- | -- |
| CO4 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | -- | -- | -- |
| CO5 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | -- | -- | -- |

Industry Consultation Committee:

| Sr. No | Name | Designation | Institute/Organisation |
|--------|---------------------|-----------------------------|--------------------------|
| 1 | Mr. Rohan Deokar | Deputy Engineer | MMRDA |
| 2 | Mr. Sanjay Kulkarni | Surveyor and Consultant | SRKulkarni Pvt.Firm |
| 3 | Mr. K.V. Kelgandre | Sr. Lecturer in Civil Engg. | K.J. Somaiya Polytechnic |
| 4 | Ms. S. M. Male | Lecturer in Civil Engg. | Govt. Polytechnic Mumbai |

Coordinator,
Curriculum Development,
Department of Civil Engg.

Head of Department
Department of Civil Engg.

I/C, Curriculum Development Cell

Principal



CE 19304 QGIS

1. Installation of QGIS (Foss: QGIS – English)

Outline: System requirements to install QGIS Add QGIS repositories on Ubuntu Linux OS Installation of QGIS on Ubuntu Linux OS Visit the Official QGIS Website Download QGIS installer for..

2. Downloading GIS Datasets

Outline: Basic introduction to GIS Download open source vector datasets from Natural Earth Data website About geospatial data About vector data View vector data in QGIS Save the map i..

3. Coordinate Reference Systems

Outline: Add layers to the projections in QGIS Change the color of the layer Resize the panels on the canvas View metadata information for layers in QGIS Save selected features from a l..

4. Digitizing Map Data

Outline: Create Point and Polygon shape files Digitize Point and Polygon shape files About Toggle editing and Add Feature tools Open attribute table for Point feature Open attribute tab..

5. Importing Spreadsheets

Outline: Import spreadsheets in CSV format to create a Point layer Convert Point layer to a Polyline layer About QGIS Geoalgorithm About WMS layers Select a WMS map from Bhuvan website ..

6. Vector Data Styling

Outline: Load vector data in QGIS Open attribute table for the layer Learn to style vector layers using, Single symbol styling Categorized styling Grada..

7. Geometric Properties of Vectors

Outline: Show attribute table for a shapefile layer Show selected features from attribute table on the map Change the CRS of the layer Add columns to the attribute table Calculate stati..

8. Raster Data Styling

Outline: Information about download and save example files from the Code files link Change Coordinate Reference System for the given layer Use Identify Features tool to view the pixel va..

9. Creating a Map

Outline: Information on how to download the example files given in Code files link Add vector layer on canvas Show labels for the cities on the map About Print Composer tool Show how t..

10. Creating Dataset Using Google Earth Pro

Outline: About Google Earth Pro program. Download and install Google Earth Pro on Ubuntu Linux 16.04. Navigate Google Earth Pro. Create a point dataset for a few locations in Maharashtra..

11. Plugins

Outline: Information about the Plugins Enable Core Plugins Install an External Plugin Locate a Plugin on QGIS interface Install QuickMapServices Plugin Download OpenStreetMap data Us..

12. Table Joins and Spatial Joins

Outline: Load vector layer on QGIS canvas Open attribute table for the layer About different types of combining attribute data Add Delimited Text Layer on QGIS canvas Join the attribut..

13. Nearest Neighbour Analysis

Outline: Open shape files showing locations of volcanoes and cities on QGIS canvas Open attribute table for the layers About Nearest Neighbour Analysis Statistical analysis using Distanc..

14. DEM Analysis

Outline: About Digital Elevation Model (DEM) analysis Open Shuttle Radar Topography Mission (SRTM) data website Download DEM data from SRTM data website Save DEM data from SRTM data webs..

15. Create Contour Lines

Outline: Add DEM on QGIS map canvas Clip area in DEM using Clipper tool About contour lines Show contour lines for the DEM Change the color of the contour lines Open attribute table fo..

16. Interpolation

Outline: About Interpolation Methods of interpolation Load the vector layer on QGIS canvas Label the Point features on the map Enable Interpolation Plugin About Inverse Distance Weight..



Government Polytechnic, Mumbai

Department of Civil Engineering

**P-19 Curriculum
(Sandwich Pattern)**

**Semester-IV
(Course Contents)**

GOVERNMENT POLYTECHNIC MUMBAI
 (Academically Autonomously Institute, Government of Maharashtra)
Teaching and Examination Scheme (P19)
With effect from AY 2019-20

Programme: Diploma in Civil Engineering (Sandwich Pattern)

Term / Semester - IV

| Course Code | Course Title | Teaching Hours/Contact Hours | | | | Credits | Examination Scheme (Marks) | | | | | | |
|-------------|--------------------------------------|------------------------------|----------------|----|-------|----------------|----------------------------|-----|-----|----|-----|-----|-------|
| | | L | P | TU | Total | | Theory | | | PR | OR | TW | Total |
| | | | | | | | TH | TS1 | TS2 | | | | |
| AM19401 | Theory of Structures | 4 | -- | 01 | 5 | 5 | 60 | 20 | 20 | -- | -- | -- | 100 |
| AM19402 | Concrete Technology | 4 | 2 | -- | 6 | 6 | 60 | 20 | 20 | -- | -- | 25 | 125 |
| CE19401 | Hydraulics | 3 | 2 | -- | 5 | 5 | 60 | 20 | 20 | -- | 25 | -- | 125 |
| CE19402 | Environmental Engineering | 4 | 2 | -- | 6 | 6 | 60 | 20 | 20 | -- | 25* | 25 | 150 |
| CE19403 | Computer Aided Drafting | 1 | 4 | -- | 5 | 5 | -- | -- | -- | 50 | -- | 50 | 100 |
| | Elective – I (Any one) | 4 | -- | -- | 4 | 4 | 60 | 20 | 20 | -- | -- | -- | 100 |
| CE19404 | Repairs & Rehabilitation of Building | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| CE19405 | Building Services & Maintenance | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| CE19406 | Material Management | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| CE19407 | Safety & Quality Control | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| CE19408 | QCAD (5) (Spoken Tutorials) | -- | 4 [#] | -- | 4 | 4 [#] | -- | -- | -- | -- | -- | -- | -- |
| | Total | 20 | 14 | 01 | 35 | 35 | 300 | 100 | 100 | 50 | 50 | 100 | 700 |

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment)

* Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination

Note: Duration of Examination--TS1&TS2 -1 hour , TH- 2 hours 30 minutes, PR/OR – 3 hours per batch , SCA- Library - 1 hour, Sports- 2 hours, Creative Activity-2 hours
 Self, on- line learning Mode through MOOCs /Spoken Tutorials / NPTEL / SWAYAM / FOSSEE etc.

Department Coordinator,
Curriculum Development,
Dept. of Civil Engineering

Head of Department
Dept. of Civil Engineering

In-Charge
Curriculum Development Cell

Principal

| | | | | | | | | | | |
|--|-----------|-----------|-----------|---|---------------|--------------|-----------|-----------|-----------|------------|
| Programme : Diploma in Civil Engineering (Sandwich Pattern) | | | | | | | | | | |
| Course Code: AM19401 | | | | Course Title: Theory of Structures | | | | | | |
| Compulsory / Optional: Compulsory | | | | | | | | | | |
| Teaching Scheme and Credits | | | | Examination Scheme | | | | | | |
| TH | PR | TU | Total | TH (2 Hrs 30 min) | TS1 (1 Hr) | TS2 (1Hr) | PR | OR | TW | Total |
| 04 | -- | 01 | 05 | 60 | 20 | 20 | -- | -- | -- | 100 |

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination
 Note: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill test are to be conducted. First skill test at mid term and second skill test at the end of the term

Rationale :

This course deals with analysis of forces and stresses in structures. This forms base for developing the concepts required in the design of various structures. The application of theoretical principles and laws are applied to field situation to solve field problems which enables the students in understanding concepts.

Course Outcomes: Student should be able to

| | |
|-----|---|
| CO1 | Analyze stresses induced in vertical member subjected to direct and bending loads. |
| CO2 | Analyze slope and Deflection in fixed and continuous beams. |
| CO3 | Analyze continuous beam under different loading conditions using the principles of Three Moments. |
| CO4 | Analyze continuous beam using Moment Distribution Method under different loading conditions. |
| CO5 | Evaluate axial forces in the members of simple truss. |

Course Content Details:

| Unit No | Topics / Sub-topics |
|----------|---|
| 1 | Direct and Bending Stresses in vertical members : 1.1 Introduction to axial and eccentric loads, eccentricity about one principal axis only, nature of stresses, Maximum and minimum stresses, resultant stresses and distribution diagram. 1.2 Condition for no tension or zero stress at extreme fiber, Limit of eccentricity, core of section for rectangular and circular cross sections, Middle third rule. 1.3 Chimneys of circular cross section subjected to wind pressure, Maximum and minimum stresses, resultant stresses and distribution diagram at base. 1.4 Analysis of dams subjected to horizontal water pressure, conditions of stability, Maximum and minimum stresses, resultant stresses and distribution diagram at base. Course Outcome: CO1 Teaching Hours : 12 hrs Marks: 12 (R- 4, U-4, A-4) |

| | |
|---|---|
| 2 | <p>Fixed and Continuous Beam :</p> <p>2.1 Concept of fixity, effect of fixity, advantages and disadvantages of fixed beam over simply supported beam.</p> <p>2.2 Principle of superposition, Fixed end moments from first principle for beam subjected to point load, UDL over entire span.</p> <p>2.3 Application of standard formulae in finding end moments, end reactions and drawing S.F. and B.M. diagrams for a fixed beam.</p> <p>2.4 Definition, effect of continuity, nature of moments induced due to continuity, concept of deflected shape, practical examples.</p> <p>2.5 Clapeyron's theorem of three moment (no derivation), Application of Clapeyron's theorem maximum up to three spans and two unknown support moment only, Support at same level spans having same and uniform moment of inertia subjected to concentrated loads and uniformly distributed loads over entire span.</p> <p>2.6 Drawing SF diagrams showing point of contraflexure, shear and BM diagrams showing net BM and point of contraflexure for continuous beams.</p> <p>Course Outcome: CO3 Teaching Hours:16 hrs Marks: 14 (R- 4, U- 4, A- 6)</p> |
| 3 | <p>Moment distribution method :</p> <p>3.1 Introduction to moment distribution method, sign convention, Carry over factor, stiffness factor, distribution factor.</p> <p>3.2 Application of moment distribution method to various types of continuous beams subjected to concentrated loads and uniformly distributed load over entire span having same or different moment of inertia, supports at same level, up to three spans and two unknown support moments only.</p> <p>3.3 Introduction to portal frames – Symmetrical and unsymmetrical portal frames with the concept of Bays and stories.</p> <p>Course Outcome: CO4 Teaching Hours: 12 hrs Marks: 12 (R- 2, U- 4, A- 6)</p> |
| 4 | <p>Slope and Deflection:</p> <p>4.1 Concept of slope and deflection, stiffness of beams, Relation among bending moment, slope, deflection and radius of curvature, (no derivation).</p> <p>4.2 Double integration method to find slope and deflection of cantilever and simply supported beams subjected to concentrated load and uniformly distributed load on entire span.</p> <p>4.3 Macaulay's method for slope and deflection, application to cantilever and simply supported beam subjected to concentrated and uniformly distributed load on entire span.</p> <p>Course Outcome: CO2 Teaching Hours: 12 hrs Marks: 12 (R-2, U- 4, A- 6)</p> |
| 5 | <p>Simple trusses:</p> <p>5.1 Types of trusses (Simple, Fink, compound fink, French truss, pratt truss, Howe truss, North light truss, King post and Queen post truss)</p> <p>5.2 Calculate support reactions for trusses subjected to point loads at joints</p> <p>5.3 Calculate forces in members of truss using Method of joints and Method of sections.</p> <p>Course Outcome: CO5 Teaching Hours: 8 hrs Marks: 10 (R- 2, U- 2, A- 6)</p> |

Suggested Specifications Table (Theory):

| Unit No | Topic Title | Distribution of Theory Marks | | | |
|---------|---|------------------------------|---------|---------|-------------|
| | | R Level | U Level | A Level | Total Marks |
| 1 | Direct and Bending Stresses in vertical members | 4 | 4 | 4 | 12 |
| 2 | Fixed and Continuous Beam | 4 | 4 | 6 | 14 |

| | | | | | |
|--------------|----------------------------|-----------|-----------|-----------|-----------|
| 3 | Moment distribution method | 2 | 4 | 6 | 12 |
| 4 | Slope and Deflection | 2 | 4 | 6 | 12 |
| 5 | Simple trusses | 2 | 2 | 6 | 10 |
| Total | | 14 | 20 | 26 | 60 |

List of Tutorials:

| Sr. No. | Unit No | COs | Title of the Tutorials | Hours |
|---------|---------|--------------|--|-----------|
| 1 | 01 | CO1 | Assignment 1 : Solving of four problems on Bending Stresses in vertical members. | 02 |
| 2 | 02 | CO2 | Assignment 2 : Solving of four problems on Slope and Deflection. | 02 |
| 3 | 03 | CO3 | Assignment 3 : Solving of three problems on Fixed Beam. | 02 |
| 4 | 03 | CO3 | Assignment 3 : Solving of three problems on Continuous Beam. | 03 |
| 5 | 04 | CO4 | Assignment 4 : Solving of four problems on Moment distribution method. | 02 |
| 6 | 05 | CO5 | Assignment 5 : Solving of four problems Simple trusses. | 04 |
| | | Total | | 15 |

References/ Books:

| Sr. No. | Title | Author, Publisher, Edition and Year Of publication | ISBN |
|---------|--|--|--|
| 1 | Theory of structures | Ramamrutham.S, Dhanpatrai & Sons. | ISBN-10: 935216427X; ISBN-13: 978-9352164271 |
| 2 | Theory of structures | Khurmi, R. S. , S. Chand and Co., New Delhi. | ISBN 10: 812192829X ISBN 13: 9788121928298 |
| 3 | Structural Analysis Vol-1 | Bhavikatti, S S , Vikas Publishing House Pvt Ltd.New Delhi. | ISBN 10: 8125942696 ISBN 13: 9788125942696 |
| 4 | Mechanics of structures, Volume-I and II | Junnarkar, S. B. , Charotar Publishing House, Anand. | ISBN :9789385039270988 ISBN 978-93-85039-02-7 |
| 5 | Theory of Structures | Pandit, G.S. and Gupta, S.P., Tata McGraw Hill, New Delhi. | ISBN : 0074634933, 9780074634936 |

E-References:

1. <http://www.coursera.org>
2. <http://www.newcastle.edu.au>
3. <http://www.elsevier.com>
4. <http://www.civilenggforall.com>
5. <http://www.nationallibrary.gov.in>

CO Vs PO and CO Vs PSO Mapping (CIVIL ENGINEERING)

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | 3 | 3 | -- | 1 | -- | 1 | 1 | -- | -- |
| CO2 | 3 | 3 | 3 | -- | 1 | -- | 1 | 1 | -- | -- |
| CO3 | 3 | 3 | 3 | -- | 1 | -- | 1 | 1 | -- | -- |
| CO4 | 3 | 3 | 3 | -- | 1 | -- | 1 | 1 | -- | -- |
| CO5 | 3 | 3 | 3 | -- | 1 | -- | 1 | 1 | -- | -- |

Industry Consultation Committee:

| Sr. No | Name | Designation | Institute/Organisation |
|--------|---------------------|-----------------------------|--------------------------|
| 1 | Mr. Rohan Deokar | Deputy Engineer | MMRDA |
| 2 | Mr. Sanjay Kulkarni | Surveyor and Consultant | SRKulkarni Pvt.Firm |
| 3 | Mr. K.V. Kelgandre | Sr. Lecturer in Civil Engg. | K.J. Somaiya Polytechnic |
| 4 | Ms. S. D. Deshpande | Principal | Govt. Polytechnic Mumbai |

Coordinator,
Curriculum Development,
Department of Civil Engineering

Head of Department
Department of Civil Engineering

I/C, Curriculum Development Cell

Principal

| | | | | | | | | | | |
|--|-----------|-----------|-----------|--|---------------|--------------|-----------|-----------|-----------|------------|
| Programme : Diploma in Civil Engineering (Sandwich Pattern) | | | | | | | | | | |
| Course Code: AM19402 | | | | Course Title: Concrete Technology | | | | | | |
| Compulsory / Optional: Compulsory | | | | | | | | | | |
| Teaching Scheme and Credits | | | | Examination Scheme | | | | | | |
| TH | PR | TU | Total | TH (2 Hrs 30 min) | TS1 (1 Hr) | TS2 (1Hr) | PR | OR | TW | Total |
| 04 | 02 | -- | 06 | 60 | 20 | 20 | -- | -- | 25 | 125 |

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination
 Note: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill test are to be conducted. First skill test at mid term and second skill test at the end of the term

Rationale :

Concrete is most widely used construction material in all types of Civil Engineering Structures. The Civil Engineering technician has to plan, supervise and ensure the quality of final product of concrete, i.e. its durability, strength, tolerance, appearance & finish. To discharge his duties effectively, he must be able to supervise the concrete construction at all stages of concrete chain, which broadly consists of making of concrete and interaction of its various ingredients both in plastic and hardened stage. For this purpose, a technician must know the basic properties of concrete as well as of its ingredients like cement, aggregates, water and admixtures, etc. He should learn and practice the basic principles governing the strength, durability and workability of concrete. He should understand the basic principles of mix-design and develop supervisory skills required for various operations in concrete construction.

Course Outcomes: Student should be able to

| | |
|-----|--|
| CO1 | Use different types of cement and aggregates in concrete . |
| CO2 | Prepare concrete of desired compressive strength. |
| CO3 | Prepare concrete of required specification. |
| CO4 | Maintain quality of concrete under different conditions. |
| CO5 | Apply relevant admixtures for concreting. |

Course Content Details:

| Unit No | Topics / Sub-topics |
|----------|---|
| 1 | Cement, Aggregates and Water: 1.1 Physical properties of Cement: fineness, standard consistency, setting time, soundness, compressive strength. Relevant BIS codes 1.2 Testing of cement: Laboratory tests-fineness, standard consistency, setting time, soundness, compressive strength. Storage of cement and effect of storage on properties of cement. |

| | |
|---|---|
| | <p>1.3 BIS Specifications and field applications of different types of cements: Rapid hardening, Low heat, Portland pozzolana, Portland slag, Composite slag, High Alumina and White cement.</p> <p>1.4 Aggregates: Requirements of good aggregate, Classification according to size and shape.</p> <p>1.5 Fine aggregates: Properties, size, specific gravity, bulk density, water absorption and bulking, fineness modulus and grading zone of sand, silt content and their specification as per IS 383. Concept of crushed Sand, manufactured sand, slag sand.</p> <p>1.6 Coarse aggregates: Properties, size, shape, surface texture, water absorption, soundness, specific gravity and bulk density, fineness modulus of coarse aggregate, grading of coarse aggregates, crushing value, impact value and abrasion value of coarse aggregates with specifications, Replacement of metal as GGBFS.</p> <p>1.7 Water: Quality of water, impurities in mixing water and permissible limits for solids as per IS: 456.</p> <p>Course Outcome: CO1 Teaching Hours : 14 hrs Marks: 14 (R-6, U-6, A-2)</p> |
| 2 | <p>Concrete:</p> <p>2.1 Concrete: Different grades of concrete, provisions of IS 456.</p> <p>2.2 Duff Abraham water cement (w/c) ratio law, significance of w/c ratio, selection of w/c ratio for different grades, maximum w/c ratio for different grades of concrete for different exposure conditions as per IS 456.</p> <p>2.3 Properties of fresh concrete: Workability: Factors affecting workability of concrete. Determination of workability of concrete by slump cone, compaction factor, Vee-Bee Consistometer, flow table test. Value of workability requirement for different types of concrete works. Segregation, bleeding and preventive measures.</p> <p>2.4 Properties of Hardened concrete: Strength, Durability, Impermeability, hydration of cement.</p> <p>Course Outcome: CO2 Teaching Hours: 12 hrs Marks: 12 (R-4, U-4, A-4)</p> |
| 3 | <p>Concrete Mix Design and Testing of Concrete:</p> <p>3.1 Concrete mix design: Objectives, methods of mix design, study of mix design as per IS 10262 (only procedural steps).</p> <p>3.2 Testing of concrete, determination of compressive strength of concrete cubes at different ages, interpretation and co-relation of test results, relation between cylinder strength and cube strength.</p> <p>3.3 Non- destructive testing of concrete: Rebound hammer test, working principle of rebound hammer and factor affecting the rebound index, Ultrasonic pulse velocity test as per IS13311 (part 1 and 2), Importance of NDT tests.</p> <p>Course Outcome: CO3 Teaching Hours: 12 hrs Marks: 10 (R-2, U-4, A- 4)</p> |
| 4 | <p>Quality Control of Concrete:</p> <p>4.1 Concreting Operations: Batching, Mixing, Transportation, Placing, Compaction, Curing and Finishing of concrete.</p> <p>4.2 Forms for concreting: Different types of form works for beams, slabs, columns, materials used for form work, requirement of good form work. Stripping time for removal of form works per IS 456.</p> <p>4.3 Curing methodology.</p> <p>4.4 Joints in concrete construction: Types of joints, methods for joining old and new concrete, materials used for filling joints.</p> <p>4.5 Durability of concrete.</p> <p>Course Outcome: CO4 Teaching Hours: 10 hrs Marks: 12 (R-4, U-4, A-4)</p> |

| | |
|----------|--|
| 5 | Chemical Admixture, Special Concrete and Extreme Weather concreting: |
| | 5.1 Admixtures in concrete: Purpose, properties and application for different types of admixture such as accelerating admixtures, retarding admixtures, water reducing admixtures, air entraining admixtures and super plasticizers (Ligno, SMF, SMI, PCE). Micro silica fume. |
| | 5.2 Special Concrete: Properties, advantages and limitation of following types of Special concrete: Ready mix Concrete, Fiber Reinforced Concrete, High performance Concrete Self-compacting concrete and light weight concrete, geopolymer concrete. |
| | 5.3 Cold weather concreting: effect of cold weather on concrete, precautions to be taken while concreting in cold weather condition. |
| | 5.4 Hot weather concreting: effect of hot weather on concrete, precautions to be taken while concreting in hot weather condition. |
| | 5.5 Mass concreting. |
| | Course Outcome: CO5 Teaching Hours: 12 hrs Marks: 12 (R-4, U-4, A-4) |

Suggested Specifications Table (Theory):

| Unit No | Topic Title | Distribution of Theory Marks | | | |
|--------------|---|------------------------------|-----------|-----------|-------------|
| | | R Level | U Level | A Level | Total Marks |
| 1 | Cement, Aggregates and Water | 6 | 6 | 2 | 12 |
| 2 | Concrete | 4 | 4 | 4 | 12 |
| 3 | Concrete Mix Design and Testing of Concrete | 2 | 4 | 4 | 10 |
| 4 | Quality Control of Concrete | 4 | 4 | 4 | 12 |
| 5 | Chemical Admixture, Special Concrete and Extreme Weather concreting | 4 | 4 | 4 | 12 |
| Total | | 20 | 22 | 18 | 60 |

List of experiments:

| Sr. No. | Unit No | COs | Title of the Experiments | Hours |
|---------|---------|-----|--|-------|
| 1 | 01 | CO1 | Determine fineness of cement by Blaine's air permeability apparatus Or by sieving. | 02 |
| 2 | 01 | CO1 | Determine specific gravity, standard consistency, initial and final setting times of cement. | 02 |
| 3 | 01 | CO1 | Determine compressive strength of cement. | 02 |
| 4 | 01 | CO1 | Determine silt content in sand. | 02 |
| 5 | 01 | CO1 | Determine bulking of sand, bulk density of sand and coarse aggregate | 02 |
| 6 | 01 | CO1 | Determine water absorption of fine and coarse aggregates. | 02 |
| 7 | 01 | CO1 | Determine Fineness modulus of fine aggregate by sieve analysis. | 02 |
| 8 | 01 | CO1 | Determine impact value of aggregate. | 02 |
| 9 | 01 | CO1 | Determine crushing value of aggregate. | 02 |
| 10 | 01 | CO1 | Determine abrasion value of aggregate. | 02 |

| | | | | |
|----|----|--------------|---|-----------|
| 11 | 01 | CO1 | Determine elongation and flakiness index of coarse aggregates. | 02 |
| 12 | 02 | CO2 | Determine workability of concrete by slump cone test. | 02 |
| 13 | 02 | CO2 | Determine workability of concrete by compaction factor test. | 02 |
| 14 | 03 | CO3 | To prepare concrete mix of a particular grade and determine compressive strength of concrete for 7 and 28 days. | 02 |
| 15 | 05 | CO5 | Demonstration of NDT equipments . | 02 |
| | | Total | | 30 |

References/ Books:

| Sr. No. | Title | Author, Publisher, Edition and Year Of publication | ISBN |
|---------|--|--|--|
| 1 | Concrete Technology | Gambhir, M.L., Tata McGraw Hill Publishing Co. Ltd., Delhi. | ISBN-13 9781259062551 |
| 2 | Concrete Technology | Shetty, M.S., S. Chand and Co. Pvt. Ltd., Ram Nagar, Delhi. | ISBN : 978-81-219-0003-4 |
| 3 | Concrete Technology | Santhakumar, A. R., Oxford University Press, New Delhi. | ISBN-10: 0199458529; ISBN-13: 978-0199458523 |
| 4 | Concrete Technology | Neville, A. M. and Brooks, J.J., Pearson Education Pvt. Ltd. | ISBN 10: 9353436559 ISBN 13: 9789353436551 |
| 5 | Laboratory Manual in Concrete Technology | Sood, H., Kulkarni P. D., Mittal L. N., CBS Publishers, New Delhi. | ISBN : 8123909411, 9788123909417 |
| 6 | IS 456 : 2000 | BIS, New Delhi | --- |
| 7 | IS 383 | BIS, New Delhi | --- |
| 8 | IS 4031 | BIS, New Delhi | --- |

E-References:

1. <http://www.cement.org>
2. <http://www.j-act.org>
3. <http://www.indianconcreteinstitute.org>
4. <http://econcretetech.com>
5. <http://theconstructor.org>
6. <http://www.nationallibrary.gov.in>

CO Vs PO and CO Vs PSO Mapping (CIVIL ENGINEERING)

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | 1 | -- | 3 | 2 | -- | -- | -- | 3 | -- |
| CO2 | 3 | 2 | -- | 3 | 2 | 1 | 1 | -- | 3 | -- |
| CO3 | 3 | 2 | 3 | 3 | 2 | 1 | 1 | -- | 3 | -- |
| CO4 | 3 | 2 | 1 | 3 | 2 | 1 | 2 | -- | 3 | -- |

| | | | | | | | | | | |
|------------|---|---|----|---|---|----|---|----|---|----|
| CO5 | 3 | 2 | -- | 3 | 3 | -- | 2 | -- | 3 | -- |
|------------|---|---|----|---|---|----|---|----|---|----|

Industry Consultation Committee:

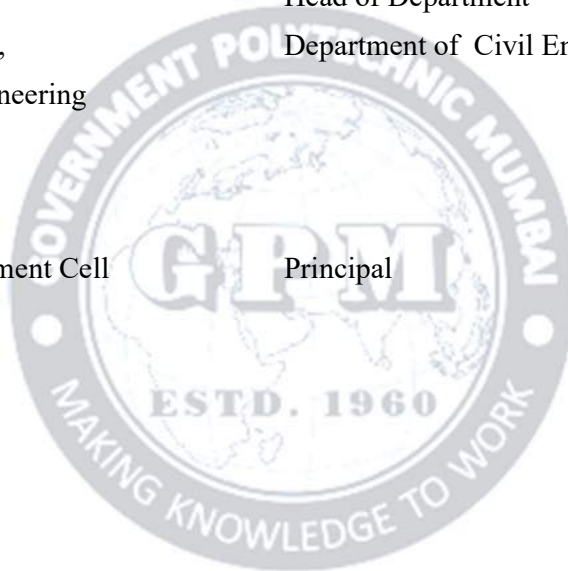
| Sr. No | Name | Designation | Institute/Organisation |
|---------------|---------------------|-----------------------------|-------------------------------|
| 1 | Mr. Rohan Deokar | Deputy Engineer | MMRDA |
| 2 | Mr. Sanjay Kulkarni | Surveyor and Consultant | SRKulkarni Pvt.Firm |
| 3 | Mr. K.V. Kelgandre | Sr. Lecturer in Civil Engg. | K.J. Somaiya Polytechnic |
| 4 | Ms. S.D.Deshpande | Principal | Govt. Polytechnic Mumbai |

Coordinator,
Curriculum Development,
Department of Civil Engineering

Head of Department
Department of Civil Engineering

I/C, Curriculum Development Cell

Principal



| | | | | | | | | | | |
|--|-----------|-----------|-----------|---------------------------------|---------------|--------------|-----------|-----------|-----------|------------|
| Programme : Diploma in Civil Engineering (Sandwich Pattern) | | | | | | | | | | |
| Course Code: CE19401 | | | | Course Title: Hydraulics | | | | | | |
| Compulsory / Optional: Compulsory | | | | | | | | | | |
| Teaching Scheme and Credits | | | | Examination Scheme | | | | | | |
| L | P | TU | Total | TH (2 Hrs 30 min) | TS1 (1 Hr) | TS2 (1Hr) | PR | OR | TW | Total |
| 03 | 02 | -- | 05 | 60 | 20 | 20 | -- | 25 | -- | 125 |

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination
 Note: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill test are to be conducted. First skill test at mid term and second skill test at the end of the term.

Rationale:

This course is classified under basic technology course and describes facts, concepts, principles and techniques of scientific investigation in the given field. This subject deals with behavior of static or flowing water which is important liquid to be studied in Irrigation Engineering., Water Supply Engineering., and Transportation Engineering. because its behaviour affects design and construction techniques of Civil Engineering structures in Irrigation, Water Engineering and Highway Engineering Building construction is a core course in civil engineering.

Course Outcomes: Student should be able to

| | |
|-----|---|
| CO1 | Understand various terms associated with hydraulics. |
| CO2 | Measure pressure and determine total hydrostatic pressure for different conditions. |
| CO3 | Understand various parameters associated with fluid flow. |
| CO4 | Determine head loss of fluid flow through pipes. |
| CO5 | Find the fluid flow parameters in open channels. |
| CO6 | Select relevant hydraulic pumps for different applications. |

Course Content Details:

| Unit No | Topics / Sub-topics |
|---------|--|
| 1 | Technical terms used in Hydraulics : 1.1 Fluid, fluid mechanics, hydraulics, hydrostatics, hydrokinematics, hydrodynamics, ideal and real fluid, application of hydraulics. 1.2 Physical properties of fluid – density-specific volume, specific gravity, surface tension, capillarity, viscosity-Newton's law of viscosity. Course Outcome: CO1 Teaching Hours : 3 hrs Marks: 04 (R- 2, U-2, A- 0) |
| 2 | Pressure measurement and Hydrostatic pressure : 2.1 Various types of pressure – Atmospheric Pressure, Gauge Pressure, Absolute Pressure, Vacuum Pressure. Concept of Pressure head and its unit, Pascal's law of fluid pressure and its uses. 2.2 Measurement of differential Pressure by different methods. 2.3 Variation of pressure with depth, Pressure diagram, hydrostatic pressure and center of |

| | |
|---|---|
| | <p>pressure on immersed surfaces and on tank walls.</p> <p>2.4 Determination of total pressure and center of pressure on sides and bottom of water tanks, sides and bottom of tanks containing two liquids, vertical surface in contact with liquid on either side.</p> <p>Course Outcome: CO2 Teaching Hours : 10 hrs Marks: 12 (R- 2, U-4, A- 6)</p> |
| 3 | <p>Fluid Flow Parameters</p> <p>3.1 Types of flow – Gravity and pressure flow, Laminar, Turbulent, Uniform, Non-uniform, Steady, Unsteady flow. Reynolds number.</p> <p>3.2 Discharge and its unit, continuity equation of flow.</p> <p>3.3 Energy of flowing liquid: potential, kinetic and pressure energy.</p> <p>3.4 Bernoulli's theorem : statement, assumptions, equation.</p> <p>Course Outcome: CO3 Teaching Hours : 8 hrs Marks: 10 (R-2 , U-8, A-0)</p> |
| 4 | <p>Flow through pipes</p> <p>4.1 Major head loss in pipe: Frictional loss and its computation by Darcy's Weisbach equation, Use of Moody's Diagram and Nomograms.</p> <p>4.2 Minor losses in pipe: loss at entrance, exit, sudden contraction, sudden enlargement and fittings.</p> <p>4.3 Flow through pipes in series, pipes in parallel and Dupuit's equation for equivalent pipe.</p> <p>4.4 Hydraulic gradient line and total energy line. Water hammer in pipes: Causes and Remedial measures.</p> <p>4.5 Discharge measuring device for pipe flow: Venturi meter - construction and working.</p> <p>4.6 Discharge measurement using Orifice, Hydraulic Coefficients of Orifice.</p> <p>Course Outcome: CO4 Teaching Hours : 10 hrs Marks: 12 (R- 4, U-2, A- 6)</p> |
| 5 | <p>Flow through Open Channel</p> <p>5.1 Geometrical properties of channel section: Wetted area, wetted perimeter, hydraulic radius for rectangular and trapezoidal channel section.</p> <p>5.2 Determination of discharge by Chezy's equation and Manning's equation.</p> <p>5.3 Conditions for most economical rectangular and trapezoidal channel section.</p> <p>5.4 Discharge measuring devices: Triangular and rectangular Notches. • Velocity measurement devices: current meter, floats and Pitot's tube.</p> <p>5.5 Specific energy diagram, Froudes number.</p> <p>Course Outcome: CO5 Teaching Hours : 10 hrs Marks: 12 (R- 2, U-4, A- 6)</p> |
| 6 | <p>Hydraulic Pumps</p> <p>6.1 Concept of pump, Types of pump - centrifugal, reciprocating, submersible.</p> <p>6.2 Centrifugal pump: components and working of Reciprocating pump: single acting and double acting, components and working.</p> <p>6.3 Suction head, delivery head, static head, Manometric head</p> <p>6.4 Power of centrifugal pump.</p> <p>6.5 Selection and choice of pump</p> <p>Course Outcome: CO6 Teaching Hours : 4 hrs Marks: 08 (R- 4, U-4, A-0)</p> |

Suggested Specifications Table (Theory):

| Unit No | Topic Title | Distribution of Theory Marks | | | |
|---------|---|------------------------------|---------|---------|-------------|
| | | R Level | U Level | A Level | Total Marks |
| 1 | Technical terms used in Hydraulics Introduction | 4 | 2 | -- | 06 |

| | | | | | |
|--------------|---|-----------|-----------|-----------|-----------|
| 2 | Pressure measurement and Hydrostatic pressure | 2 | 4 | 6 | 12 |
| 3 | Fluid Flow Parameters | 2 | 8 | -- | 10 |
| 4 | Flow through pipes | 4 | 2 | 6 | 12 |
| 5 | Flow through Open Channel | 2 | 4 | 6 | 12 |
| 6 | Hydraulic Pumps | 4 | 4 | -- | 08 |
| Total | | 18 | 24 | 18 | 60 |

List of experiments:

| /Sr. No. | Unit No | COs | Title of the Experiments | Hours |
|--------------|---------|-----|--|-----------|
| 1 | 2 | CO2 | Use piezometer to measure pressure at a given point. | 2 |
| 2 | 2 | CO2 | Use Bourdon's Gauge to measure pressure at a given point. | 2 |
| 3 | 2 | CO2 | Use U tube differential manometer to measure pressure difference between two given points. | 2 |
| 4 | 3 | CO2 | Find the resultant pressure and its position for given situation of liquid in a tank. | 2 |
| 5 | 3 | CO3 | Use Reynold's apparatus to determine type of flow. | 2 |
| 6 | 3 | CO3 | Use Bernoulli's apparatus to apply Bernoulli's theorem to get total energy line for a flow in a closed conduit of varying cross sections | 2 |
| 7 | 4 | CO4 | Use Friction factor Apparatus to determine friction factor for a given pipe | 2 |
| 8 | 4 | CO4 | Determine minor losses in pipe fittings due to sudden contraction and sudden enlargement. | 2 |
| 9 | 4 | CO4 | Determine minor losses in pipe fitting due to Bend and Elbow. | 2 |
| 10 | 4 | CO4 | Calibrate Venturimeter to find out the discharge in a pipe | 2 |
| 11 | 4 | CO4 | Calibrate the Orifice to find out the discharge through a tank | 2 |
| 12 | 4 | CO4 | Use Pitot tube to measure the velocity of flow of water in open channel. | 2 |
| 13 | 5 | CO5 | Use triangular notch and Rectangular notch to measure the discharge through open channel. | 4 |
| 14 | 6 | CO6 | Determine the efficiency of centrifugal pump. | 2 |
| Total | | | | 30 |

References/ Books:

| Sr. No. | Title | Author, Publisher, Edition and Year Of publication | ISBN |
|---------|--------------------------------|---|-----------------|
| 1 | Hydraulics and Fluid Mechanics | Modi, P. N. and Seth, S.M., Standard book house, Delhi. | ISBN;8189401262 |

| | | | |
|---|---|--|--------------------|
| 2 | A text book of Fluid mechanics and Hydraulic Machines | R.K.Bansal Laxmi publication pvt.ltd,ninth edition ,2005 | ISBN;8131808157 |
| 3 | Fluid Mechanics and Fluid Machines | Ramamrutham, and Narayan, R., Dhanpat Rai publishing Company | ISBN;9788187433842 |
| 4 | Fluid Mechanics & Hydraulic Machines, | Khanna Book Publishing Co., New Delhi | ISBN;9788187433842 |

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2. www.learnrstv.com
3. www.shiksha.com, IIT, Roorkee
4. www.blackwellpublishing.com
5. www.hrpwa.org
6. www.creativeworld9.com vii.nptel.iitm.ac.in
7. <http://www.nationallibrary.gov.in>

CO Vs PO and CO Vs PSO Mapping :

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 2 | 3 | 3 | 3 | 2 | 3 | 2 | 1 | 3 | 1 |
| CO2 | 2 | 3 | 3 | 3 | 2 | 3 | 2 | 1 | 3 | 3 |
| CO3 | 2 | 3 | 3 | 3 | 2 | 3 | 2 | 1 | 3 | 3 |
| CO4 | 2 | 3 | 3 | 3 | 2 | 3 | 2 | 1 | 3 | 3 |
| CO5 | 2 | 3 | 3 | 3 | 2 | 3 | 2 | 1 | 3 | 3 |
| CO6 | 2 | 3 | 3 | 3 | 2 | 3 | 2 | 1 | 3 | 2 |

Industry Consultation Committee:

| Sr. No | Name | Designation | Institute/Organisation |
|--------|------------------------|-----------------------------|--------------------------|
| 1 | Mr. Rohan Deokar | Deputy Engineer | MMRDA |
| 2 | Mr. Sanjay Kulkarni | Surveyor and Consultant | SRKulkarni Pvt.Firm |
| 3 | Mr. K.V. Kelgandre | Sr. Lecturer in Civil Engg. | K.J. Somaiya Polytechnic |
| 4 | Smt.Meera Anserwadekar | Sr. Lecturer in Civil Engg. | Govt. Polytechnic Mumbai |

Coordinator,
Curriculum Development,
Department of _____

Head of Department
Department of _____

I/C, Curriculum Development Cell

Principal

| | | | | | | | | | | |
|--|-----------|-----------|-----------|--|---------------|--------------|-----------|------------|-----------|------------|
| Programme : Diploma in Civil Engineering (Sandwich Pattern) | | | | | | | | | | |
| Course Code: CE19402 | | | | Course Title: Environmental Engineering | | | | | | |
| Compulsory / Optional: Compulsory | | | | | | | | | | |
| Teaching Scheme and Credits | | | | Examination Scheme | | | | | | |
| L | P | TU | Total | TH (2 Hrs 30 min) | TS1 (1 Hr) | TS2 (1Hr) | PR | OR | TW | Total |
| 04 | 02 | -- | 06 | 60 | 20 | 20 | -- | 25* | 25 | 150 |

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination
 Note: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill test are to be conducted. First skill test at mid term and second skill test at the end of the term

Rationale:

Water is a basic need of everyday living. With growing need of water for irrigation, industry, drinking water, hydropower, pollution free water has assumed greater importance. Similarly waste in form of solid and liquid if not treated and disposed of in a scientific and hygienic manner ,may lead to health hazards, The job of civil engineer is to conduct survey, collect data, prepare drawings, and supervise construction of water and waste water treatment plants .This subject is intended to teach the students concepts, principles and procedures of Environmental Engineering which will enable him to apply this knowledge for construction, supervision, execution of Environmental Engineering projects

Course Outcomes: Student should be able to

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|-----|--|
| CO1 | Calculate quantity and analyze quality of water. |
| CO2 | Select type of treatment required to raw water. |
| CO3 | Perform execution and maintenance of distribution system |
| CO4 | Perform execution and maintenance of sewerage system |
| CO5 | Decide treatment of sewage and its safe disposal |
| CO6 | Prepare layout plan for building drainage system. |

Course Content Details:

| No | Topics / Sub-topics |
|----|--|
| 1 | Water Works, Quantity and Quality of water 1.1 Water works: Necessity and importance of water works, components in water works, Components in water supply scheme 1.2 Quantity of water: Per capita demand, factors affecting rate of demand, fluctuations in demand and its effects on design of water supply units. Types of demand-Domestic, Public, Industrial, Fire fighting, Compensate losses and waste. Design period, Population forecasting- Methods of population forecasting. Sources of Water- Surface & subsurface sources, choice of source, Intake works – types, factors affecting location. |

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| | <p>1.3 Quality of water: Potable/ Wholesome water, Impurities in water, water sampling, Water analysis – Physical, Chemical, Bacteriological test and their significance. Water quality standards. Water borne diseases.</p> <p>Course Outcome: CO1 Teaching Hours :12 Marks:12 (R-4 , U- 4 , A- 4)</p> |
| 2 | <p>Treatment of Water</p> <p>2.1 Components in water treatment plant:- Object of water treatment, Flow diagram of water treatment plant, Functions of each unit, constructional details of screens chamber , aerators, grit chamber, sedimentation units, flash mixer , clariflocculator.</p> <p>2.2 Filtration – Theory of filtration, Types – slow sand; rapid sand & pressure filter.</p> <p>2.3 Disinfection:-Object of disinfection, Methods of disinfection. Chlorination- Properties of chlorine, action of chlorine. Forms of chlorination, Break point chlorination-its importance, residual chlorine. Tests for residual chlorine.</p> <p>Course Outcome: CO2 Teaching Hours :10 Marks:10 (R-2 , U- 4 , A- 4)</p> |
| 3 | <p>Conveyance and Distribution of water</p> <p>3.1 Conveyance: Meaning, pipes used in conveyance of water. Laying and testing of pipes.</p> <p>3.2 Distribution system: Gravity, Pumping and Dual system. Layouts of distribution system – dead end, grid iron, radial & ring. Requirements of a good distribution system.</p> <p>3.3 Valves- Sluice valve, air relief valve, pressure relief valve, non-return valve</p> <p>3.4 Service reservoirs- functions, types, location & capacity.</p> <p>3.5 System of supply Continuous & intermittent.</p> <p>3.6 Layout of building water supply arrangement.</p> <p>3.7 Maintenance of distribution system.</p> <p>Course Outcome:CO3 Teaching Hours :8 Marks:08 (R- 2, U- 2 , A- 4)</p> |
| 4 | <p>Sewerage systems, Design and Maintenance of sewer</p> <p>4.1 Definition of terms: Sewage, sullage, refuse, garbage, sanitary sewage, storm water. Methods of sewage collection -Conservancy & water carriage system.</p> <p>4.2 Systems of sewerage: Separate, combined & partially separate systems.</p> <p>4.3 Quantity of sewage – Factors affecting quantity of sewage, peak flow, minimum flow,</p> <p>4.4 Types of sewer based on material of construction and shapes of sewer.</p> <p>4.5 Design of sewers: Peak flow, non-scouring velocity, self-cleansing velocity, gradient of sewer, size of sewer, Laying and testing of sewers.</p> <p>4.6 Sewer appurtenances: Manholes-types, purpose, location. Inlets, Ventilation of sewers.</p> <p>4.7 Maintenance of sewers. Safety precautions during maintenance of sewers.</p> <p>Course Outcome:CO4 Teaching Hours : 12 Marks:12 (R-4 , U-4, A-4)</p> |
| 5 | <p>Characteristics, Treatment & Disposal of Sewage</p> <p>5.1 Characteristics of sewage: Physical, Chemical and biological. Strength of sewage.</p> <p>5.2 Aerobic and anaerobic decomposition, Importance of BOD and its significance, COD and its significance</p> <p>5.3 Treatment of sewage- Layout of STP, Preliminary treatment - Screening; grit removal; grease removal, Primary treatment – sedimentation & chemical precipitation, Secondary treatment – Trickling filter & activated sludge process.</p> <p>5.4 Sludge & effluent disposal-Types of sludge, method of sludge disposal. Natural & artificial methods of disposal of effluent, Miscellaneous treatment – oxidation pond & ditch,</p> |

| | |
|---|--|
| | aerated & anaerobic lagoons. Course Outcome:CO5 Teaching Hours :12 Marks:12 (R- 2 , U- 4 , A-6) |
| 6 | Building Drainage System 6.1 Systems of plumbing- Single stack, One pipe and One pipe partially ventilated, Two pipe system. 6.2 Components of house drainage system- Traps, Inspection chamber, Sanitary fittings, Layout of building drainage system, Recycling of waste water Course Outcome:CO6 Teaching Hours :6 Marks:06 (R- -- , U-2 , A-4) |

Suggested Specifications Table (Theory):

| Unit No | Topic Title | Distribution of Theory Marks | | | |
|--------------|--|------------------------------|-----------|-----------|-------------|
| | | R Level | U Level | A Level | Total Marks |
| 1 | Water Works, Quantity and Quality of water | 4 | 4 | 4 | 12 |
| 2 | Treatment of Water | 2 | 4 | 4 | 10 |
| 3 | Distribution of water | 2 | 2 | 4 | 08 |
| 4 | Sewerage systems, Design and Maintenance of sewer. | 4 | 4 | 4 | 12 |
| 5 | Characteristics, Treatment & Disposal of Sewage | 2 | 4 | 6 | 12 |
| 6 | Building Drainage System | - | 2 | 4 | 06 |
| Total | | 14 | 20 | 26 | 60 |

List of experiments/ Assignments:

| Sr. No. | Unit No | COs | Title of the Experiments/Assignment | Hours |
|--------------|---------|-----|---|-----------|
| 1 | 1 | CO1 | Conduct test on water sample to determine its 1) pH 2) Turbidity | 2 |
| 2 | 2 | CO2 | Conduct test on water sample for determination of optimum dose of coagulant. | 2 |
| 3 | 3 | CO3 | Study of different fixtures used in building water supply arrangement at G.P.Mumbai and prepare report. | 2 |
| 4 | 4 | CO4 | Assignment on maintenance of sewers. | 2 |
| 5 | 5 | CO5 | Conduct test on sewage sample to determine its 1) pH 2) Turbidity | 2 |
| 6 | 6 | CO6 | Visit to residential/ public building to study different systems of plumbing and sanitary fittings and prepare report. | 2 |
| 7 | 1 | CO1 | Collecting data regarding population of city/town and forecast population and find out total water demand. | 2 |
| 8 | 1 | CO2 | Visit to Water Treatment plant to study various treatment units and their function. Prepare detail visit report.(Compulsory) | 8 |
| 9 | 2 | CO5 | Visit to Sewage Treatment plant to study various treatment units and their function. Prepare detail visit report.(Compulsory) | 8 |
| Total | | | | 30 |

Note: All experiments are compulsory.

References/ Books:

| Sr. No. | Title | Author, Publisher, Edition and Year Of publication | ISBN |
|---------|---|---|---|
| 1 | Elements of Public Health Engg. | K.N. Duggal, S. Chand & Co. Delhi. | 9788121900126 |
| 2 | Water Supply & Waste water Engg. (Two vol.) | S. K. Garg, Khanna Publisher, Delhi | 13:978-8174091208, 8174092307 |
| 3 | Water Supply & Sanitary Engg | G.S. & J. S. Biridie, Dhanpat Rai & Sons,, Delhi | 13:978-8787433798, 9789352165773 |
| 4 | Environmental Engg | A. Kamala & D.L. Kanth Rao Tata Mc-Graw-Hill publishing co. Ltd., Delhi. | 0074517082, 9780074517086 |
| 5 | Water Supply & Sanitary Engg. | S.C.Rangwala India Publishing house Delhi. | 9789385039201 |
| 6 | Water Supply & Waste Water Engg. (Two vol.) | Dr. B.C.Punmia & Jain Laxmi Publication, Jodhpur | 13:978-8131807033, 13:978-8131805961 |
| 7 | Water Supply & Waste Water Engg. (Two vol.) | B. S. N. Raju Tata Mc-Graw-Hill publishing co. Ltd., Delhi. | 0074518739 |
| 8 | Water Supply Engg. Volume – I & II | P. N. Modi Standard book house, Delhi | 13:9788190089326 |

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2. www.icivilengineer.com
3. www.epa.net
4. www.mud/cpheeo.in
5. <http://www.nationallibrary.gov.in>

CO Vs PO and CO Vs PSO Mapping

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | 3 | 3 | 2 | 1 | 1 | 2 | 2 | 2 | 3 |
| CO2 | 3 | 3 | 3 | 2 | 2 | 1 | 2 | 2 | 2 | 3 |
| CO3 | 3 | 3 | 2 | 2 | 2 | 1 | 2 | 2 | 2 | 3 |
| CO4 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 2 | 1 | 2 | 2 | 2 | 3 |
| CO6 | 3 | 2 | 3 | 3 | 2 | 1 | 2 | 2 | 2 | 2 |

Industry Consultation Committee:

| Sr. No | Name | Designation | Institute/Organisation |
|---------------|---------------------|-----------------------------|-------------------------------|
| 1 | Mr. Rohan Deokar | Deputy Engineer | MMRDA |
| 2 | Mr. Sanjay Kulkarni | Surveyor and Consultant | SRKulkarni Pvt.Firm |
| 3 | Mr. K.V. Kelgandre | Sr. Lecturer in Civil Engg. | K.J. Somaiya Polytechnic |
| 4 | Mr. D. K. Fad | Sr. Lecturer in Civil Engg. | Govt. Polytechnic Mumbai |

Coordinator,
Curriculum Development,
Department of Civil Engg.

Head of Department
Department of Civil Engg.

I/C, Curriculum Development Cell

Principal



| | | | | | | | | | | |
|--|-----------|-----------|-----------|--|---------------|--------------|-----------|-----------|-----------|------------|
| Programme : Diploma in Civil Engineering (Sandwich Pattern) | | | | | | | | | | |
| Course Code: CE19403 | | | | Course Title: Computer Aided Drafting | | | | | | |
| Compulsory / Optional: Compulsory | | | | | | | | | | |
| Teaching Scheme and Credits | | | | Examination Scheme | | | | | | |
| TH | PR | TU | Total | TH (2Hrs 30 min) | TS1 (1 Hr) | TS2 (1Hr) | PR | OR | TW | Total |
| 01 | 04 | -- | 05 | -- | -- | -- | 50 | -- | 50 | 100 |

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination
 Note: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill test are to be conducted. First skill test at mid term and second skill test at the end of the term

Rationale :

As diploma engineer student must know more about computer operation & its applications. In order to work in software engineering fields in Civil Engineering the student must know drafting methodologies and their applications to various Civil Engineering fields. Using CAD software it is easy to create and modify drawings. In civil engineering industry operating skills are required for computer aided drafting, handling of printers & plotters.

Course Outcomes: Student should be able to

| | |
|-----|--|
| CO1 | Understand the importance of CAD. |
| CO2 | Use different CAD commands for drawing. |
| CO3 | Draw, edit and modify 2D drawings. |
| CO4 | Understand organize the drawing. |
| CO5 | Understand various latest software packages being used in Civil Engineering. |

Course Content Details:

| Unit No | Topics / Sub-topics |
|----------|--|
| 1 | Introduction : 1.1 Introduction to CAD, Applications, Advantages of CAD, CAM, CAE, pre-requisite (hardware and software). 1.2 CAD Packages available in market, Auto CAD, Omega Designer, P-CAD, Robo CAD, Felix CAD, IntelliCAD, LisCAD. 1.3 Auto CAD and manual drafting, advantage. System requirements, CAD peripherals, 1.4 Opening screen, functional and control keys, WCS, UCS. Course Outcome: CO1 Teaching Hours: -- Marks: 08 (R- NA, U-NA, A- NA) |
| 2 | Draw and Enquiry commands : 2.1 Line, circle, arc, Redraw, Erase, Undo, Redo, Osnap, Ellipse, Polygon, copy move, setting up of drawing, Paper sizes, limits, layers, Grid, snap zoom, pan, Region, Color, |

| | |
|---|---|
| | Array, Rotate, Scale, Trim, Break, Extend, Fillet, Chamfer, Text, mirror, Stretch, Line mode, Arc mode, area list Course Outcome: CO2 Teaching Hours: -- Marks:12 (R- NA, U-NA, A- NA) |
| 3 | Dimensioning Commands : 3.1 Drawing, Dim, Dim scale, Linear, Angular, Adjustable, Geometric dimension, Editing dimension text and variables. Course Outcome: CO3 Teaching Hours: -- Marks: 12 (R- NA, U-NA, A- NA) |
| 4 | Organization Drawing : 4.1 Layers, layer state creating new layer Changing object properties. 4.2 Drawing set up – Controlling unit display, sizing the drawing sheet, creating new drawing with Wizards and Templates. Course Outcome: CO4 Teaching Hours: -- Marks:12 (R- NA, U-NA, A- NA) |
| 5 | Study of latest software packages used in Civil Engineering: 5.1 For drafting and modeling :- Auto CAD, Microstation, Smart sketch, Revit, Inroads, Speedicon, Triforma, ZCADD 5.2 For analysis:- STADPRO, GTSTRUDD, Tekla, SDS2, Auto CAD plant 3D-2019 Course Outcome: CO5 Teaching Hours: -- Marks: 06 (R- NA, U-NA, A- NA) |

List of experiments:

| Sr. No. | Unit No | COs | Title of the Experiments | Hours |
|---------|---------|---------------------|---|-----------|
| 1 | 1 | CO1 | Assignment on introduction , Applications & advantages of CAD | 02 |
| 2 | 2,3,4 | CO2, CO3 | Practice exercises for following topics 1. Set the initial view. 2. Use of Draw command. 3. Use of Edit command. 4. Use of Modify command. 5. Apply dimensions. | 08 |
| 3 | 2,3,4 | CO2, CO3, CO4 | Drawing of 2 BHK – Plan of building, Elevation, Section, Isometric view of any object, etc. | 18 |
| 4 | 2,3,4 | CO2, CO3, CO4 | To prepare, drawing for any civil engineering, RCC/ Steel structure using any available CAD package. | 18 |
| 5 | 2,3,4 | CO2, CO3, CO4 | To prepare General Arrangement drawing- GAD to show services details such as furniture arrangements, electric points, water line, drainage line) | 14 |
| | | Total | | 60 |

References/ Books:

| Sr. No. | Title | Author, Publisher, Edition and Year Of publication | ISBN |
|---------|-------------------------------|--|-----------------------|
| 1 | Auto CAD Practice 2018 | BPB Publication, New Delhi | ISBN 9789386551870 |
| 2 | Bently Software and Intigraph | -- | -- |
| 3 | Applying AutoCAD 2008 | McGraw Hill , New Delhi | ISBN 9780078801532 |

E-References:

1. www.udemy.com
2. <http://www.quora.com>
3. <http://thesourcecad.com>
4. <http://www.nationallibrary.gov.in>

CO Vs PO and CO Vs PSO Mapping

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | 3 | 3 | 2 | 1 | 2 | 2 | 3 | -- | -- |
| CO2 | 3 | 3 | 3 | 2 | 1 | 1 | 3 | 3 | -- | -- |
| CO3 | 3 | 3 | 3 | 2 | 1 | 1 | 3 | 3 | -- | -- |
| CO4 | 3 | 3 | 3 | 2 | 1 | 1 | 3 | 3 | -- | -- |
| CO5 | 3 | 3 | 3 | 2 | 1 | 1 | 3 | 3 | -- | -- |

Industry Consultation Committee:

| Sr. No | Name | Designation | Institute/Organisation |
|--------|---------------------|-----------------------------|--------------------------|
| 1 | Mr. Rohan Deokar | Deputy Engineer | MMRDA |
| 2 | Mr. Sanjay Kulkarni | Surveyor and Consultant | SRKulkarni Pvt.Firm |
| 3 | Mr. K.V. Kelgandre | Sr. Lecturer in Civil Engg. | K.J. Somaiya Polytechnic |
| 4 | Ms. S. M. Male | Lecturer in Civil Engg. | Govt. Polytechnic Mumbai |

Coordinator,
Curriculum Development,
Department of Civil Engineering

Head of Department
Department of Civil Engineering

I/C, Curriculum Development Cell

Principal

| | | | | | | | | | | |
|--|----|----|-----------|---|---------------|--------------|----|----|----|------------|
| Programme : Diploma in Civil Engineering (Sandwich Pattern) | | | | | | | | | | |
| Course Code: CE19404 | | | | Course Title: Repairs & Rehabilitation of Building | | | | | | |
| Compulsory / Optional: Optional | | | | | | | | | | |
| Teaching Scheme and Credits | | | | Examination Scheme | | | | | | |
| TH | PR | TU | Total | TH (2 Hrs 30 min) | TS1 (1 Hr) | TS2 (1Hr) | PR | OR | TW | Total |
| 04 | -- | -- | 04 | 60 | 20 | 20 | -- | -- | -- | 100 |

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination
 Note: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill test are to be conducted. First skill test at mid term and second skill test at the end of the term.

Rationale:

In present scenario advent of advanced analysis and design techniques, the safety margin has decreased considering slender sections of structural elements than before. This economics choice has increased the importance of vigilant supervision in maintenance, accurate workmanship in maintenance and good management for safety and serviceability of the structures more than before.

In a well-managed building, maintenance work in fact should continue throughout the year under an adequate preventive maintenance policy. "The prevention is better than cure" is an axiom well applicable to maintenance of building also.

Course Outcomes: Student should be able to

| | |
|-----|---|
| CO1 | Decide which type of maintenance is needed for a given damaged structure. |
| CO2 | Assess causes of damages various types of structures. |
| CO3 | Select the relevant material for repair of the given structure. |
| CO4 | Apply relevant method of retrofitting for re-strengthening of structures. |
| CO5 | Suggest relevant technique to restore the damages of the given structural elements. |

Course Content Details:

| Unit No | Topics / Sub-topics |
|----------|---|
| 1 | Basics of maintenance : 1.1 Types of Maintenances - repair, retrofitting, re-strengthening, rehabilitation and restoration. 1.2 Necessity, objectives and importance of maintenance. 1.3 Approach of effective management for maintenance. 1.4 Periodical maintenance: check list, maintenance manual containing building plan, reinforcement details, material sources, maintenance frequency, corrective maintenance procedures and sources. Pre- and post- monsoon maintenance. Course Outcome: CO1 , Teaching Hours : 8 hrs Marks: 10 (R- 6, U-4, A-0) |

| | |
|---|---|
| 2 | <p>Causes and detection of damages :</p> <p>2.1 Causes of damages due to distress, earthquake, wind, flood, dampness, corrosion, fire, deterioration, termites, pollution and foundation settlement.</p> <p>2.2 Various aspects of visual observations for detection of damages.</p> <p>2.3 Load test and non-destructive tests (brief description). NDT tests on damaged structure such as rebound hammer, ultrasonic pulse velocity, rebar locator, crack detection microscope, digital crack measuring gauge.</p> <p>2.4 Chemical test - Chloride test, sulphate attack, carbonation test, pH measurement, resistivity method, Half-cell potential meter (Introduction and demonstration only).</p> <p>Course Outcome: CO2 , Teaching Hours :12 hrs Marks: 12 (R- 4, U-6, A-2)</p> |
| 3 | <p>Materials for maintenance and repairs :</p> <p>3.1 Types of repair material, material selection.</p> <p>3.2 Essential parameters for maintenance and repair materials such - bond with substrate, durability.</p> <p>3.3 Waterproofing materials based on polymer modified cement slurry, UV resistant acrylic polymer, ferro-cement.</p> <p>3.4 Repairing materials for masonry: plastic/aluminum nipples, non-shrink cement, polyester putty or 1:3 cement sand mortar, galvanized steel wire fabrics and clamping rods, wire nails, ferro-cement plates.</p> <p>3.5 Repairing materials for RCC: epoxy resins, epoxy mortar, cement mortar impregnated with polypropylene, silicon, polymer concrete composites, sealants, fiber reinforcement concrete, emulsions and paints.</p> <p>Course Outcome: CO3 , Teaching Hours : 14 hrs Marks: 14 (R-4, U-6, A-4)</p> |
| 4 | <p>Maintenance and repair methods for masonry Construction :</p> <p>4.1 Causes of cracks in walls - bulging of wall, shrinkage, bonding, shear, tensile, vegetation.</p> <p>4.2 Probable crack location: junction of main and cross wall, junction of slab and wall, cracks in masonry joints.</p> <p>4.3 Repair methods based on crack type - For minor & medium cracks (width 0.5 mm to 5mm): grouting and for major cracks (width more than 5mm): fixing mesh across cracks, RCC band, installing ferro-cement plates at corners, dowel bars, propping of load bearing.</p> <p>4.4 Remedial measures for dampness & efflorescence in wall.</p> <p>Course Outcome: CO4, Teaching Hours :12hrs Marks: 12 (R- 4, U-4, A- 4)</p> |
| 5 | <p>Maintenance and repair methods for RCC Construction :</p> <p>5.1 Repair stages such as concrete removal and surface preparation, fixing suitable formwork, bonding/passive coat and repair application, various methods of surface preparation.</p> <p>5.2 Repair options such as grouting, patch repairs, carbonated concrete, cleaning the corroded steel, concrete overlays, latex concrete, epoxy bonded mortar and concrete, polymer concrete, corrosion protection such as jacketing.</p> <p>5.3 Building cracks and its prevention, common methods for dormant crack repairs such as Epoxy injection, grooving and sealing, stitching, grouting and guniting/shotcreting.</p> <p>5.4 Strengthening methods for live cracks such as addition of reinforcements, Jacketing, brackets, collars, supplementary members i.e. shoring, underpinning and propping of framed structure.</p> <p>5.5 FRP, Micro Concrete & its methodology.</p> <p>Course Outcome: CO5 , Teaching Hours :14 hrs Marks: 12 (R-4, U-4, A-4)</p> |

Suggested Specifications Table (Theory):

| Unit No | Topic Title | Distribution of Theory Marks | | | |
|--------------|---|------------------------------|-----------|-----------|-------------|
| | | R Level | U Level | A Level | Total Marks |
| 1 | Basics of maintenance | 6 | 4 | -- | 10 |
| 2 | Causes and detection of damages | 4 | 6 | 2 | 12 |
| 3 | Materials for maintenance and repairs | 4 | 6 | 4 | 14 |
| 4 | Maintenance and repair methods for masonry Construction | 4 | 4 | 4 | 12 |
| 5 | Maintenance and repair methods for RCC Construction | 4 | 4 | 4 | 12 |
| Total | | 22 | 24 | 14 | 60 |

References/ Books:

| Sr. No. | Title | Author, Publisher, Edition and Year Of publication | ISBN |
|---------|--|---|---|
| 1 | Building Repair and Maintenance Management | Gahlot, P. S., Sharma, S., CBS Publishers & Distributors Pvt. Ltd., New Delhi | ISBN: 9788123912431 |
| 2 | Maintenance and Repairs of Buildings | Guha, P. K., Maintenance and Repairs of Buildings, New Central Book Agencies | ISBN 10: 8173810737 ISBN 13: 9788173810732 |
| 3 | Maintenance and Repairs of Buildings | Hutchin Son, B. D., Maintenance and Repairs of Buildings, Newnes-Butterworth | ISBN 10: 0408001917 ISBN 13 : 9780408001915 |
| 4 | Relevant BIS codes | BIS New Delhi | -- |

E-Reference :

1. <http://www.acea.be/industry-topics/repairs-and-maintenance>
2. <http://theconstructor.org>
3. <http://www.nqr.gov.in>
4. <http://www.researchgate.net>
5. <http://www.nationallibrary.gov.in>

CO Vs PO and CO Vs PSO Mapping :

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 1 | 3 | 3 | -- | -- | 3 | 2 | 1 | 3 | -- |
| CO2 | 3 | 3 | 3 | 2 | 2 | 3 | 2 | 1 | 3 | -- |

| | | | | | | | | | | |
|------------|---|---|---|---|---|---|---|---|---|----|
| CO3 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 1 | 3 | -- |
| CO4 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 1 | 3 | -- |
| CO5 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 1 | 3 | -- |

Industry Consultation Committee:

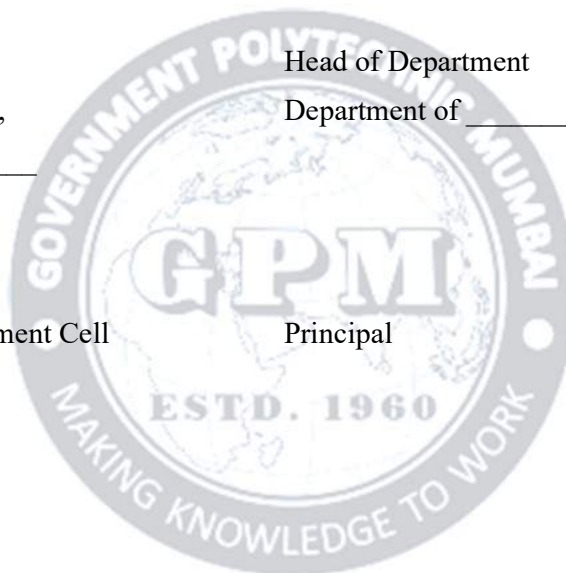
| Sr. No | Name | Designation | Institute/Organisation |
|---------------|---------------------|-----------------------------|-------------------------------|
| 1 | Mr. Rohan Deokar | Deputy Engineer | MMRDA |
| 2 | Mr. Sanjay Kulkarni | Surveyor and Consultant | SRKulkarni Pvt.Firm |
| 3 | Mr. K.V. Kelgandre | Sr. Lecturer in Civil Engg. | K.J. Somaiya Polytechnic |
| 4 | Mr. P.A. Pisal | Sr. Lecturer in Civil Engg. | Govt. Polytechnic Mumbai |

Coordinator,
Curriculum Development,
Department of _____

Head of Department
Department of _____

I/C, Curriculum Development Cell

Principal



| | | | | | | | | | | |
|--|----|----|-----------|--|---------------|--------------|----|----|----|------------|
| Programme : Diploma in Civil Engineering (Sandwich Pattern) | | | | | | | | | | |
| Course Code: CE19405 | | | | Course Title: Building Services & Maintenance | | | | | | |
| Compulsory / Optional: Optional | | | | | | | | | | |
| Teaching Scheme and Credits | | | | Examination Scheme | | | | | | |
| TH | PR | TU | Total | TH (2 Hrs 30 min) | TS1 (1 Hr) | TS2 (1Hr) | PR | OR | TW | Total |
| 04 | -- | -- | 04 | 60 | 20 | 20 | -- | -- | -- | 100 |

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination
 Note: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill test are to be conducted. First skill test at mid term and second skill test at the end of the term.

Rationale:

Building Services and its maintenance is a crucial course, as its having a great demand from building industry. AS buildings are becoming more complex and more modern, building services like plumbing, HVAC, fire safety, lighting & acoustics are necessary to include in Civil Engineering curriculum. This is important course as it include 20 % of construction cost. The students should able to classify various types of building services as per requirements. He can justify the necessity of designing the various building services.

Course Outcomes: Student should be able to

| | |
|-----|--|
| CO1 | Classify various types of building services as per functional requirements. |
| CO2 | Propose the fire safety requirements for multi-storeyed building. |
| CO3 | Devise suitable water supply and sanitation system for given type of building. |
| CO4 | Evaluate the potential of rain water harvesting and solar water heater system for the given type of building. |
| CO5 | Justify the necessity of designing the system of lighting, ventilation and acoustics for the given type of building. |

Course Content Details:

| Unit No | Topics / Sub-topics |
|----------|--|
| 1 | Overview of Building Services : 1.1 Introduction to building services, Classification of buildings as per National Building code, Necessity of building services, Functional requirements of building, Different types of building services i.e. HVAC (Heat, Ventilation and Air Conditioning), Escalators and lifts, fire safety, protection and control, plumbing services, rain water harvesting, solar water heating system, lighting, acoustics, sound insulation and electric installation etc. 1.2 Role and responsibility of Building Service Engineer, Introduction to BMS (Building Management Services), Role of BMS, concept of smart building. Course Outcome: CO1 , Teaching Hours : 8 hrs Marks: 10 (R- 6, U-4, A-0) |

| | |
|---|---|
| 2 | <p>Modes of vertical communication :</p> <p>2.1 Objectives and modes of vertical communication in building.</p> <p>2.2 Lifts: Different types of lifts and its uses, Component parts of Lift- Lift Well, Travel, Pit, Hoist Way, Machine, Buffer, Door Locks, Suspended Rope, Lift Car, Landing Door, Call Indicators, Call Push etc., Design provisions for basic size calculation of space enclosure to accommodate lift services, Safety measures.</p> <p>2.3 Escalators: Different Types of Escalators and its Uses, Components of escalators, Design provisions for basic size calculation of space enclosure to accommodate escalator services, Safety measures.</p> <p>2.4 Ramp: Necessity, design consideration, gradient calculation, layout and Special features required for physically handicapped and elderly.</p> <p>Course Outcome: CO2 , Teaching Hours :12 hrs Marks: 12 (R- 4, U-4, A-4)</p> |
| 3 | <p>Fire Safety :</p> <p>3.1 Fire protection requirements for multi-storeyed building, causes of fire in building, Fire detecting and various extinguishing systems, Working principles of various fire protection systems.</p> <p>3.2 Safety against fire in residential and public buildings (multi-storeyed building), National Building Code provision for fire safety, Fire resisting materials and their properties, Fire resistant construction, procedures for carrying out fire safety inspections of existing buildings, Provisions for evacuation.</p> <p>Course Outcome: CO3 , Teaching Hours : 12 hrs Marks: 12 (R-4, U-6, A-2)</p> |
| 4 | <p>Plumbing Services :</p> <p>4.1 Importance of plumbing, AHJ (Authority Having Jurisdiction) approval, Plumbing Terminology and fixtures: Terms used in plumbing, Different types of plumbing fixtures, shapes/ sizes, capacities, situation and usage, Traps, Interceptors.</p> <p>4.2 System of plumbing for building water supply: storage of water, hot and cold water supply system.</p> <p>4.3 System of plumbing for building drainage: Types of drainage system such as two pipe system, one pipe system, types of Vents and purpose of venting, Concept of grey water and reclaimed water.</p> <p>4.4 Different pipe materials, and jointing methods, fittings, hanger, supports and valves used in plumbing and their suitability.</p> <p>Course Outcome: CO4, Teaching Hours :14 hrs Marks: 14 (R- 4, U-6, A- 4)</p> |
| 5 | <p>Lighting, Ventilation and Acoustics :</p> <p>5.1 Concept of SWH (Solar water heating), component parts of SWH, various system of SWH (heat transfer, propulsion, passive direct system, active direct system, Do-it-yourself), installation and maintenance.</p> <p>5.2 Concept of lighting, types of lighting (natural and artificial), factors influencing the brightness of room, factors affecting selection of artificial lighting, installation of light (direct, half-direct, indirect, half-indirect and direct-indirect), types of light control (manual switch, remote switch, timer switch and photo-electric cell switch), types of lamps (incandescent, tungsten halogen and electric discharge), Lamp selection as per room sizes. Hymas light</p> <p>5.3 Concept of ventilation, necessity and Types of ventilation.</p> <p>5.4 Building Acoustic, Objectives, acoustic Control in a building, acoustic material (porous absorber and cavity resonator)</p> <p>Course Outcome: CO5 , Teaching Hours :14 hrs Marks: 12 (R-4, U-4, A-4)</p> |

Suggested Specifications Table (Theory):

| Unit No | Topic Title | Distribution of Theory Marks | | | |
|--------------|-------------------------------------|------------------------------|-----------|-----------|-------------|
| | | R Level | U Level | A Level | Total Marks |
| 1 | Overview of Building Services | 6 | 4 | -- | 10 |
| 2 | Modes of vertical communication | 4 | 4 | 4 | 12 |
| 3 | Fire Safety | 4 | 6 | 2 | 12 |
| 4 | Plumbing Services | 4 | 6 | 4 | 14 |
| 5 | Lighting, Ventilation and Acoustics | 4 | 4 | 4 | 12 |
| Total | | 22 | 24 | 14 | 60 |

References/ Books:

| Sr. No. | Title | Author, Publisher, Edition and Year Of publication | ISBN |
|---------|---|---|--|
| 1 | Building Services | Patil, S. M., Seema Publication, Mumbai. | ISBN: 9788175259805 |
| 2 | The A to Z of Practical Building Construction and its Management | Mantri and Sandeep.Satya Prakashan, New Delhi. | ISBN-10: 9351921417; ISBN-13: 978-9351921417 |
| 3 | Fire Services in India: History, Detection, Protection, Management | Bag S P, Mittal Publications, New Delhi. | ISBN-10: 8170995981 |
| 4 | Plumbing Design and Practice | Deolalikar, S. G., McGraw-Hill | ISBN-10: 9339221311 |
| 5 | Principles of Fire Safety Engineering: Understanding Fire and Fire Protection | Akhil Kumar Das., PHI Learning Pvt. Ltd, New Delhi. | ISBN : 9789389347234 |
| 6 | Practical handbook on building maintenance | Gupta M K, Civil works, Nabhi Publications. | ISBN : 8172746903, 9788172746902 |
| 7 | Solar panel installation guide & user manual | Shraman N L, The Memory Guru of India. | ISBN: 978-0-9942464-1-7 |
| 8 | National Building Code Part1, 4, 8, 9 | BIS New Delhi | -- |
| 9 | IS 12183(Part 1):1987 Code of practice for plumbing in multistoried buildings | BIS New Delhi | -- |
| 10 | 2008 Uniform plumbing code – India (UPC-I | BIS New Delhi | -- |

E-Reference :

1. <http://www.cibse.org>
2. <http://wbdg.org>
3. http://www.designingbuilding.co.uk/wiki/buiding_services
4. <http://www.premierschoolofbuilding.com>
5. <http://www.nationallibrary.gov.in>

CO Vs PO and CO Vs PSO Mapping :

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | -- | 3 | -- | 2 | 3 | 3 | -- | 3 | -- |
| CO2 | 3 | 3 | 3 | -- | 2 | 3 | 3 | -- | 3 | -- |
| CO3 | 3 | 3 | 2 | 1 | 3 | 3 | 3 | -- | 3 | -- |
| CO4 | 3 | 2 | 3 | 1 | 3 | 3 | 3 | -- | 3 | -- |
| CO5 | 3 | 3 | 3 | 1 | 3 | 3 | 3 | -- | 3 | -- |

Industry Consultation Committee:

| Sr. No | Name | Designation | Institute/Organisation |
|--------|---------------------|-----------------------------|--------------------------|
| 1 | Mr. Rohan Deokar | Deputy Engineer | MMRDA |
| 2 | Mr. Sanjay Kulkarni | Surveyor and Consultant | SRKulkarni Pvt.Firm |
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| 4 | Mr. P.A. Pisal | Sr. Lecturer in Civil Engg. | Govt. Polytechnic Mumbai |

Coordinator,
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Head of Department
Department of _____

I/C, Curriculum Development Cell

Principal

| | | | | | | | | | | |
|--|----|----|-----------|--|---------------|--------------|----|----|----|------------|
| Programme : Diploma in Civil Engineering (Sandwich Pattern) | | | | | | | | | | |
| Course Code: CE19406 | | | | Course Title: Material Management | | | | | | |
| Compulsory / Optional: Optional | | | | | | | | | | |
| Teaching Scheme and Credits | | | | Examination Scheme | | | | | | |
| TH | PR | TU | Total | TH (2 Hrs 30 min) | TS1 (1 Hr) | TS2 (1Hr) | PR | OR | TW | Total |
| 04 | -- | -- | 04 | 60 | 20 | 20 | -- | -- | -- | 100 |

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination
 Note: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill test are to be conducted. First skill test at mid term and second skill test at the end of the term.

Rationale:

This course deals with management of materials. Smooth running of any industry depends upon the interdepartmental relations and planning for execution of work jointly. Efficiency of production department also depends upon the availability of raw material of required quality and quantity. Therefore there should be proper co-ordination between production department, production planning, stores department and purchase department. Incorrect materials planning can also lead to higher inventories and high cost.

Course Outcomes: Student should be able to

| | |
|-----|--|
| CO1 | Performs functions of material management. |
| CO2 | Manage inventory of materials by various inventory management techniques. |
| CO3 | Buy Materials by following particular procedure and price forecasting. |
| CO4 | Prepare requisition of materials along with specifications. |
| CO5 | Materials management using latest techniques. |
| CO6 | Negotiation using different techniques and management of obsolete surplus and scrap materials. |

Course Content Details:

| Unit No | Topics / Sub-topics |
|----------|---|
| 1 | Importance of Material Management : 1.1 Growing importance of material management, Scope, Objectives, Organizing for Materials Management. 1.2 Importance of specifications in Materials Management. Course Outcome: CO1 , Teaching Hours : 6 hrs Marks: 06 (R- 4, U-2, A-0) |
| 2 | Inventory Management : 2.1 Selective control – ABC Analysis – Purpose and objectives of ABC Analysis Mechanics 2.2 Advantages and limitations of ABC Analysis 2.3 Order point – Lead Time, Safety stock , re-order point , standard order and |

| | |
|---|--|
| | <p>Economic order 2.4 Quantity (EOQ) , Graphical & Analytical Method.</p> <p>Course Outcome: CO2 , Teaching Hours : 10 hrs Marks:10 (R- 2, U-4, A-4)</p> |
| 3 | <p>Buying Procedure :</p> <p>3.1 Sourcing Buy or lease 3.2 Purchase systems 3.3 Problems in relations with supplier 3.4 Value Analysis - Definition & Scope 3.5 Selection of products for value analysis 3.6 Value analysis framework 3.7 Implementation & Methodology. 3.8 Ethics in purchasing.</p> <p>Course Outcome: CO3 , Teaching Hours : 12 hrs Marks: 14 (R-4, U-6, A-4)</p> |
| 4 | <p>Inventory Control & Cost reduction techniques</p> <p>4.1 Inventory turns ratios 4.2 Standardization need & importance 4.3 Codification – concept benefits 4.4 Value engineering & Value analysis concept & process 4.5 Inventory of recycled materials for the various constructions.</p> <p>Course Outcome: CO4, Teaching Hours :12 hrs Marks: 10 (R- 4, U-6, A-0)</p> |
| 5 | <p>Latest Techniques in Materials Management</p> <p>5.1 Just in Time (JIT) zero inventory concept 5.2 Integrated computerized management systems in Materials Management. 5.3 Introduction to SAP</p> <p>Course Outcome: CO5 , Teaching Hours :10 hrs Marks: 10 (R-4, U-4, A-2)</p> |
| 6 | <p>Management of obsolete Surplus and Scrap Material</p> <p>6.1 Definitions, Reasons for generation and accumulation of obsolete Surplus and scrap, Survey committee, presale preparations, sale auction sale by tender. 6.2 Interlinking between material management and construction planning.</p> <p>Course Outcome: CO5 , Teaching Hours :10 hrs Marks: 10 (R-4, U-4, A-2)</p> |

Suggested Specifications Table (Theory):

| Unit No | Topic Title | Distribution of Theory Marks | | | |
|---------|---|------------------------------|---------|---------|-------------|
| | | R Level | U Level | A Level | Total Marks |
| 1 | Importance of Materials Management | 4 | 2 | -- | 06 |
| 2 | Inventory Management | 2 | 4 | 4 | 10 |
| 3 | Buying procedure | 4 | 6 | 4 | 14 |
| 4 | Inventory control & Cost reduction techniques | 4 | 6 | -- | 10 |
| 5 | Latest Techniques in Materials Management | 4 | 4 | 2 | 10 |

| | | | | | |
|--------------|---|-----------|-----------|-----------|-----------|
| 6 | Management of obsolete Surplus and Scrap material | 4 | 4 | 2 | 10 |
| Total | | 22 | 26 | 12 | 60 |

References/ Books:

| Sr. No. | Title | Author, Publisher, Edition and Year Of publication | ISBN |
|---------|---|--|--|
| 1 | Materials Management | Ammer Deans S., R.D. Irwin Hllions | ISBN-10: 0256021465; ISBN-13: 978-0256021462 |
| 2 | Materials Management An Integrated Approach | P. Gopalkrishan and M. Sundaresan, Prentice – Hall of India Pvt. Ltd. New Delhi. | ISBN 10: 8120300270 ISBN 13 : 9788120300279 |
| 3 | An Integrated concept of Materials Management | M.M. Shah, Tata McGraw Hill Publisher Co. Ltd. New Delhi | ISBN 97893 8116 2538 |

E-Reference :

1. <http://www.iimmmumbai.org>
2. <http://www.wikipedia.com>
3. <http://www.constructionmaterials.org.in>
4. <http://www.nationallibrary.gov.in>

CO Vs PO and CO Vs PSO Mapping :

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | 1 | -- | -- | -- | 3 | 2 | -- | 3 | -- |
| CO2 | 3 | 3 | 3 | 2 | 2 | 3 | 2 | -- | 3 | -- |
| CO3 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | -- | 3 | -- |
| CO4 | 3 | 2 | 3 | 3 | 2 | 3 | 2 | -- | 3 | -- |
| CO5 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | -- | 3 | -- |

Industry Consultation Committee:

| Sr. No | Name | Designation | Institute/Organisation |
|--------|---------------------|-----------------------------|--------------------------|
| 1 | Mr. Rohan Deokar | Deputy Engineer | MMRDA |
| 2 | Mr. Sanjay Kulkarni | Surveyor and Consultant | SRKulkarni Pvt.Firm |
| 3 | Mr. K.V. Kelgandre | Sr. Lecturer in Civil Engg. | K.J. Somaiya Polytechnic |
| 4 | Mr. P.A. Pisal | Sr. Lecturer in Civil Engg. | Govt. Polytechnic Mumbai |

Coordinator,
Curriculum Development,
Department of _____

Head of Department
Department of _____

I/C, Curriculum Development Cell

Principal



| | | | | | | | | | | |
|--|----|----|-----------|---|---------------|--------------|----|----|----|------------|
| Programme : Diploma in Civil Engineering (Sandwich Pattern) | | | | | | | | | | |
| Course Code: CE19407 | | | | Course Title: Safety and Quality Control | | | | | | |
| Compulsory / Optional: Optional | | | | | | | | | | |
| Teaching Scheme and Credits | | | | Examination Scheme | | | | | | |
| L | P | TU | Total | TH (2 Hrs 30 min) | TS1 (1 Hr) | TS2 (1Hr) | PR | OR | TW | Total |
| 04 | -- | -- | 04 | 60 | 20 | 20 | -- | -- | -- | 100 |

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination

Note: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill test are to be conducted. First skill test at mid term and second skill test at the end of the term.

Rationale:

Success of any industry depends on quality of their products. With the changing scenario of industries are adapting system standardization & concept of quality is changed to quality is not to be inspected but to be built in, quality is not the responsibility of any one department and evaluation of the quality control programmed of that industry. The subject imparts knowledge so that student understands & performs his nature of job related to quality control effectively.

This subject deals with the scope of safety in construction operations as well as in the demolition operation. It also deals with importance of safety with regards to storage, stocking and handling of materials of construction.

Course Outcomes: Student should be able to

| | |
|-----|--|
| CO1 | Understand safety measures and causes of accidents in construction. |
| CO2 | Understand Safety practices to be adopted during Construction operation. |
| CO3 | Safety practices to be adopted during demolition operation. |
| CO4 | Understand Safety practices to be adopted during stocking and storage. |
| CO5 | Study statutory obligations about safety and accident prevention. |
| CO6 | Analyse the aspects of quality such as quality in design, quality in conformance and quality in performance. |

Course Content Details:

| Unit No | Topics / Sub-topics |
|----------|---|
| 1 | Meaning and scope of safety in construction: 1.1 Basic philosophy peculiarities and parameters governing the safety in construction such as site planning and layout, safe access, good house-keeping. 1.2 Accidents and hazards- their causes and effects. Course Outcome: CO1 , Teaching Hours : 4hrs Marks: 04 (R- 2, U-2, A-0) |

| | |
|---|---|
| 2 | <p>Safety in construction operation:</p> <p>2.1 Safety in the use of construction machineries.</p> <p>2.2 Movement of construction machinery- heavy/ long items, earth moving equipments. Railway wagons, motor trucks, materials, vehicles, etc.</p> <p>2.3 Safety in prevention & protection at work site including the collapsing of the structure.</p> <p>2.4 Safety in use of explosives- open cast machinery, quarrying.</p> <p>2.5 Project management and safety in construction- Introduction, manpower utilization, utilization of material, equipment and tools. Temporary installation and structures.</p> <p>2.6 Special precautions for works of engineering, construction like distilling/fractioning columns, chimney, silos-oil and gas installation, transmission/communication lines, cable car installation, air fields.</p> <p>2.7 Tolerance</p> <p>Course Outcome: CO2 , Teaching Hours :15hrs Marks: 12 (R- 2, U-4, A-6)</p> |
| 3 | <p>Safety in Demolition operation:</p> <p>3.1 Planning and permit.</p> <p>3.2 Planning the sequence of demolition.</p> <p>3.3 Safety precaution to be taken for and during demolition carrying out repairs, additions and alterations.</p> <p>Course Outcome: CO3 , Teaching Hours :6hrs Marks: 06 (R- 0, U-2, A- 4)</p> |
| 4 | <p>4.1 Safety with regard to storage, stocking and handling of materials of construction:-Health hazards while handling construction materials and chemicals; safety measures with respect to handling of materials such as cement, limes, aggregates, flyash, timber, steel, glass, paint, varnishes, petroleum products, chemicals used in construction, plastic & PVC materials, etc.</p> <p>4.2 Accident prevention: - Occupational health hazards, occupational diseases relating to construction work. Safety in the use and maintenance of personal protective equipment's specific to construction industry, health and welfare measures, emergency medical treatment of injuries and rehabilitation at construction site.</p> <p>Course Outcome: CO4, Teaching Hours :12hrs Marks: 12(R- 0, U-4, A- 8)</p> |
| 5 | <p>Introduction to statutory obligations:-</p> <p>5.1 Regulations of employment and condition of work in construction.</p> <p>5.2 Construction safety law, IS and NB codes, local building and development.</p> <p>5.3 Accident investigation and reporting, structure stability and precautions to be taken</p> <p>Course Outcome: CO5 , Teaching Hours :8hrs Marks: 08 (R- 2, U-4, A-2)</p> |
| 6 | <p>Quality control:</p> <p>6.1 Meaning of Quality control, difference between quality of design, quality of conformance (QC) and Quality of performance (QA), concept of reliability and maintainability.</p> <p>6.2 Quality policy, Quality objectives, economics of Quality, cost and value of Quality specification.</p> |

| | |
|--|--|
| | 6.3 Quality control, assurance, checklist, standard procedures and Quality audit, maintenance, calibration of testing equipment for quality assurance –AMIL equipment 6.4 Vender rating, organization setup for Quality management. 6.5 Difference between Quality control and inspection. 6.6 Inspection objectives and types. 6.7 Quality compliance. 6.8 New trends in Quality management: Quality circles- basic concept, purpose & functioning, Concept of TQM, concept of KAIZEN, concept of PLKA YOKE, ISO 9000, various aspects of certification, application & advantages. Course Outcome: CO6 , Teaching Hours :15hrs Marks: 18 (R- 4, U-8, A-6) |
|--|--|

NOTE: - Visit and case study of different structures- enabling, erection, construction, occupancy, during repairs, demolition.

Suggested Specifications Table (Theory):

| Unit No | Topic Title | Distribution of Theory Marks | | | |
|--------------|---|------------------------------|-----------|-----------|-------------|
| | | R Level | U Level | A Level | Total Marks |
| 1 | Meaning and scope of safety in construction | 2 | 2 | 0 | 4 |
| 2 | Safety in construction operation | 2 | 4 | 6 | 12 |
| 3 | Safety in Demolition operation | -- | 2 | 4 | 6 |
| 4 | Safety with regard to storage, stocking and handling of materials of construction | -- | 4 | 8 | 12 |
| 5 | Introduction to statutory obligations | 2 | 4 | 2 | 8 |
| 6 | Quality control | 4 | 8 | 6 | 18 |
| Total | | 10 | 24 | 26 | 60 |

References/ Books:

| Sr. No. | Title | Author, Publisher, Edition and Year Of publication | ISBN |
|---------|--------------------------------|---|-------------------------|
| 1 | Construction Safety | Jimmie W. ,Hinze,Prentice hall central Labour Institute | ISBN:0133779122 |
| 2 | Structural Renovation Building | Alexander Newoman,Mcgraw Hill Publications,2001 | ISBN: 978-0070471627 |
| 3 | Design and renovation | Donald Friedman. W. Nortan & Company,1997 | ISBN: 978-0393730142 |
| 4 | Metrology and Quality ontrol | R. K. Jain ,Khanna Publishers-Delhi | ISBN: 978-81-7409-153-6 |
| 5 | Quality Control | M. S. Mahajan, Dhanpat Rai and co. ltd | ISBN-10: 8177000659 |

E-Reference :

1. <http://www.learningconstruction.com/>
2. <http://www.understandconstruction.com/>
3. <http://www.constructionknowledge.net/>
4. <http://www.nationallibrary.gov.in>

CO Vs PO and CO Vs PSO Mapping :

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 2 | 3 | 3 | 3 | 2 | 3 | 2 | 1 | 3 | 1 |
| CO2 | 2 | 3 | 3 | 3 | 2 | 3 | 2 | 1 | 3 | 3 |
| CO3 | 2 | 3 | 3 | 3 | 2 | 3 | 2 | 1 | 3 | 3 |
| CO4 | 2 | 3 | 3 | 3 | 2 | 3 | 2 | 1 | 3 | 3 |
| CO5 | 2 | 3 | 3 | 3 | 2 | 3 | 2 | 1 | 3 | 3 |
| CO6 | 2 | 3 | 3 | 3 | 2 | 3 | 2 | 1 | 3 | 2 |

Industry Consultation Committee:

| Sr. No | Name | Designation | Institute/Organisation |
|--------|------------------------|-----------------------------|--------------------------|
| 1 | Mr. Rohan Deokar | Deputy Engineer | MMRDA |
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| 3 | Mr. K.V. Kelgandre | Sr. Lecturer in Civil Engg. | K.J. Somaiya Polytechnic |
| 4 | Smt.Meera Anserwadekar | Sr. Lecturer in Civil Engg. | Govt. Polytechnic Mumbai |

Coordinator,
Curriculum Development,
Department of _____

Head of Department
Department of _____

I/C, Curriculum Development Cell

Principal

CE 19408 QCAD

1. Introduction to QCAD (Foss: QCAD – English)

Outline: Introduction to QCAD Menu Items and Toolbar Drawing Objects Snapping Tools Using Layers.....

2. Drawing methods in QCAD

Outline: Drawing Methods in QCAD Cartesian Coordinate System Using Command line to Draw Objects Drawing Methods....

3. Using Modification Tools I

Outline: Using Modification Tools Trim Copy Move Rotate.....

4. Modification Tools to Stretch and mirror

Outline: Using Modification Tools to Stretch and Mirror in QCAD Stretch Mirror.....

5. Modification Tools to Scale and Roate

Outline: Using Modification Tools to Scale and Rotate in QCAD Scale Rotate Two.....



Government Polytechnic, Mumbai

Department of Civil Engineering

**P-19 Curriculum
(Sandwich Pattern)**

**Semester-V
(Course Contents)**

GOVERNMENT POLYTECHNIC MUMBAI
(Academically Autonomously Institute, Government of Maharashtra)
Teaching and Examination Scheme (P19)
With effect from AY 2019-20

Programme: Diploma in Civil Engineering (Sandwich Pattern)

Term / Semester - V

| Course Code | Course Title | Teaching Hours/Contact Hours | | | | Credits | Examination Scheme (Marks) | | | | | | |
|-------------|--|------------------------------|----------------|----|-------|----------------|----------------------------|-----|-----|----|-----|-----|-------|
| | | L | P | TU | Total | | Theory | | | PR | OR | TW | Total |
| | | | | | | | TH | TS1 | TS2 | | | | |
| AM19501 | Design of Reinforced Concrete and Steel Structures | 4 | 4 | -- | 8 | 8 | 60 | 20 | 20 | -- | 25* | 25 | 150 |
| CE19501 | Estimation and Costing | 4 | 2 | -- | 6 | 6 | 60 | 20 | 20 | -- | 25* | 25 | 150 |
| CE19502 | Contracts, Accounts and Valuation | 4 | 2 | -- | 6 | 6 | 60 | 20 | 20 | -- | 25* | -- | 125 |
| CE19503 | Irrigation Engineering | 3 | -- | -- | 3 | 3 | 60 | 20 | 20 | -- | 25* | -- | 125 |
| | Elective – II (Any one) | 4 | -- | -- | 4 | 4 | 60 | 20 | 20 | -- | -- | -- | 100 |
| AM19502 | Prestressed & Precast Concrete | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| CE19504 | Construction Management | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| AM19503 | Advanced Geotechnical Engineering | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| CE19505 | Solid Waste Management | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| CE19506 | Project | -- | 4 | -- | 4 | 4 | -- | -- | -- | -- | 50* | 50 | 100 |
| CE19507 | Entrepreneurship (NPTEL) | -- | 4 [#] | -- | 4 | 4 [#] | -- | -- | -- | -- | -- | -- | -- |
| | Total | 19 | 16 | -- | 35 | 35 | 300 | 100 | 100 | -- | 150 | 100 | 750 |

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment)

* Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination

Note: Duration of Examination--TS1&TS2 -1 hour , TH- 2 hours 30 minutes, PR/OR – 3 hours per batch , SCA- Library - 1 hour, Sports- 2 hours, Creative Activity-2 hours
Self, on- line learning Mode through MOOCs /Spoken Tutorials / NPTEL / SWAYAM / FOSSEE etc.

Department Coordinator,
Curriculum Development,
Dept. of Civil Engineering

Head of Department
Dept. of Civil Engineering

In-Charge
Curriculum Development Cell

Principal

| | | | | | | | | | | |
|--|-----------|-----------|-----------|---|---------------|--------------|-----------|------------|-----------|------------|
| Programme : Diploma in Civil Engineering (Sandwich Pattern) | | | | | | | | | | |
| Course Code: AM19501 | | | | Course Title: Design of Reinforced Concrete & Steel Structures | | | | | | |
| Compulsory / Optional: Compulsory | | | | | | | | | | |
| Teaching Scheme and Credits | | | | Examination Scheme | | | | | | |
| TH | PR | TU | Total | TH (3Hrs) | TS1 (1 Hr) | TS2 (1Hr) | PR | OR | TW | Total |
| 04 | 04 | -- | 08 | 60 | 20 | 20 | -- | 25* | 25 | 150 |

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination

Note: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill test are to be conducted. First skill test at mid term and second skill test at the end of the term

Rationale :

In this course, the student will study elements of RCC & Steel structures. They will be introduced to basic structural elements such as beams/tension members, columns/compression members along with the concepts of their designs.

Basic Principles of designing RCC shall be helpful for students in supervising and executing construction activities effectively. Steel is commonly used as a construction material for various steel structures such as steel girders, steel bridges, steel trusses, columns, towers, railway bridges, industrial building, etc. For the design of steel structures, the properties of steel, different sections, various grades and strength characteristics of steel are required. This will be useful for developing insight for the design concepts and will help student in effective supervision and quality control on site.

Course Outcomes: Student should be able to

| | |
|-----|--|
| CO1 | Design of singly and doubly reinforced RCC beam. |
| CO2 | Design of RCC beam for shear and development length. |
| CO3 | Design of short and long RCC columns. |
| CO4 | Design of steel tension and compression member. |
| CO5 | Design of steel I and Channel sections. |

Course Content Details:

| Unit No | Topics / Sub-topics |
|----------|---|
| 1 | Design of Reinforced Concrete Beams by Limit State Method: 1.1 Concept of Limit state, Stress block diagram, Introduction to singly and doubly reinforced sections, IS 456 1.2 Design of singly reinforced beam, concept of under reinforced, over reinforced and balanced section, Simple numerical problem on ultimate moment of resistance and design of beam section 1.3 Design of doubly reinforced sections, stress and strain diagrams, depth of neutral axis, |

| | |
|---|--|
| | <p>simple numerical problems on ultimate moment of resistance of reinforced beam, Calculation of Ast and Asc.</p> <p>Course Outcome: CO1 Teaching Hours : 14 hrs Marks: 14 (R-4, U-4, A-6)</p> |
| 2 | <p>Shear, Bond and Development length in Design of RCC member:</p> <p>2.1 Nominal shear stress in RCC section, Design shear strength of concrete, Design of shear reinforcement, Minimum Shear Reinforcement, Provisions of IS 456, forms of shear reinforcement</p> <p>2.2 Types of bond, Bond stress, check for bond stress, Determination of Development length in tension and compression members and check as per codal provisions, Anchorage value of 90° hook, Lapping of bars.</p> <p>2.3 Simple numericals on: Shear reinforcement, Adequacy of section for shear.</p> <p>2.4 Introduction to serviceability limit state check</p> <p>Course Outcome: CO2 Teaching Hours: 13 hrs Marks: 12 (R-4, U-4, A-4)</p> |
| 3 | <p>Design of axially loaded RCC Column :</p> <p>3.1 Definition and classification of column, Limit state of compression members, Effective length of column.</p> <p>3.2 Provisions of IS 456 for minimum steel, cover, maximum steel, spacing of ties etc.</p> <p>3.3 Design of axially loaded short column - Square, Rectangular, and Circular only.</p> <p>Course Outcome: CO3 Teaching Hours: 10 hrs Marks: 10 (R-2, U-4, A-4)</p> |
| 4 | <p>Design of Steel Tension and Compression Members (Limit State Method) :</p> <p>4.1 Types of sections used for Tension members.</p> <p>4.2 Strength of tension member by- yielding of section, rupture of net cross-section and block shear.</p> <p>4.3 Design of axially loaded single angle and double angle tension members with bolted and welded connections.</p> <p>4.4 Types of sections used as compression member, Calculation of effective length, Radius of gyration and slenderness ratio, Permissible values of slenderness ratio as per IS 800, Design compressive stress.</p> <p>4.5 Introduction to built up sections, lacing and battening (Meaning and purpose), Diagrams of single and double lacing and battening system. (No numerical problems).</p> <p>4.6 Design of axially loaded single and double angle struts connected by bolted and welded connections with gusset plate.</p> <p>Course Outcome: CO4 Teaching Hours: 15 hrs Marks: 14 (R-4, U-4, A-6)</p> |
| 5 | <p>Design of Steel beams (Limit State Method) :</p> <p>5.1 Standard beam sections, Bending stress calculations.</p> <p>5.2 Design of simple I and channel section.</p> <p>5.3 Check for shear as per IS 800.</p> <p>Course Outcome: CO5 Teaching Hours: 8 hrs Marks: 10 (R-2, U-4, A-4)</p> |

Suggested Specifications Table (Theory):

| Unit No | Topic Title | Distribution of Theory Marks | | | |
|---------|--|------------------------------|---------|---------|-------------|
| | | R Level | U Level | A Level | Total Marks |
| 1 | Design of Reinforced Concrete Beams by Limit State Method | 4 | 4 | 6 | 14 |
| 2 | Shear, Bond and Development length in Design of RCC member | 4 | 4 | 4 | 12 |
| 3 | Design of axially loaded RCC Column | 2 | 4 | 4 | 10 |

| | | | | | |
|--------------|---|-----------|-----------|-----------|-----------|
| 4 | Design of Steel Tension and Compression Members (Limit State Method) | 4 | 4 | 6 | 14 |
| 5 | Design of Steel beams (Limit State Method) | 2 | 4 | 4 | 10 |
| Total | | 16 | 20 | 24 | 60 |

List of experiments:

| Sr. No. | Unit No | COs | Title of the Experiments | Hours |
|---------|---------|---------------|--|-----------|
| 1 | 1,2 | CO1, CO2 | Draw cross section, strain diagram & stress diagram for singly reinforced section. | 04 |
| 2 | 1,2 | CO1, CO2 | Draw cross section, strain diagram & stress diagram for doubly reinforced section. | 04 |
| 3 | 3 | CO3 | Draw sketches of different types of column footings. | 02 |
| 4 | 1,2,3 | CO1, CO2, CO3 | Interpret the actual RCC Structural Drawings used on site with reference to reinforcement details of various structural elements. | 02 |
| 5 | 1,2,3 | CO1, CO2, CO3 | Prepare a checklist for reinforcement provided from actual drawings used on site for various structural elements. | 02 |
| 6 | 1,2,3 | CO1, CO2, CO3 | Prepare a detailed report of site visit for reinforcement detailing of structural elements like beams, columns, staircase & footing. | 08 |
| 7 | 5 | CO5 | Design simply supported I section steel beam for udl. | 06 |
| 8 | 4 | CO4 | Draw any five commonly used rolled steel sections and five built up sections. | 02 |
| 9 | 4,5 | CO4, CO5 | Summarize the provisions of IS 800 required for the design of tension member in report form. | 04 |
| 10 | 4,5 | CO4, CO5 | Compile relevant clauses from IS 800 required for the design of a compression member and submit it in report form. | 04 |
| 11 | 4 | CO4 | Draw sketches for single & double lacing of given built up columns. | 02 |
| 12 | 4 | CO4 | Draw sketches for battening of given built up columns. | 02 |
| 13 | 4,5 | CO4, CO5 | Prepare a report on the IS 800 provisions pertaining to design of lacing & battening along with its significance. | 04 |
| 14 | 4,5 | CO4, CO5 | Design beams section for shear as per IS 800 provisions. | 06 |
| 15 | | CO4, CO5 | Prepare a detailed report of site visit for study of rolled steel tension & compression members used in various structures. | 08 |
| | | Total | | 60 |

References/ Books:

| Sr. No. | Title | Author, Publisher, Edition and Year Of publication | ISBN |
|---------|---|--|--|
| 1 | Limit State Theory and Design of Reinforced Concrete Structures | Shah, V. L., and Karve, S.R., Structures Publications, Pune, 2014. | ISBN-10: 819037172X |
| 2 | Fundamentals of Reinforced Concrete | Sinha N.C., and Roy S.K., S. Chand & Co., New Delhi. | ISBN-10: 8121901278; ISBN-13: 978-8121901277 |
| 3 | Reinforced Concrete Design Principles and Practice | Krishna Raju, and N. Pranesh, R.N., New Age International, Mumbai. | ISBN: 9788122414608, 8122414605 |
| 4 | Limit State Design of Steel Structures | Shah, V. L., and Gore, V., Structures Publications, Pune. | ISBN : 4567170962, 1234567170961 |
| 5 | Design of Steel Structures | Subramanian N., Oxford University Press. | ISBN-10: 0195676815 |
| 6 | IS 456 : 2000 Plain and Reinforced Concrete | BIS | --- |
| 7 | IS 800 : 2007 Steel Code | BIS | --- |

E-References:

1. <http://www.academia.edu>
2. <http://www.irjet.net>
3. <http://www.nitw.ac.in>
4. <http://www.slideshare.net>
5. <http://link.springer.com>
6. <http://www.nationallibrary.gov.in>

CO Vs PO and CO Vs PSO Mapping (CIVIL ENGINEERING)

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | 3 | 3 | -- | 2 | 2 | 3 | 3 | 2 | -- |
| CO2 | 3 | 3 | 3 | -- | 2 | 2 | 3 | 3 | 2 | -- |
| CO3 | 3 | 3 | 3 | -- | 2 | 2 | 3 | 3 | 2 | -- |
| CO4 | 3 | 3 | 3 | -- | 2 | 2 | 3 | 3 | 2 | -- |
| CO5 | 3 | 3 | 3 | -- | 2 | 2 | 3 | 3 | 2 | -- |

Industry Consultation Committee:

| Sr. No | Name | Designation | Institute/Organisation |
|--------|---------------------|-------------------------|------------------------|
| 1 | Mr. Rohan Deokar | Deputy Engineer | MMRDA |
| 2 | Mr. Sanjay Kulkarni | Surveyor and Consultant | SRKulkarni Pvt.Firm |

| | | | |
|---|--------------------|-----------------------------|--------------------------|
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| 4 | Ms. S.D.Deshpande | Principal | Govt. Polytechnic Mumbai |

Coordinator,
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Head of Department
Department of Civil Engineering

I/C, Curriculum Development Cell

Principal



| Programme : Diploma in Civil Engineering (Sandwich Pattern) | | | | | | | | | | |
|---|----|----|-------|------------------------------------|---------------|--------------|----|-----|----|-------|
| Course Code:CE19501 | | | | Course Title: Estimation & Costing | | | | | | |
| Compulsory / Optional: Compulsory | | | | | | | | | | |
| Teaching Scheme and Credits | | | | Examination Scheme | | | | | | |
| TH | PR | TU | Total | TH (3Hrs) | TS1 (1 Hr) | TS2 (1Hr) | PR | OR | TW | Total |
| 04 | 02 | -- | 06 | 60 | 20 | 20 | -- | 25* | 25 | 150 |

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination

Note: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill test are to be conducted. First skill test at mid term and second skill test at the end of the term

Rationale :

This is a core technology course which will enable the students to learn core facts, concepts, principles & procedures in Estimating & Costing. With this knowledge and skill, students will be able to prepare estimate before start of construction and systematically procure materials during execution using specifications for ensuring appropriate type of construction process & quality of engineering products in specialized areas in Building Construction, Irrigation, Transportation and Environmental Engineering. In absence of market rates they can prepare their own rate and thereby prepare the detailed estimate.

Course Outcomes: Student should be able to

| | |
|-----|--|
| CO1 | Select modes of measurements for different items of works. |
| CO2 | Prepare approximate estimate of a civil engineering works. |
| CO3 | Prepare detailed estimate of a civil engineering works. |
| CO4 | Calculate quantity of earthwork. |
| CO5 | Justify rate for given items of work using rate analysis techniques. |

Course Content Details:

| Unit No | Topics / Sub-topics |
|----------|--|
| 1 | Fundamentals of Estimating and Costing: 1.1 Estimating and Costing – Meaning, purpose, Administrative approval, Technical Sanction and Budget provision. 1.2 Types of estimates – Approximate and Detailed estimate. 1.3 Types and Uses of Estimates: Revised estimate, Supplementary estimate, Revised & Supplementary Estimate, Repair and maintenance estimate. 1.4 Roles and responsibility of Estimator. 1.5 Checklist of items in load bearing and framed structure. 1.6 Standard formats of Measurement sheet, Abstract sheet, Face sheet. |

| | |
|---|--|
| | <p>1.7 Modes of measurement and desired accuracy in measurements for different items of work as per IS:1200.</p> <p>1.8 Rules for deduction in different category of work as per IS:1200.</p> <p>1.9 Description / specification of items of building work as per PWD /DSR.</p> <p>Course Outcome: CO1 Teaching Hours : 12 hrs Marks: 12 (R- 6, U-4, A-2)</p> |
| 2 | <p>Approximate Estimates:</p> <p>2.1 Approximate estimate - Definition, Purpose.</p> <p>2.2 Methods of approximate estimate - Service unit method, Plinth area rate method, Cubical content method, Typical bay method, Approximate quantity method (with simple numericals)</p> <p>2.3 Approximate estimate for roads, Railways, bridges/culvert, irrigation projects and water supply projects.</p> <p>Course Outcome: CO2 Teaching Hours: 10 hrs Marks: 12 (R-2, U- 4, A- 6)</p> |
| 3 | <p>Detailed Estimate :</p> <p>3.1 Detailed Estimate- Definition and Purpose, Data required for detailed estimate - Civil cost, GST, Contingencies, Supervision charges, Agency charges, Procedure for preparation of detailed estimate- Taking out quantities and Abstracting.</p> <p>3.2 Methods of Detailed Estimate- Unit quantity method and total quantity method (with simple numericals)</p> <p>3.3 Long wall and Short wall method, Centre line method.</p> <p>3.4 Bar bending schedule for footing, column, beam, Lintel, chajja and slab elements.</p> <p>3.5 Provisions in detailed estimate: contingencies, work charged establishment, percentage charges, water supply and sanitary Charges and electrification charges etc.</p> <p>3.6 Prime cost, Provisional sum, Provisional quantities, Bill of quantities.</p> <p>Course Outcome: CO3 Teaching Hours:14 hrs Marks: 14 (R- 2, U- 6, A- 6)</p> |
| 4 | <p>Estimate for Civil Engineering Works:</p> <p>4.1 Earthwork - Quantities for roads, Embankment and canal by – Mid sectional area method, mean sectional area method, Prismoidal and trapezoidal formula method.</p> <p>4.2 Detailed estimate for septic tank, Community well.</p> <p>Course Outcome: CO4 Teaching Hours: 12 hrs Marks: 10 (R- 2 ,U- 4, A- 4)</p> |
| 5 | <p>Rate Analysis:</p> <p>5.1 Rate Analysis: Definition, purpose and importance.</p> <p>5.2 Lead (Standard and Extra), lift, overhead charges, water charges and contractors' profit.</p> <p>5.3 Procedure for rate analysis.</p> <p>5.4 Task work- Definition, types. Task work of different skilled labour for different items.</p> <p>5.5 Categories of labours, their daily wages, types and number of labours for different items of work.</p> <p>5.6 Transportation charges of materials - Lead and Lift, Hire charges of machineries and equipments.</p> <p>5.7 Preparing rate analysis of different items of work pertaining to buildings.</p> <p>Course Outcome: CO5 Teaching Hours: 12 hrs Marks: 12 (R- 2, U- 4, A- 6)</p> |

Suggested Specifications Table (Theory):

| Unit No | Topic Title | Distribution of Theory Marks | | | |
|---------|--|------------------------------|---------|---------|-------------|
| | | R Level | U Level | A Level | Total Marks |
| 1 | Fundamentals of Estimating and Costing | 6 | 4 | 2 | 12 |

| | | | | | |
|--------------|--------------------------------------|-----------|-----------|-----------|-----------|
| 2 | Approximate Estimates | 2 | 4 | 6 | 12 |
| 3 | Detailed Estimate | 2 | 6 | 6 | 14 |
| 4 | Estimate for Civil Engineering Works | 2 | 4 | 4 | 10 |
| 5 | Rate Analysis | 2 | 4 | 6 | 12 |
| Total | | 14 | 22 | 24 | 60 |

List of experiments:

| Sr. No. | Unit No | COs | Title of the Experiments | Hours |
|---------|---------|--------------|---|-----------|
| 1 | 01 | CO1 | Prepare the list of items to be executed with units for detailed estimate of a given structure | 02 |
| 2 | 01 | CO1 | Study of items with specification given in the DSR (for any 5 items). | 02 |
| 3 | 02 | CO2 | Prepare approximate estimate for the given civil engineering works. | 02 |
| 4 | 03 | CO3 | Calculate the quantity of items of work from the given set of drawings using standard measurement sheet for load bearing residential structure using description of item from DSR. (1BHK building with staircase) | 06 |
| 5 | 03 | CO3 | Prepare detailed estimate from the given set of drawings using “standard measurement and abstract format” for RCC framed structure using description of item from DSR along with face sheet.(1BHK building with staircase) | 05 |
| 6 | 03 | CO3 | Calculate the reinforcement quantities from the given set of drawings for a room size of 3m X 4m with bar bending schedule (footing, column, beam, lintel with chajja, slab) | 05 |
| 7 | 04 | CO4 | Prepare quantity of earthwork of road of 500m. | 04 |
| 8 | 05 | CO5 | Prepare rate analysis for the given 5 items of works. | 04 |
| | | Total | | 30 |

References/ Books:

| Sr. No. | Title | Author, Publisher, Edition and Year Of publication | ISBN |
|---------|--|--|--|
| 1 | Estimating and Costing in Civil Engineering | Datta, B.N. UBS Publishers Distributors Pvt. Ltd. New Delhi. | ISBN-10: 8174767703; ISBN-13: 978-8174767707 |
| 2 | Estimating construction cost (fifth edition) | Peurifoy, Robert L. Oberlender, Garold. McGraw Hill Education, New Delhi. | ISBN-13: 978-0071150842 |
| 3 | Estimating and Costing | Rangwala, S.C. Charotar Publishing House PVT. LTD., Anand. | ISBN : 9789385039058 896 |
| 4 | Estimating and Costing | Birdie, G.S. Dhanpat Rai Publishing Company(P) Ltd. New Delhi. | ISBN-10: 9384559512; ISBN-13: 978-9384559519 |

| | | | |
|---|--|--|--|
| 5 | Estimating and costing, specification and valuation in civil engineering | Chakraborti, M. Monojit Chakraborti, Kolkata. | ISBN-10: 818530436X ISBN-13 : 978- 8185304366 |
| 6 | PWD Schedule of Rates. | | |
| 7 | Ministry of Road Transport and Highways (MORT&H) Specifications and Analysis of Schedule of Rates. | | |

E-References:

1. <http://www.nap.edu>
2. <http://www.darshan.ac.in>
3. <http://www.sanfoundry.com>
4. <http://www.cmu.edu>
5. www.yb.tl
6. <http://www.nationallibrary.gov.in>

CO Vs PO and CO Vs PSO Mapping (CIVIL ENGINEERING)

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | 3 | 2 | -- | -- | 1 | 1 | 1 | 3 | -- |
| CO2 | 3 | 3 | 3 | -- | -- | 1 | 2 | 1 | 3 | -- |
| CO3 | 3 | 3 | 3 | -- | -- | 1 | 2 | 1 | 3 | -- |
| CO4 | 3 | 3 | 3 | -- | -- | 1 | 2 | 1 | 3 | -- |
| CO5 | 3 | 3 | 3 | -- | -- | 1 | 2 | -- | 3 | -- |

Industry Consultation Committee:

| Sr. No | Name | Designation | Institute/Organisation |
|--------|---------------------|-----------------------------|--------------------------|
| 1 | Mr. Rohan Deokar | Deputy Engineer | MMRDA |
| 2 | Mr. Sanjay Kulkarni | Surveyor and Consultant | SRKulkarni Pvt.Firm |
| 3 | Mr. K.V. Kelgandre | Sr. Lecturer in Civil Engg. | K.J. Somaiya Polytechnic |
| 4 | Ms. S. M. Male | Lecturer in Civil Engg. | Govt. Polytechnic Mumbai |

Coordinator,
Curriculum Development,
Department of Civil Engineering

Head of Department
Department of Civil Engineering

I/C, Curriculum Development Cell

Principal

| | | | | | | | | | | |
|--|-----------|-----------|-----------|--|---------------|--------------|-----------|------------|-----------|------------|
| Programme : Diploma in Civil Engineering (Sandwich Pattern) | | | | | | | | | | |
| Course Code: CE19502 | | | | Course Title: Contracts, Accounts & Valuation | | | | | | |
| Compulsory / Optional: Compulsory | | | | | | | | | | |
| Teaching Scheme and Credits | | | | Examination Scheme | | | | | | |
| TH | PR | TU | Total | TH (2Hrs 30 min) | TS1 (1 Hr) | TS2 (1Hr) | PR | OR | TW | Total |
| 04 | 02 | -- | 06 | 60 | 20 | 20 | -- | 25* | -- | 125 |

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination
 Note: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill test are to be conducted. First skill test at mid term and second skill test at the end of the term

Rationale :

The students will learn concepts, principles and procedures of contracts, accounts and valuation. The student will know procedure for preparing tender documents and contracts. The students will understand the procedure for execution of Civil engineering works in Government and private sectors. The student calculate rent and prepare valuation of a civil structures.

Course Outcomes: Student should be able to

| | |
|-----|---|
| CO1 | Understand various types of contract and when they are used. |
| CO2 | Suggest the relevant type of contract for the given civil engineering work. |
| CO3 | Prepare the typical Tender document for the given civil engineering work. |
| CO4 | Decide type of payment for the executed work. |
| CO5 | Justify the rent fixation and valuation of given civil structure. |

Course Content Details:

| Unit No | Topics / Sub-topics |
|----------|---|
| 1 | Procedure to execute the work : 1.1 Administrative approval, Technical sanction, budget provision, expenditure sanction. 1.2 Methods for carrying out works- contract method, departmental method -rate list method, piece work method, day's work method, employing labours on daily wages basis. Course Outcome: CO1 Teaching Hours : 8 hrs Marks: 04 (R-4, U-0, A-0) |
| 2 | Contracts : 2.1 Definition of contract, objects of contract, requirements of contract, overview of Indian Contract Act. 2.2 Types of engineering contract with advantages, disadvantages and their suitability - Lump sum contract, item rate contract, percentage rate contract, cost plus percentage, cost plus fixed fee, cost plus variable percentage and cost plus variable fee contract, labour contract, demolition contract, target contract, negotiated contract, Engineering Procurement Construction Contract (EPC), Annuity Contract. |

| | |
|---|---|
| | <p>2.3 Introduction of FIDIC Conditions of contract.</p> <p>2.4 Classification of contractor on basis of financial limits, Requirement of documents for registration of contractor.</p> <p>2.5 Build Operate Transfer (BOT) Project, BOT Toll contract, BOT (Annuity) contract, Design, Build, Finance, Operate and Transfer (DBFOT) contract, Hybrid Annuity contract, Operate Maintain and Transfer (OMT) contract, Operation & Maintenance contract (Introduction only).</p> <p>Course Outcome: CO2 Teaching Hours: 10 hrs Marks: 14 (R-6, U-6, A-2)</p> |
| 3 | <p>Tender and Tender Documents :</p> <p>3.1 Definition of tender, necessity of tender, types of tender- Local, Global, Limited.</p> <p>3.2 E -Tendering System – Online procedure of submission and opening of bids (Technical and Financial).</p> <p>3.3 Notice to invite tender (NIT)- Points to be included while drafting tender notice, Drafting of tender notice.</p> <p>3.4 Procedure of submitting filled tender Documents (Two envelope system), procedure of opening tender, comparative statement, scrutiny of tenders, award of contract, letter of award.</p> <p>3.5 Meaning of terms - Earnest Money Deposit (EMD), Performance Security Deposit, Validity period, corrigendum to tender notice and its necessity, Unbalanced bid.</p> <p>3.6 Tender documents – Index, tender notice, general instructions, special instructions, Schedule A, Schedule B, Schedule C etc.</p> <p>3.7 Terms related to tender documents – contract conditions- time limit, time extension, penalty, defective material and workmanship, termination of contract, suspension of work, subletting of contract, extra items, price variation clause(escalation), defect liability Period, liquidated Damages.</p> <p>3.8 Arbitration- Meaning, Qualification of an arbitrator, Appointment, Dispute and Settlement of disputes, Arbitration and Conciliation Act, Arbitration award.</p> <p>Course Outcome: CO3 Teaching Hours:16 hrs Marks: 16 (R- 6, U- 6, A- 4)</p> |
| 4 | <p>Accounts :</p> <p>4.1 Various account forms and their uses – Measurement Books, E- Measurement book (E-MB), Nominal Muster Roll(NMR), Imprest Cash, Indent, Invoice, Bill, Vouchers, Hand receipt Cash Book, Temporary Advance. Heads of Accounts.</p> <p>4.2 Mode of Payment to the contractor and its necessity -Interim Payment, Advance Payment Secured Advance, Petty advance, Mobilization advance, Running account bill, Final bill, Retention money, E - payment.</p> <p>Course Outcome: CO4 Teaching Hours: 12 hrs Marks: 12 (R- 6 ,U- 6, A- 0)</p> |
| 5 | <p>Introduction to Valuation :</p> <p>5.1 Definition and purpose of Valuation, role of valuer. Definition - Cost, Price and Value, Characteristics of Value, Factors Affecting Value.</p> <p>5.2 Types of Value - Book Value, Scrap Value, Salvage Value, Speculative Value, Distress Value, Market Value, monopoly Value, Sentimental Value. Factors affecting value.</p> <p>5.3 Depreciation, Obsolescence, Sinking Fund, Methods of Calculation of Depreciation – Straight Line Method, Sinking Fund Method, Constant Percentage Method.</p> <p>5.4 Fixation of rent, Lease – types of lease, lease hold property and free hold property. Mortgage – Mortgage deed, precautions to be taken while making mortgage.</p> <p>Course Outcome: CO5 Teaching Hours: 14 hrs Marks: 14 (R- 4, U- 4, A- 6)</p> |

Suggested Specifications Table (Theory):

| Unit No | Topic Title | Distribution of Theory Marks | | | |
|--------------|-------------------------------|------------------------------|-----------|-----------|-------------|
| | | R Level | U Level | A Level | Total Marks |
| 1 | Procedure to execute the work | 4 | 0 | 0 | 04 |
| 2 | Contracts | 6 | 6 | 2 | 14 |
| 3 | Tender and Tender Documents | 6 | 6 | 4 | 16 |
| 4 | Accounts | 6 | 6 | 0 | 12 |
| 5 | Introduction to Valuation | 4 | 4 | 6 | 14 |
| Total | | 26 | 22 | 12 | 60 |

List of experiments:

| Sr. No. | Unit No | COs | Title of the Experiments | Hours |
|---------|---------|--------------|--|-----------|
| 1 | 01 | CO1 | Assignment on procedure of execution of construction work. | 03 |
| 2 | 02 | CO2 | Assignment on types of contracts. | 02 |
| 3 | 02 | CO2 | Assignment on class of Contractor's registration with its limits and procedure of registration, documents required and upgradation as Contractor in PWD. | 06 |
| 4 | 02 | CO2 | Assignment on BOT | 04 |
| 5 | 03 | CO3 | Collection of any five tender notices. | 02 |
| 6 | 03 | CO3 | Drafting of tender notice for Government and Private work. | 04 |
| 7 | 04 | CO4 | Assignment on Interim payment, Secured Advance, Advance Payment, Petty Advance, Running Bill & Final Bill, Mobilization Advance. | 03 |
| 8 | 05 | CO5 | Numericals on rent fixation and capitalized value of property. | 06 |
| | | Total | | 30 |

References/ Books:

| Sr. No. | Title | Author, Publisher, Edition and Year Of publication | ISBN |
|---------|--|--|--|
| 1 | Estimating and Costing in Civil Engineering | Datta, B.N. UBS Publishers Distributors Pvt. Ltd. New Delhi. | ISBN-10: 8174767703; ISBN-13: 978-8174767707 |
| 2 | Construction Management and Contract Practices | Raina, V. K., Shroff Publishers & Distributors Pvt. Ltd. | ISBN: 9789352137220 |
| 3 | Estimating and Costing | Rangwala, S.C. Charotar Publishing House PVT. LTD., Anand. | ISBN : 9789385039058 896 |
| 4 | Estimating and Costing | Birdie, G.S. Dhanpat Rai Publishing Company(P) Ltd. New Delhi. | ISBN-10: 9384559512; ISBN-13: 978- |

| | | | |
|---|--|--|--|
| | | | 9384559519 |
| 5 | Estimating and costing, specification and valuation in civil engineering | Chakraborti, M. Monojit Chakraborti, Kolkata. | ISBN-10: 818530436X ISBN-13 : 978- 8185304366 |
| 6 | Civil Engineering Contracts and Estimates | Patil, B. S., Orient Longman, Mumbai | ISBN-10: 9788173719578 |

E-References:

1. <http://www.nap.edu>
2. <http://www.darshan.ac.in>
3. <http://www.sanfoundry.com>
4. <http://www.cmu.edu>
5. www.yb.tl
6. <http://www.nationallibrary.gov.in>

CO Vs PO and CO Vs PSO Mapping (CIVIL ENGINEERING)

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | 3 | 2 | -- | -- | 1 | 1 | -- | 1 | -- |
| CO2 | 3 | 3 | 3 | -- | -- | 1 | 2 | -- | 1 | -- |
| CO3 | 3 | 3 | 3 | -- | -- | 1 | 2 | -- | 1 | -- |
| CO4 | 3 | 3 | 3 | -- | -- | 1 | 2 | -- | 1 | -- |
| CO5 | 3 | 3 | 3 | -- | -- | 1 | 2 | -- | 3 | -- |

Industry Consultation Committee:

| Sr. No | Name | Designation | Institute/Organisation |
|--------|---------------------|-----------------------------|--------------------------|
| 1 | Mr. Rohan Deokar | Deputy Engineer | MMRDA |
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I/C, Curriculum Development Cell

Principal

| | | | | | | | | | | |
|--|----|----|-----------|---|---------------|--------------|----|------------|----|------------|
| Programme : Diploma in Civil Engineering (Sandwich Pattern) | | | | | | | | | | |
| Course Code: CE19503 | | | | Course Title: Irrigation Engineering | | | | | | |
| Compulsory / Optional: Compulsory | | | | | | | | | | |
| Teaching Scheme and Credits | | | | Examination Scheme | | | | | | |
| TH | PR | TU | Total | TH (2 Hrs 30 min) | TS1 (1 Hr) | TS2 (1Hr) | PR | OR | TW | Total |
| 03 | -- | -- | 03 | 60 | 20 | 20 | -- | 25* | -- | 125 |

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination
 Note: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill test are to be conducted. First skill test at mid term and second skill test at the end of the term

Rationale:

India is basically an agricultural country and all its resources depend on the agricultural output. Water is evidently the most vital element in plant life. The total rainfall in a particular area may be either insufficient or ill timed. In order to get maximum yield it is essential to supply the optimum quantity of water and to maintain correct timing. This is possible only through a systematic irrigation system. Irrigation engineering, being an essential part of civil engineering has been included in the programme.

Course Outcomes: Student should be able to

| | |
|-----|---|
| CO1 | State importance of irrigation, advantages, disadvantages in Indian context. |
| CO2 | Discuss methods of water application to crops and types of crops in Maharashtra and evaluate duty and delta relation for crops. |
| CO3 | Calculate the storage capacity of reservoirs. |
| CO4 | State types of dams, spillway structures and their suitability conditions and identify different forces acting on gravity dam and conditions of stability of dam. |
| CO5 | Describe types of canals, canals structures and cross drainage works and functions of regulating and cross drainage. |
| CO6 | Classify different irrigation systems. |

Course Content Details:

| Unit No | Topics / Sub-topics |
|----------|---|
| 1 | Introduction to Irrigation engineering and Hydrology 1.1 Irrigation Engineering: Definition, necessity of irrigation, Different Irrigation engineering systems, National Water Policy. 1.2 Hydrology: Concept of hydrology, Hydrologic cycle, Definition of rain fall, rainfall intensity. 1.3 Rain Gauges - Symon's rain gauge, automatic rain gauge, its construction and functioning, average rainfall, methods of calculating average rainfall. arithmetic average method, Thiessen's polygon method, isohyetal method. 1.4 Runoff: Definition, Factors affecting Run off, Computation of runoff Using Inglis formula, Stranges and Bennie's tables. |

| | |
|---|---|
| | <p>1.5 Maximum Flood Discharge (MFD): Concept of MFD, Computation of MFD by Inglis and Dicken's formula.</p> <p>1.6 Yield, dependable yield and calculation of yield.</p> <p>1.7 Simple numerical problems.</p> <p>Course Outcome: CO1 , Teaching Hours :4 hrs Marks: 06 (R-4, U-2, A-0)</p> |
| 2 | <p>Water requirement of crops :</p> <p>2.1 Cropping seasons and crops in Maharashtra.</p> <p>2.2 Definitions of terms - Crop season, crop period, base period crop rotation, Intensity of Irrigation, command area, Gross command area, Cultivable command area, Irrigable Command Area, Crop pattern.</p> <p>2.3 Duty & Delta, Relation between duty & delta, factors affecting duty, Methods of improving duty.</p> <p>2.4 Time factor, capacity factor.</p> <p>2.5 Determination of water requirements & capacity of canal.</p> <p>2.6 Assessment of irrigation water.</p> <p>2.7 Numerical problems on water requirement of crops.</p> <p>Course Outcome: CO2 , Teaching Hours :8 hrs Marks: 08 (R- 4, U-4, A-0)</p> |
| 3 | <p>Reservoir planning :</p> <p>3.1 Investigating survey for reservoir planning and data collection.</p> <p>3.2 Area capacity curves- Construction and uses.</p> <p>3.3 Silting of reservoir, rate of silting, factors affecting silting, sediment control.</p> <p>3.4 Evaporation from reservoir, method of reducing evaporation.</p> <p>3.5 Fixing Control levels and respective storage in reservoir. Simple numerical problems on Fixing Control levels.</p> <p>Course Outcome: CO3 , Teaching Hours :6 hrs Marks: 08 (R- 2, U-0, A-6)</p> |
| 4 | <p>Dams and Spillways :</p> <p>4.1 Definition, types - gravity dam (masonry and concrete), earthen dam, choice of type of a dam.</p> <p>4.2 Earthen Dam: Components and their function, typical cross section, seepage through embankment and foundation, seepage control through embankment and foundation. Phreatic line & its characteristics. Slope protection, Downstream drainage system, Criteria for safe design of earthen dam, Causes of failure of earthen dam and condition of Stability. Construction of earthen dam.</p> <p>4.3 Gravity Dam: Forces acting on gravity dam, Conditions of stability, theoretical and practical profile, high & low dams. Galleries- Function, Types. Control of cracking in gravity dams. Outlets in gravity dams.</p> <p>4.4 Definition, purpose, components parts, types of spillways - with & without gates, ogee spillway, bar spillway Conditions favouring each type.</p> <p>4.5 Energy dissipation below spillways, stilling basin.</p> <p>4.6 Spillway crest gates - Radial and vertical lift gates.</p> <p>Course Outcome: CO3 , Teaching Hours :12 hrs Marks: 18 (R- 2,U-4,A-12)</p> |
| 5 | <p>Canal :</p> <p>5.1 Classification of canals according to alignment and position in the canal network.</p> <p>5.2 Canal alignments - ridge canal, contour canal, side slope.</p> <p>5.3 Cross section of canal in embankment and cutting, partial embankment and</p> |

| | |
|---|--|
| | <p>cutting, balancing depth. Design of most economical canal section.</p> <p>5.4 Canal lining - Purpose, material used and its properties. Advantages of canal lining</p> <p>5.5 CD works- Aqueduct , siphon aqueduct, super passage, level crossing</p> <p>5.6 Canal regulators- Head regulator, Cross regulator, Escape, Falls and Outlets. Canal maintenance.</p> <p>Course Outcome: CO4 , Teaching Hours : 8hrs Marks: 10 (R- 2, U-2, A- 6)</p> |
| 6 | <p>Diversion Head works and Minor and Micro Irrigation :</p> <p>6.1 Layout of diversion head works - component parts and their function - weir or barrage, divide wall, pocket, scouring sluices, silt excluder, silt Extractor, fish ladder.</p> <p>6.2 Weirs - Functions, site selection, types - sloping weir, vertical drop weir, K.T. Weir, situation favoring its Construction.</p> <p>6.3 Barrage - Components and their functions, layout of typical barrage, situation favouring Construction of barrage.</p> <p>6.4 Comparison between weir & barrage.</p> <p>6.5 Bandhara-Construction and working Advantages and disadvantages of bandhara irrigation, layout and component parts, solid and open bandhara.</p> <p>6.6 Percolation Tanks – Need, selection of site, construction</p> <p>6.7 Lift irrigation scheme-Components and their functions ,lay out</p> <p>6.8 Drip and Sprinkler Irrigation- Need, components, Layout, operation and Maintenance.</p> <p>Course Outcome: CO6 , Teaching Hours :7 hrs Marks: 10 (R- 6,U-4, A-0)</p> |

Suggested Specifications Table (Theory):

| Unit No | Topic Title | Distribution of Theory Marks | | | |
|--------------|--|------------------------------|-----------|-----------|-------------|
| | | R Level | U Level | A Level | Total Marks |
| 1 | Introduction to Irrigation engineering and Hydrology | 04 | 02 | -- | 06 |
| 2 | Water requirement of crops | 04 | 04 | -- | 08 |
| 3 | Reservoir planning | 02 | -- | 06 | 08 |
| 4 | Dams and Spillways | 02 | 04 | 12 | 18 |
| 5 | Canals | 02 | 02 | 06 | 10 |
| 6 | Diversion Head works & Minor and Micro Irrigation | 06 | 04 | -- | 10 |
| Total | | 20 | 16 | 24 | 60 |

References/ Books:

| Sr. No. | Name of Book | Author, Publisher, Edition and Year Of publication Author | ISBN |
|---------|--|--|-------------------------|
| 1 | Irrigation Engineering and water power engineering | B.C Punmia,Pande B.B.Lal,Laxmi Publication,Ltd,12th Edition, Aug 1992 Distributors | ISBN-13: 978-8131807637 |

| | | | |
|---|--|---|------------------------|
| 2 | Irrigation and water power engineering | S.K Garg,Khanna Publication,Delhi-6 | ISBN:8174090479 |
| 3 | The Fundamental principles of Irrigation Engineering | Priyani V. B.,Charotkar Book Stall,Anand ,fifth edition | ISBN-13: C076000000005 |
| 4 | Text book of Irrigation Engineering | Dahigaonkar J. G,Wheeler Publishing Allahabad | ISBN: 8185614458 |

E-References :

1. <http://www.maharashtrawaterpolicy.com>
2. <http://nptel.ac.in>
3. <http://wrd.maharashtra.gov.in>
4. <http://www.nationallibrary.gov.in>

CO Vs PO and CO Vs PSO Mapping

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 2 | 3 | 3 | 3 | 2 | 3 | 2 | 1 | 3 | 1 |
| CO2 | 2 | 3 | 3 | 3 | 2 | 3 | 2 | 1 | 3 | 1 |
| CO3 | 2 | 3 | 3 | 3 | 2 | 3 | 2 | 1 | 3 | 1 |
| CO4 | 2 | 3 | 3 | 3 | 2 | 3 | 2 | 1 | 3 | 1 |
| CO5 | 2 | 3 | 3 | 3 | 2 | 3 | 2 | 1 | 3 | 1 |
| CO6 | 2 | 3 | 3 | 3 | 2 | 3 | 2 | 1 | 3 | 1 |

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Coordinator,
Curriculum Development,
Department of _____

Head of Department
Department of _____

I/C, Curriculum Development Cell

Principal

| | | | | | | | | | | |
|--|----|----|-----------|---|---------------|--------------|----|----|----|------------|
| Programme : Diploma in Civil Engineering (Sandwich Pattern) | | | | | | | | | | |
| Course Code: AM19502 | | | | Course Title: Prestressed & Precast Concrete | | | | | | |
| Compulsory / Optional: Optional | | | | | | | | | | |
| Teaching Scheme and Credits | | | | Examination Scheme | | | | | | |
| TH | PR | TU | Total | TH (2 Hrs 30 min) | TS1 (1 Hr) | TS2 (1Hr) | PR | OR | TW | Total |
| 04 | -- | -- | 04 | 60 | 20 | 20 | -- | -- | -- | 100 |

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination
 Note: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill test are to be conducted. First skill test at mid term and second skill test at the end of the term

Rationale :

In today's system fast developing technology, use of prestressed and precast concrete is increasing with leaps and bounds. Due to several attractive and elegant features prestressed concrete and precast concrete is becoming popular in many fields, it has successfully replaced the conventional structural materials like R.C.C. and steel. All these revolution in area of structural engineering made it essential to specialize the engineering students in the subject of "Prestressed & Precast Concrete".

Course Outcomes: Student should be able to

| | |
|-----|--|
| CO1 | Select the relevant precast concrete element for a given type of construction. |
| CO2 | Use relevant components for prefabricated structures. |
| CO3 | Justify the relevance of prestressed element in a given situation. |
| CO4 | Select relevant methods / systems for given construction work. |
| CO5 | Propose suitable cable profile for the given prestressed concrete members. |

Course Content Details:

| Unit No | Topics / Sub-topics |
|---------|---|
| 1 | Precast concrete Elements : 1.1 Advantages and disadvantages of precast concrete members 1.2 Non-structural Precast elements - Paver blocks, Fencing Poles, Transmission Poles, Manhole Covers, Hollow and Solid Blocks, kerb stones as per relevant BIS specifications 1.3 Structural Precast elements – tunnel linings, Canal lining, Box culvert, bridge panels, foundation, sheet piles 1.4 Testing of Precast components as per BIS standards Course Outcome: CO1 Teaching Hours : 12 hrs Marks: 10 (R-4, U-6, A-0) |
| 2 | Prefabricated building : 2.1 Precast Structural Building components such as slab panels, beams, columns, footings, walls, lintels and chajjas, staircase elements. |

| | |
|---|---|
| | <p>2.2 Prefabricated building using precast load bearing and non load bearing wall panels, floor systems - Material characteristics, Plans & Standard specifications</p> <p>2.3 Modular co-ordination, modular grid, and finishes</p> <p>2.4 Prefab systems and structural schemes and their classification including design considerations</p> <p>2.5 Joints – requirements of structural joints and their design considerations</p> <p>2.6 Manufacturing, storage, curing, transportation and erection of above elements, equipment needed</p> <p>Course Outcome: CO2 Teaching Hours: 14 hrs Marks: 14 (R-4, U-6, A-4)</p> |
| 3 | <p>Introduction to Prestressed Concrete :</p> <p>3.1 Principles of pre-stressed concrete and basic terminology.</p> <p>3.2 Applications, advantages and disadvantages of prestressed concrete</p> <p>3.3 Materials used and their properties, Necessity of high-grade materials</p> <p>3.4 Types of Pre-stressing steel -Wire, Cable, tendon, Merits-demerits and applications</p> <p>Course Outcome: CO3 Teaching Hours: 8 hrs Marks: 10 (R-4, U-4, A-2)</p> |
| 4 | <p>Methods and systems of prestressing :</p> <p>4.1 Methods of prestressing – Internal and External pre-stressing, Pre and Post tensioning-applications</p> <p>4.2 Systems for pre tensioning – process, applications, merits and demerits - Hoyer system</p> <p>4.3 Systems for post-tensioning - process, applications, merits and demerits - Freyssinet system, Magnel Blaton system, Gifford Udall system.</p> <p>4.4 Prestressing force in Cable, Loss of prestress during the tensioning process - loss due to friction, length effect, wobbling effect and curvature effect, (Simple Numerical problems to determine loss of pre-stress), Loss of pre-stress at the anchoring stage.</p> <p>4.5 Loss of pre-stress occurring subsequently: losses due to shrinkage of concrete, creep of concrete, elastic shortening, and creep in steel, (Simple Numerical problems to determine loss of pre-stress).</p> <p>4.6 BIS recommendations for percentage loss in case of Pre and Post tensioning.</p> <p>Course Outcome: CO4 Teaching Hours: 14 hrs Marks: 14 (R-4, U-6, A-4)</p> |
| 5 | <p>Analysis and design of Prestressed rectangular beam section :</p> <p>5.1 Basic assumptions in analysis of pre-stressed concrete beams.</p> <p>5.2 Cable Profile in simply supported rectangular beam section – concentric, eccentric straight and parabolic</p> <p>5.3 Effect of cable profile on maximum stresses at mid span and at support</p> <p>5.4 Numerical problems on determination of maximum stresses at mid spans with linear (concentric and eccentric) cable profiles only.</p> <p>5.5 Simple steps involved in Design of simply supported rectangular beam section (No numerical problems)</p> <p>Course Outcome: CO5 Teaching Hours: 12 hrs Marks: 12 (R-4, U-4, A-4)</p> |

Suggested Specifications Table (Theory):

| Unit No | Topic Title | Distribution of Theory Marks | | | |
|---------|---------------------------|------------------------------|---------|---------|-------------|
| | | R Level | U Level | A Level | Total Marks |
| 1 | Precast concrete Elements | 4 | 6 | -- | 12 |
| 2 | Prefabricated building | 4 | 6 | 4 | 12 |

| | | | | | |
|--------------|--|-----------|-----------|-----------|-----------|
| 3 | Introduction to Prestressed Concrete | 4 | 4 | 2 | 10 |
| 4 | Methods and systems of prestressing | 4 | 6 | 4 | 12 |
| 5 | Analysis and design of Prestressed rectangular beam section | 4 | 4 | 4 | 12 |
| Total | | 20 | 26 | 14 | 60 |

References/ Books:

| Sr. No. | Title | Author, Publisher, Edition and Year Of publication | ISBN |
|---------|---|---|--|
| 1 | Pre-stressed Concrete | Krishna Raju, N., Pre-stressed Concrete, Tata McGraw Hill, New Delhi. | ISBN : 0074622099, 9780074622094 |
| 2 | Pre-stressed Concrete | Shrikant B. Vanakudre, Prestressed Concrete, Khanna Publishing House, New Delhi | ISBN-10: 938617331X; ISBN-13: 978-9386173317 |
| 3 | Pre Cast and Pre Stress Technology: Process, Method and Future Technology | Marzuki, Nor Ashikin, Pre Cast and Pre Stress Technology: Process, Method and Future Technology, Createspace Independent Publication. | ISBN-10: 1499353391; ISBN-13: 978-1499353396 |
| 4 | Handbook on Precast Concrete buildings. | Indian Concrete Institute. | ISBN, 8192062341, 9788192062341 |
| 5 | IS 12592 Precast Concrete Manhole Cover and Frame | BIS, New Delhi. | -- |
| 6 | IS 15658 Precast concrete blocks for paving - Code of Practice | BIS, New Delhi. | -- |
| 7 | IS 15916 Building Design and Erection Using Prefabricated Concrete - Code of Practice | BIS, New Delhi. | -- |
| 8 | IS 15917 Building Design and Erection Using Mixed/Composite Construction - Code of Practice | BIS, New Delhi. | -- |
| 9 | IS 458 Precast Concrete Pipes (with and without reinforcement) — Specification | BIS, New Delhi. | -- |

E-References:

1. <http://www.pci.org>
2. <http://www.precast.org>
3. <http://www.indianconcrete.org>
4. <http://nitterhouseconcrete.com>

5. <http://precastblocks.com>
6. <http://www.nationallibrary.gov.in>

CO Vs PO and CO Vs PSO Mapping (CIVIL ENGINEERING)

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | 3 | 3 | -- | 2 | -- | 3 | 1 | 2 | -- |
| CO2 | 3 | 3 | 3 | -- | 2 | -- | 3 | 1 | 2 | -- |
| CO3 | 3 | 3 | 3 | -- | 2 | 1 | 3 | -- | 2 | -- |
| CO4 | 3 | 3 | 3 | -- | 2 | 1 | 3 | -- | 2 | -- |
| CO5 | 3 | 3 | 3 | -- | 2 | -- | 3 | 1 | 2 | -- |

Industry Consultation Committee:

| Sr. No | Name | Designation | Institute/Organisation |
|--------|---------------------|-----------------------------|--------------------------|
| 1 | Mr. Rohan Deokar | Deputy Engineer | MMRDA |
| 2 | Mr. Sanjay Kulkarni | Surveyor and Consultant | SRKulkarni Pvt.Firm |
| 3 | Mr. K.V. Kelgandre | Sr. Lecturer in Civil Engg. | K.J. Somaiya Polytechnic |
| 4 | Ms. S.D.Deshpande | Principal | Govt. Polytechnic Mumbai |

Coordinator,
Curriculum Development,
Department of Civil Engineering

Head of Department
Department of Civil Engineering

I/C, Curriculum Development Cell

Principal

| | | | | | | | | | | |
|--|----|----|-----------|--|---------------|--------------|----|----|----|------------|
| Programme : Diploma in Civil Engineering (Sandwich Pattern) | | | | | | | | | | |
| Course Code: CE19505 | | | | Course Title: Construction Management | | | | | | |
| Compulsory / Optional: Optional | | | | | | | | | | |
| Teaching Scheme and Credits | | | | Examination Scheme | | | | | | |
| TH | PR | TU | Total | TH (2 Hrs 30 min) | TS1 (1 Hr) | TS2 (1Hr) | PR | OR | TW | Total |
| 04 | -- | -- | 04 | 60 | 20 | 20 | -- | -- | -- | 100 |

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination
 Note: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill test are to be conducted. First skill test at mid term and second skill test at the end of the term

Rationale :

The Civil Engineer has to plan, manage and execute civil engineering works. He has to manage different resources. He should have knowledge of basic management and basic management process related to civil engineering field. The functions of construction management typically include the following: Specifying project objectives, scope, budgeting, scheduling, setting performance requirements, and selecting project participants.

Course Outcomes: Student should be able to

| | |
|-----|--|
| CO1 | Understand the contract management. |
| CO2 | Prepare and understand the nuances of executing the site layout. |
| CO3 | Prepare networks and bar charts for the given construction project. |
| CO4 | Understand the intricacies of disputes, related arbitration and settlement laws. |
| CO5 | Apply safety measures at construction projects. |

Course Content Details:

| Unit No | Topics / Sub-topics |
|----------|---|
| 1 | <p>Construction industry and management:</p> <p>1.1 Organization-objectives, principles of organization, types of organization: government/public and private construction industry, Role of various personnel in construction organization.</p> <p>1.2 Agencies associated with construction work- owner, promoter, builder, designer, architects.</p> <p>1.3 Role of consultant for various activities: Preparation of Detailed Project Report (DPR), monitoring of progress and quality, settlement of disputes.</p> <p>Course Outcome: CO1 Teaching Hours : 12 hrs Marks: 12 (R- 6, U-6, A-0)</p> |

| | |
|---|--|
| 2 | Site Layout: 2.1 Principles governing site layout. 2.2 Factors affecting site layout. 2.3 Preparation of site layout. 2.4 Land acquisition procedures and providing compensation. Course Outcome: CO2 Teaching Hours: 10 hrs Marks: 10 (R -2, U- 4, A- 4) |
| 3 | Planning and scheduling: 3.1 Identifying broad activities in construction work & allotting time to it, Methods of Scheduling, Development of bar charts, Merits & limitations of bar chart. 3.2 Elements of Network: Event, activity, dummy activities, Precautions in drawing Network, Numbering the events. 3.3 CPM networks, activity time estimate, Event Times by forward & backward pass calculation, start and finish time of activity, project duration. Floats: Types of Floats-Free, independent and total floats, critical activities and critical path, 3.4 Purpose of crashing a network, Normal Time and Cost, Crash Time and Cost, Cost slope, Optimization of cost and duration. 3.5 Material Management- Ordering cost, inventory carrying cost, Economic Order Quantity. 3.6 Store management, various records related to store management, inventory control by ABC technique, Introduction to material procurement through portals (e.g. www.inampro.nic.in) Course Outcome: CO3 Teaching Hours:16 hrs Marks: 20 (R- 4, U- 6, A- 10) |
| 4 | Construction Contracts and Specifications: 4.1 Types of Construction contracts. 4.2 Contract documents, specifications, general special conditions. 4.3 Contract Management, procedures involved in arbitration and settlement (Introduction only) Course Outcome: CO4 Teaching Hours:14 hrs Marks: 10 (R- 6, U- 4, A- 0) |
| 5 | Safety in Construction: 5.1 Safety in Construction Industry—Causes of Accidents, Remedial and Preventive Measures. 5.2 Labour Laws and Acts pertaining to Civil construction activities (Introduction only) Course Outcome: CO5 Teaching Hours: 8 hrs Marks: 8 (R- 2, U- 4, A- 2) |

Suggested Specifications Table (Theory):

| Unit No | Topic Title | Distribution of Theory Marks | | | |
|--------------|---|------------------------------|-----------|-----------|-------------|
| | | R Level | U Level | A Level | Total Marks |
| 1 | Construction industry and management | 6 | 6 | 0 | 12 |
| 2 | Site Layout | 2 | 4 | 4 | 10 |
| 3 | Planning and scheduling | 4 | 6 | 10 | 20 |
| 4 | Construction Contracts and Specifications | 6 | 4 | 0 | 10 |
| 5 | Safety in Construction | 2 | 4 | 2 | 8 |
| Total | | 20 | 24 | 16 | 60 |

References/ Books:

| Sr. No. | Title | Author, Publisher, Edition and Year Of publication | ISBN |
|---------|--|---|---|
| 1 | Construction Engineering and Management | Sharma S. C. and Deodhar S. V. Khanna Book Publishing, New Delhi | ISBN: 978-81-7409-272-4 |
| 2 | B.M Construction planning and management | Gahlot, P.S. and Dhir New Age International (P) Ltd. Publishers, New Delhi. | ISBN 10 8122404111 ISBN 13 9788122404111 |
| 3 | Construction planning and management | Shrivastava, U.K. Galgotia Publication Pvt Ltd. New Delhi | ISBN : 817515246X, 9788175152465 |
| 4 | The A To Z of Practical Building Construction and its Management | Mantri, S. Satya Prakashan New Delhi | ISBN-10: 9351921417; ISBN-13: 978-9351921417 |
| 5 | Industrial Engineering and management | Khanna, O.P. Dhanpat Rai New Delhi | ISBN-10: 818992835X |

E-References:

1. <http://libguides.ac.uk>
2. <http://project-management.com>
3. <http://www.transit.dot.gov>
4. www.inampro.nic.in
5. <http://www.nationallibrary.gov.in>

CO Vs PO and CO Vs PSO Mapping (CIVIL ENGINEERING)

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | 2 | 2 | -- | -- | 3 | 3 | -- | 3 | -- |
| CO2 | 3 | 2 | 2 | 2 | -- | 3 | 3 | -- | 3 | -- |
| CO3 | 3 | 3 | 3 | 3 | -- | 3 | 3 | -- | 3 | -- |
| CO4 | 3 | 3 | 3 | -- | -- | 3 | 3 | -- | 3 | -- |
| CO5 | 3 | 3 | -- | -- | -- | 3 | 3 | -- | 3 | -- |

Industry Consultation Committee:

| Sr. No | Name | Designation | Institute/Organisation |
|--------|---------------------|-----------------------------|--------------------------|
| 1 | Mr. Rohan Deokar | Deputy Engineer | MMRDA |
| 2 | Mr. Sanjay Kulkarni | Surveyor and Consultant | SRKulkarni Pvt.Firm |
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Coordinator,
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Head of Department
Department of Civil Engineering

I/C, Curriculum Development Cell

Principal



| | | | | | | | | | | |
|--|----|----|-----------|--|---------------|--------------|----|----|----|------------|
| Programme : Diploma in Civil Engineering (Sandwich Pattern) | | | | | | | | | | |
| Course Code: AM19503 | | | | Course Title: Advanced Geotechnical Engineering | | | | | | |
| Compulsory / Optional: Optional | | | | | | | | | | |
| Teaching Scheme and Credits | | | | Examination Scheme | | | | | | |
| TH | PR | TU | Total | TH (2Hrs 30 min) | TS1 (1 Hr) | TS2 (1Hr) | PR | OR | TW | Total |
| 04 | -- | -- | 04 | 60 | 20 | 20 | -- | -- | -- | 100 |

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination
 Note: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill test are to be conducted. First skill test at mid term and second skill test at the end of the term

Rationale :

The loads from any structure have to be ultimately transmitted to a soil through foundation. Thus the foundation is an important part of a structure and the type and details of which can be decided upon only with the knowledge and application of the principles of soil mechanics. Knowledge of this course is a must for civil engineering students.

Course Outcomes: Student should be able to

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|-----|--|
| CO1 | Identify types of rocks and sub soil strata of earth. |
| CO2 | Interpret the physical properties of soil related to given construction activities. |
| CO3 | Use the results of permeability and shear strength test for foundation analysis. |
| CO4 | Interpret soil bearing capacity results. |
| CO5 | Compute optimum values for moisture content for maximum dry density of soil through various tests. |

Course Content Details:

| Unit No | Topics / Sub-topics |
|---------|---|
| 1 | Overview of Geology and Geotechnical Engineering : 1.1 Introduction of Geology, Branches of Geology, Importance of Geology for civil engineering structure and composition of earth, Definition of a rock: Classification based on their genesis (mode of origin), formation. Classification and engineering uses of igneous, sedimentary and metamorphic rocks. 1.2 Importance of soil as construction material in Civil engineering structures and as foundation bed for structures. 1.3 Field application of geotechnical engineering for foundation design, pavement design, design of earth retaining structures, design of earthen dam. Course Outcome: CO1 Teaching Hours : 10 hrs Marks: 10 (R-4, U-4, A-2) |

| | |
|---|---|
| 2 | <p>Physical and Index Properties of Soil :</p> <p>2.1 Soil as a three phase system, water content, determination of water content by oven drying method as per BIS code, void ratio, porosity and degree of saturation, density index. Unit weight of soil mass – bulk unit weight, dry unit weight, unit weight of solids, saturated unit weight, submerged unit weight. Determination of bulk unit weight and dry unit weight by core cutter and sand replacement method, Determination of specific gravity by pycnometer.</p> <p>2.2 Consistency of soil, Atterberg limits of consistency: Liquid limit, plastic limit and shrinkage limit. Plasticity index.</p> <p>2.3 Particle size distribution test and plotting of curve, Determination of effective diameter of soil, well graded and uniformly graded soils, BIS classification of soil.</p> <p>Course Outcome: CO2 Teaching Hours: 12 hrs Marks: 12 (R-4, U-4, A-4)</p> |
| 3 | <p>Permeability and Shear Strength of Soil :</p> <p>3.1 Definition of permeability, Darcy's law of permeability, coefficient of permeability, factors affecting permeability, determination of coefficient of permeability by constant head and falling head tests, simple problems to determine coefficient of permeability. Seepage through earthen structures, seepage velocity, seepage pressure, phreatic line, flow lines, application of flow net, (No numerical problems).</p> <p>3.2 Shear failure of soil, concept of shear strength of soil. Components of shearing resistance of soil – cohesion, internal friction. Mohr-Coulomb failure theory, Strength envelope, strength equation for purely cohesive and cohesion less soils. Direct shear and vane shear test –laboratory methods.</p> <p>Course Outcome: CO3 Teaching Hours: 12 hrs Marks: 12 (R-4, U-4, A-4)</p> |
| 4 | <p>Bearing Capacity of Soil :</p> <p>4.1 Bearing capacity and theory of earth pressure. Concept of bearing capacity, ultimate bearing capacity, safe bearing capacity and allowable bearing pressure. Introduction to Terzaghi's analysis and assumptions, effect of water table on bearing capacity.</p> <p>4.2 Field methods for determination of bearing capacity – Plate load and Standard Penetration Test. Test procedures as per IS:1888 & IS:2131.</p> <p>4.3 Definition of earth pressure, Active and Passive earth pressure for no surcharge condition, coefficient of earth pressure, Rankine's theory and assumptions made for non-cohesive Soils.</p> <p>Course Outcome: CO4 Teaching Hours: 12 hrs Marks: 12 (R-4, U-4, A-4)</p> |
| 5 | <p>Compaction and stabilization of soil :</p> <p>5.1 Concept of compaction, Standard and Modified proctor test as per IS code, Plotting of Compaction curve for determining: Optimum moisture content(OMC), maximum dry density(MDD), Zero air voids line. Factors affecting compaction, field methods of compaction – rolling, ramming and vibration. Suitability of various compaction equipments- smooth wheel roller, sheep foot roller, pneumatic tyred roller, Rammer and Vibrator, Difference between compaction and consolidation.</p> <p>5.2 Concept of soil stabilization, necessity of soil stabilization, different methods of soil stabilization. California bearing ratio (CBR) test - Meaning and Utilization in Pavement Construction</p> <p>5.3 Necessity of site investigation and soil exploration: Types of exploration, criteria for deciding the location and number of test pits and bores. Field identification of soil – dry strength test, dilatancy test and toughness test.</p> <p>Course Outcome: CO5 Teaching Hours: 14 hrs Marks: 14 (R-4, U-4, A-6)</p> |

Suggested Specifications Table (Theory):

| Unit No | Topic Title | Distribution of Theory Marks | | | |
|--------------|---|------------------------------|-----------|-----------|-------------|
| | | R Level | U Level | A Level | Total Marks |
| 1 | Overview of Geology and Geotechnical Engineering | 4 | 4 | 2 | 10 |
| 2 | Physical and Index Properties of Soil | 4 | 4 | 4 | 12 |
| 3 | Permeability and Shear Strength of Soil | 4 | 4 | 4 | 12 |
| 4 | Bearing Capacity of Soil | 4 | 4 | 4 | 12 |
| 5 | Compaction and stabilization of soil | 4 | 4 | 6 | 14 |
| Total | | 20 | 20 | 20 | 60 |

References/ Books:

| Sr. No. | Title | Author, Publisher, Edition and Year Of publication | ISBN |
|---------|--|---|---|
| 1 | Soil Mechanics and Foundation Engineering | Punmia, B.C., Laxmi Publication, Delhi. | ISBN 81-7008-791-0 |
| 2 | A text book of soil mechanics and foundation Engineering | Murthy, V.N.S., CBS Publishers & Distributors Pvt. Ltd., New Delhi. | ISBN 10: 8123913621 ISBN 13: 9788123913629 |
| 3 | Geotechnical Engineering (Soil Mechanics) | Ramamurthy, T.N. & Sitharam, T.G., S Chand and Company LTD., New Delhi. | ISBN 10: 812192457X ISBN 13: 9788121924573 |
| 4 | Soil Mechanics and Foundation Engineering | Raj, P. Purushothama, Pearson India, New Delhi. | ISBN:8131790819 |
| 5 | Geotechnical Engineering | Kasamalkar, B. J., Pune Vidyarthi Griha Prakashan, Pune. | ISBN 9788170087915 |

E-References:

1. <http://www.masterportal.com>
2. <http://www.nptel.ac.in>
3. <http://www.adv-geosolutions.com>
4. <http://easyengineering.net>
5. <http://www.eni.lu>
6. <http://www.nationallibrary.gov.in>

CO Vs PO and CO Vs PSO Mapping (CIVIL ENGINEERING)

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | 2 | -- | -- | 2 | 1 | 3 | -- | 1 | -- |
| CO2 | 3 | 3 | 2 | 3 | 2 | 1 | 3 | -- | 1 | -- |
| CO3 | 3 | 3 | 3 | 3 | 2 | 1 | 3 | -- | 1 | -- |

| | | | | | | | | | | |
|------------|---|---|---|---|---|---|---|----|---|----|
| CO4 | 3 | 3 | 3 | 3 | 3 | 1 | 3 | -- | 1 | -- |
| CO5 | 3 | 2 | 3 | 3 | 3 | 1 | 3 | -- | 1 | -- |

Industry Consultation Committee:

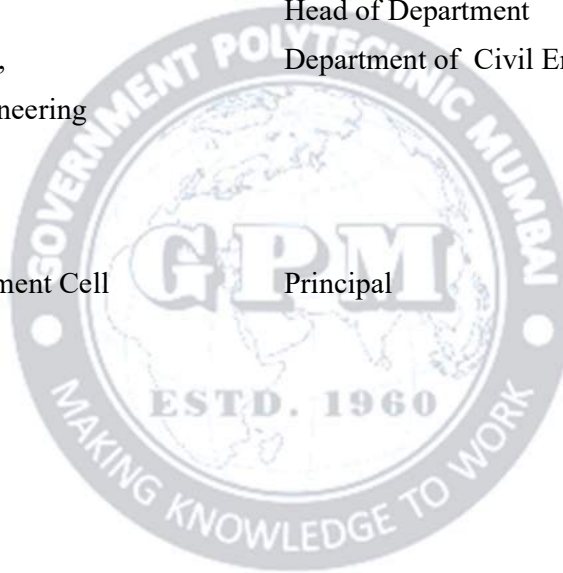
| Sr. No | Name | Designation | Institute/Organisation |
|---------------|---------------------|-----------------------------|-------------------------------|
| 1 | Mr. Rohan Deokar | Deputy Engineer | MMRDA |
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Department of Civil Engineering

I/C, Curriculum Development Cell

Principal



| | | | | | | | | | | |
|--|----|----|-----------|---|---------------|--------------|----|----|----|------------|
| Programme : Diploma in Civil Engineering (Sandwich Pattern) | | | | | | | | | | |
| Course Code: CE19505 | | | | Course Title: Solid Waste Management | | | | | | |
| Compulsory / Optional: Optional | | | | | | | | | | |
| Teaching Scheme and Credits | | | | Examination Scheme | | | | | | |
| L | P | TU | Total | TH (2 Hrs 30 min) | TS1 (1 Hr) | TS2 (1Hr) | PR | OR | TW | Total |
| 04 | -- | -- | 04 | 60 | 20 | 20 | -- | | -- | 100 |

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination
 Note: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill test are to be conducted. First skill test at mid term and second skill test at the end of the term.

Rationale:

Industrialization and Urbanization is increasing day by day. As a result of this the generation of solid waste is a major problem all over the country within the urban as well as rural area. In view of this the management of solid waste produced including Bio-medical waste, E-waste etc. is of prime need to keep the environment safe and clean. Information on classification and characteristics of solid waste will enable to decide appropriate decision about the collection and transportation of waste produced. Various disposal methods of solid waste will enable to recommend suitable method of disposal of solid waste with economy and acceptable environmental constraints including reuse and recycle where ever applicable.

Thus the knowledge of solid waste management with the concept like recycling, recovering and reuse will lead to proper disposal with acceptability. This will further lead to keeping the natural resources contamination free.

Course Outcomes: Student should be able to

| | |
|-----|--|
| CO1 | Classify the Solid Wastes. |
| CO2 | Decide collection method and transportation of MSW |
| CO3 | Use best disposal method for MSW |
| CO4 | Use best collection and disposal method for Bio-medical waste. |
| CO5 | Use best collection and disposal method for E-waste and Industrial waste. |
| CO6 | Use best practices to avoid health hazards to peoples involved in process of SWM |

Course Content Details:

| Unit No | Topics / Sub-topics |
|---------|---|
| 1 | Introduction. 1.1 Definition of Solid waste. Types of waste- Domestic, Commercial, Industrial, Market, Agricultural, Bio-medical and E-waste. 1.2 Sources of solid waste. Classification of solid waste- Hazardous and non-hazardous. 1.3 Characteristics of solid waste- Physical and Chemical. 1.4 Impact of solid waste on environment. 1.5 Solid waste management techniques, solid waste management hierarchy, solid waste prevention and reduction. |

| | |
|---|---|
| | 1.6 Factors affecting on solid waste generation. Course Outcome: CO1 , Teaching Hours : 10 Marks: 10 (R-4, U-6, A- --) |
| 2 | Storage, Collection and Transportation of Municipal Solid Waste. 2.1 Storage of municipal solid waste. Collection methods of municipal solid waste. Tools and equipment's used for storage and collection. 2.2 Transportation of municipal solid waste. Vehicles used for transportation of waste. 2.3 Role of rag pickers in waste management. 2.4 Organization pattern of solid waste management. Course Outcome: CO2 Teaching Hours :10 Marks:12 (R-4 , U-4 , A-4) |
| 3 | Disposal of Municipal Solid Waste 3.1 Composting of solid waste, Principle of composting process, Factors affecting on composting process. 3.2 Methods of composting- i) Manual composting ii) Mechanical composting iii) Vermi composting concept. 3.3 Land fill method of disposal- Factors for site selection, Land filling methods, Advantages and dis advantages of land fill method. 3.4 Incineration of solid waste- Types of incinerators, Advantages and dis advantages of incineration process. Course Outcome:CO3 Teaching Hours :10 Marks: 10 (R-2 , U-4 , A-4) |
| 4 | Bio-Medical Waste Management 4.1 Definition of Bio-medical waste. 4.2 Sources and generation of Bio-medical waste. 4.3 Classification of Bio-medical waste. 4.4 Collection and management technologies. Course Outcome:CO4 Teaching Hours : 10 Marks:10 (R- 2, U-4, A-4) |
| 5 | E-Waste and Industrial Waste Management 5.1 Definition of E-waste. 5.2 Varieties of E-waste, Dangers of E-waste. 5.3 Recycling and disposal of E-waste. 5.4 Definition of Industrial waste. Varieties of industrial waste. 5.5 Collection and disposal of industrial waste. 5.6 Control measures and Recycling of industrial waste. Course Outcome:CO5 Teaching Hours :12 Marks:10 (R- 2 , U-4 , A-4) |
| 6 | Health Aspect and Public Involvement in SWM 6.1 Health aspect during handling and processing. 6.2 Health problems during time of segregation, reuse, recovery, recycling of solid waste. 6.3 Public involvement and participation in solid waste management. Course Outcome: CO6 Teaching Hours:08 Marks: 08 (R- 2 , U-6 , A-) |

Suggested Specifications Table (Theory):

| Unit No | Topic Title | Distribution of Theory Marks | | | |
|--------------|---|------------------------------|-----------|-----------|-------------|
| | | R Level | U Level | A Level | Total Marks |
| 1 | Introduction | 4 | 6 | -- | 10 |
| 2 | Storage, Collection and Transportation of Municipal Solid Waste | 4 | 4 | 4 | 12 |
| 3 | Disposal of Municipal Solid Waste | 2 | 4 | 4 | 10 |
| 4 | Bio-Medical Waste Management | 2 | 4 | 4 | 10 |
| 5 | E-Waste and Industrial Waste Management | 2 | 4 | 4 | 10 |
| 6 | Health Aspect and Public Involvement in SWM | 2 | 6 | -- | 08 |
| Total | | 16 | 28 | 16 | 60 |

References/ Books:

| Sr. No. | Title | Author, Publisher, Edition and Year Of publication | ISBN |
|---------|---|--|--------------------------------|
| 1 | Solid Waste Management | Dr. A.D.Bhide, Indian National Scientific Documentation Centre, New Delhi. | |
| 2 | Solid Waste Management | George Tchobanoglous, McGraw Hill Education Private Ltd. New Delhi | ISBN:10:0071356231 |
| 3 | Solid Waste Management | K.Sasikumar, PHI Learning | ISBN 13:9788120338692 |
| 4 | Environmental Studies | D.L.Manjunath, PEARSON Publication | ISBN 13:978-8131709122 |
| 5 | Environmental Pollution | Khopkar S.M., New Age International Limited | ISBN:8122415075, 9788122415070 |
| 6 | Environmental Studies | Anindita Basak, PEARSON Publication | ISBN:8131785688, 9788131785683 |
| 7 | Prospect and Perspectives of Solid Waste Management | B.B.Hosetti, NEW AGE International Limited | ISBN 13:9788171324934 |

E-References:

- www.mpcb.gov.in
- www.cpcb.gov.in
- www.britanica.com
- www.downtoearth.org.in
- En.wikipedia.org
- <http://www.nationallibrary.gov.in>

CO Vs PO and CO Vs PSO Mapping

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | 3 | 3 | 1 | 1 | 3 | 2 | 2 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 3 | 2 |
| CO3 | 3 | 3 | 2 | 3 | 2 | 3 | 2 | 2 | 3 | 2 |
| CO4 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 2 | 3 | 2 |
| CO5 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 2 | 3 | 2 |
| CO6 | 3 | 2 | 3 | 3 | 2 | 3 | 2 | 2 | 3 | 3 |

Industry Consultation Committee:

| Sr. No | Name | Designation | Institute/Organisation |
|--------|---------------------|-----------------------------|--------------------------|
| 1 | Mr. Rohan Deokar | Deputy Engineer | MMRDA |
| 2 | Mr. Sanjay Kulkarni | Surveyor and Consultant | SRKulkarni Pvt.Firm |
| 3 | Mr. K.V. Kelgandre | Sr. Lecturer in Civil Engg. | K.J. Somaiya Polytechnic |
| 4 | Mr. D. K. Fad | Sr. Lecturer in Civil Engg. | Govt. Polytechnic Mumbai |

Coordinator,
Curriculum Development,
Department of Civil Engg.

Head of Department
Department of Civil Engg.

I/C, Curriculum Development Cell

Principal

| | | | | | | | | | | |
|--|---|----|-------|------------------------------|---------------|--------------|----|-----|----|-------|
| Programme : Diploma in Civil Engineering (Sandwich Pattern) | | | | | | | | | | |
| Course Code: CE19506 | | | | Course Title: Project | | | | | | |
| Compulsory / Optional: Compulsory | | | | | | | | | | |
| Teaching Scheme and Credits | | | | Examination Scheme | | | | | | |
| L | P | TU | Total | TH (2 Hrs 30 min) | TS1 (1 Hr) | TS2 (1Hr) | PR | OR | TW | Total |
| -- | 4 | -- | 04 | -- | -- | -- | -- | 50* | 50 | 100 |

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination
 Note: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill test are to be conducted. First skill test at mid term and second skill test at the end of the term.

Rationale:

The project work is included in the curriculum to encourage the students to undertake and tackle an independent problem related to Civil Engineering field. The project also comprises of literature survey of a problem assigned.

Course Outcomes: Student should be able to

| | |
|-----|---|
| CO1 | Identify, analyze and define the problems in Civil Engineering field. |
| CO2 | Find different solutions to the problems by collecting data and select most appropriate solution using latest practices in Civil Engineering. |
| CO3 | Use and integrate knowledge of different courses and data collected to make simple designs with the help of handbooks, standard data books, I.S. codes etc. |
| CO4 | Work independently as a leader as well as member of a team. |
| CO5 | Prepare and present report prepared. |

Course Content Details:

| Unit No | Topics / Sub-topics |
|---------|--|
| 1 | <p>Project Work: The students will select a topic related to any course in the curriculum, design various nits involved, prepare and present a report of the work done. The project work will be done by a group of 4 to 6 students. Oral will be based on term-work.</p> <p>Following is the list of some Civil Engineering suggestive areas for selection of project.</p> <ol style="list-style-type: none"> 1. Campus Development. 2. Bridge/Fly over/Sky walk. 3. Junction planning for city roads/planning for congested road areas/Parking studies. 4. Municipal Solid waste management. 5. Bio-Medical waste management. 6. Recycling of resources. 7. Concrete Mix design. 8. Structural audit of an existing building. 9. Manufacturing of Pre-cast concrete products. 10. Non- conventional sources of energy. |

| | |
|--|---|
| | <p>12. Transfer of technology to villages. 13. Planning and design for residential building/commercial complex. 14. Planning and design of water treatment plant for a given data. 15. Planning and design of water supply scheme for given lay-out. 16. Planning and design of sewage treatment plant for a given data. 17. Planning and design of sanitary scheme for given lay-out. 18. Lift Irrigation scheme. 19. Micro Irrigation- Drip/Sprinkler Irrigation. 20. Water shed development of small catchments. 22. Recent developments and new technologies in Civil Engg. 23. Entrepreneurship development.</p> <p>The project report shall contain the following as the case may be-</p> <ol style="list-style-type: none"> Drawings Design Test results Detailed estimate of project Photographs |
|--|---|

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CE 19507 Entrepreneurship (NPTEL)

The course structure and content covers, over a period of 12 weeks, the following 15 modules

Module 1: Entrepreneurial Journey

Module 2: Entrepreneurial Discovery

Module 3: Ideation and Prototyping

Module 4: Testing, Validation and Commercialisation

Module 5: Disruption as a Success Driver

Module 6: Technological Innovation and Entrepreneurship – 1

Module 7: Technological Innovation and Entrepreneurship – 2

Module 8: Raising Financial Resources

Module 9: Education and Entrepreneurship

Module 10: Beyond Founders and Founder-Families

Module 11: India as a Start-up Nation

Module 12: National Entrepreneurial Culture

Module 13: Entrepreneurial Thermodynamics

Module 14: Entrepreneurship and Employment

Module 15: Start-up Case Studies



Government Polytechnic, Mumbai

Department of Civil Engineering

**P-19 Curriculum
(Sandwich Pattern)**

**Semester-VI
(Course Contents)**

GOVERNMENT POLYTECHNIC MUMBAI
 (Academically Autonomously Institute, Government of Maharashtra)
Teaching and Examination Scheme (P19)
With effect from AY 2019-20

Programme: Diploma in Civil Engineering (Sandwich Pattern)

Term / Semester - VI

| Course Code | Course Title | Teaching Hours/Contact Hours | | | | Credits | Examination Scheme (Marks) | | | | | | |
|-------------|------------------|------------------------------|----|----|-------|---------|----------------------------|-----|-----|----|------|------|-------|
| | | L | P | TU | Total | | Theory | | | PR | OR | TW | Total |
| | | | | | | | TH | TS1 | TS2 | | | | |
| CE19601 | Inplant Training | -- | 40 | -- | 40 | 20 | -- | -- | -- | -- | 100* | 100* | 200 |
| | Total | -- | 40 | -- | 40 | 20 | -- | -- | -- | -- | 100 | 100 | 200 |

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment)

* Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination

Note: Duration of Examination--TS1&TS2 -1 hour , TH- 2 hours 30 minutes, PR/OR – 3 hours per batch , SCA- Library - 1 hour, Sports- 2 hours, Creative Activity-2 hours
 Self, on- line learning Mode through MOOCs /Spoken Tutorials / NPTEL / SWAYAM / FOSSEE etc.

Department Coordinator,
 Curriculum Development,
 Dept. of Civil Engineering

Head of Department
 Dept. of Civil Engineering

In-Charge
 Curriculum Development Cell

Principal

| | | | | | | | | | | |
|--|-----------|----|-----------|---------------------------------------|---------------|--------------|----|-------------|-------------|------------|
| Programme : Diploma in Civil Engineering (Sandwich Pattern) | | | | | | | | | | |
| Course Code: CE19601 | | | | Course Title: Inplant Training | | | | | | |
| Compulsory / Optional: Compulsory | | | | | | | | | | |
| Teaching Scheme and Credits | | | | Examination Scheme | | | | | | |
| L | P | TU | Total | TH (2 Hrs 30 min) | TS1 (1 Hr) | TS2 (1Hr) | PR | OR | TW | Total |
| -- | 40 | -- | 20 | -- | -- | -- | -- | 100* | 100* | 200 |

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination
 Note: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill test are to be conducted. First skill test at mid term and second skill test at the end of the term.

Rationale:

We are in the era of skill development. Indian construction industry is passing through highly competitive and mechanized phase due to globalization and advancement. Inplant training has been established to provide students an opportunity to correlate theoretical knowledge with practical activities. They will also get an overview of construction process and site environment by exposing them to different aspects of construction processes, all under the guidance of skilled and experienced persons within the organization. This exposure will include all or most of the following aspects of business: management, personnel policy, financial, marketing and purchasing functions, legal and social aspects, materials and operations and other allied activities. This mechanism of inplant training also provides an opportunity for the construction industries to contribute during the formative period of student's development.

Course Outcomes: After the industrial training Student shall:

| | |
|-----|--|
| CO1 | Get first-hand experience of working as an engineering professional, including the technical application of engineering methods. |
| CO2 | Work with other engineering professionals and to experience the discipline of working in a professional organization and observe safety precautions on respective construction site. |
| CO3 | Develop technical, interpersonal and communication skills, both oral and written. |
| CO4 | Have interactions with other professional groups. |
| CO5 | Observe the functioning and organization of business in construction industries. |
| CO6 | Be exposed to management programs and systems, effective administration methods and documentation. |

CO Vs PO and CO Vs PSO Mapping

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | 3 | 3 | 2 | 1 | 1 | 2 | 1 | 2 | 3 |

| | | | | | | | | | | |
|------------|---|---|---|---|---|---|---|---|---|---|
| CO2 | 3 | 3 | 3 | 2 | 2 | 1 | 2 | 1 | 2 | 3 |
| CO3 | 3 | 3 | 2 | 2 | 2 | 1 | 2 | 1 | 1 | 3 |
| CO4 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 1 | 2 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 2 | 1 | 2 | 2 | 1 | 3 |
| CO6 | 3 | 2 | 3 | 3 | 2 | 1 | 2 | 1 | 1 | 2 |

Implant training manual will be separately provided to each student. In manual all necessary instructions are given and required formats are provided.

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