# Guru Nanak Dev Engineering College, Ludhiana
## Civil Engineering Department
## Study Scheme 2018 (with training)

| Third Semester | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Category** | **Course Code** | **Course Title** | **Theory/ Practical** | **Hours per week** | | | **Marks Distribution** | | | **Credits** |
| | | | | **L** | **T** | **P** | **Int** | **Ext** | **Total** | |
| Professional Core courses | PCCE-101 | Surveying & Geomatics | Theory | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| Professional Core courses | PCCE-102 | Solid Mechanics | Theory | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| Professional Core courses | PCCE-103 | Fluid Mechanics | Theory | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| Professional Core courses | PCCE-104 | Disaster Preparedness & Planning | Theory | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| Engineering Science Course | ESCE-101 | Basic Electronics & applications in Civil Engineering | Theory | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| Humanities and Social Sciences including Management | HSMCE-101 | Civil Engineering-Introduction, Societal & Global Impact | Theory | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| Professional Core courses | LPCCE-101 | Surveying & Geomatics Laboratory | Practical | 0 | 0 | 2 | 30 | 20 | 50 | 1 |
| Professional Core courses | LPCCE-102 | Fluid Mechanics Laboratory | Practical | 0 | 0 | 2 | 30 | 20 | 50 | 1 |
| Professional Core courses | LPCCE-103 | Solid Mechanics Laboratory | Practical | 0 | 0 | 2 | 30 | 20 | 50 | 1 |
| Training | TR-101 | Training - I | Practical | - | - | - | 60 | 40 | 100 | 1 |
| Mandatory course | | Mentoring and Professional Development | Practical | 0 | 0 | 1 | | - | - | 0 |
| | | **26** | | **18** | **1** | **7** | **390** | **460** | **850** | **23** |

| Fourth Semester | | | | | | |
|---|---|---|---|---|---|---|
| **Category** | **Course** | **Course Title** | **Theory/** | **Hours** | **Marks** | **Credits** |

| | Code | | Practical | Per Week | | | Distribution | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | Int | Ext | Total | |
| Professional Core courses | PCCE-105 | Concrete Technology | Theory | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| Professional Core courses | PCCE-106 | Material, Testing & Evaluation | Theory | 4 | 0 | 0 | 40 | 60 | 100 | 4 |
| Professional Core courses | PCCE-107 | Hydrology & Water Resources Engineering | Theory | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| Professional Core courses | PCCE-108 | Transportation Engineering | Theory | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| Basic Science Course | BSCE-101 | Mathematics-III | Theory | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| Professional Core courses | LPCCE-104 | Concrete Testing Laboratory | Practical | 0 | 0 | 2 | 30 | 20 | 50 | 1 |
| Professional Core courses | LPCCE-105 | Transportation Laboratory | Practical | 0 | 0 | 2 | 30 | 20 | 50 | 1 |
| Project | PRCE-101 | Seminar and Technical Report Writing | Practical | 0 | 0 | 2 | 50 | - | 50 | 1 |
| Mandatory Courses (Non-credit) | MCCE-101 | Environment Science | Theory | 2 | 0 | 0 | 50* | - | 50* | 0 |
| Mandatory Courses | MPD-102 | Mentoring and Professional Development | Practical | 0 | 0 | 1 | 100 | - | 100 | 1 |
| | | **27** | | **18** | **2** | **7** | **410** | **340** | **750** | **22** |

*4 weeks Industrial/Institutional training for which viva will be conducted along End semester exam of Fifth semester.
*Grade will be awarded (Satisfactory/Unsatisfactory).

**Fifth Semester**

| Category | Course Code | Course Title | Theory/ Practical | Hours Per Week | | | Marks Distribution | | | Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | Int | Ext | Total | |
| Professional Core courses | PCCE-109 | Engineering Geology | Theory | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| Professional Core courses | PCCE-110 | Engineering Economics, Estimation and Costing | Theory | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| Professional Core courses | PCCE-111 | Construction Engineering & Management | Theory | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| Professional | PCCE-112 | Environmental | Theory | 4 | 0 | 0 | 40 | 60 | 100 | 4 |

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|---|---|---|---|---|---|---|---|---|---|---|
| Core courses | | Engineering | | | | | | | | |
| Professional Core courses | PCCE-113 | Structural Engineering | Theory | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| Professional Core courses | PCCE-114 | Geotechnical Engineering | Theory | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| Professional Core courses | LPCCE-106 | Geotechnical Laboratory | Practical | 0 | 0 | 2 | 30 | 20 | 50 | 1 |
| Professional Core courses | LPCCE-107 | Environmental Engineering Laboratory | Practical | 0 | 0 | 2 | 30 | 20 | 50 | 1 |
| Professional Core courses | LPCCE-108 | Structural Laboratory | Practical | 0 | 0 | 2 | 30 | 20 | 50 | 1 |
| Training | TR-102 | Training - II* | Practical | - | - | - | 60 | 40 | 100 | 1 |
| Mandatory Course | | Mentoring and Professional Development | Practical | 0 | 0 | 1 | - | - | | 0 |
| | | **28** | | **19** | **2** | **7** | **390** | **460** | **850** | **25** |

**Sixth Semester**

| **Category** | **Course Code** | **Course Title** | **Theory/ Practical** | **Hours Per Week** | | | **Marks Distribution** | | | **Credits** |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | **L** | **T** | **P** | **Int** | **Ext** | **Total** | |
| Professional Core courses | PCCE-115 | Irrigation Engineering | Theory | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| Professional Core courses | PCCE-116 | Building Construction Practice | Theory | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| Professional Elective courses | PECE-XXX | Track Specific Course – I | Theory | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| Professional Elective courses | PECE-XXX | Track Specific Course – II | Theory | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| Professional Core courses | LPCCE-109 | CAD & BIM Laboratory | Practical | 0 | 0 | 2 | 30 | 20 | 50 | 1 |
| Open Elective courses | OEZZ-XXX | Open Elective – I | Theory | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| Open Elective Courses (Non-credit) | MCI-102/ MCI-103 | Constitution of India/ Management –I (Organizational Behaviour) | Theory | 2 | 0 | 0 | 50* | - | 50* | 0 |
| Project | PRCE-102 | Minor Project | Practical | 0 | 0 | 2 | 60 | 40 | 100 | 1 |
| Mandatory Course | MPD-103 | Mentoring and Professional Development | Practical | 0 | 0 | 1 | 100 | - | 100 | 1 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | **25** | | **17** | **3** | **5** | **390** | **360** | **750** | **21** |
| #4 weeks Industrial/Institutional training for which viva will be conducted along End Semester Exam of Seventh semester.<br>*Grade will be awarded (Satisfactory/Unsatisfactory). | | | | | | | | | | |

| **Choice – I (Industrial Training in 7th Semester)** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Seventh Semester** | | | | | | | | | | |
| **Category** | **Course Code** | **Course Title** | **Theory/ Practical** | **Hours Per Week** | | | **Marks Distribution** | | | **Credits** |
| | | | | **L** | **T** | **P** | **Int** | **Ext** | **Total** | |
| Training | TR-103 | Training - III# | Practical | - | - | - | 60 | 40 | 100 | 1 |
| Training | TR-104 | Industrial Training | Practical | - | - | - | 350 | 150 | 500 | 15 |
| | | | | | | | **410** | **190** | **600** | **16** |
| **Eighth Semester** | | | | | | | | | | |
| **Category** | **Course Code** | **Course Title** | **Theory/ Practical** | **Hours Per Week** | | | **Marks** | | | **Credits** |
| | | | | **L** | **T** | **P** | **Int** | **Ext** | **Total** | |
| Professional Elective courses | PECE-XXX | Track Specific Course – III | Theory | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| Professional Elective courses | PECE-XXX | Track Specific Course – IV | Theory | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| Open Elective courses | OEZZ-XXX | Open Elective – II | Theory | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| Professional Core courses | LPCCE-110 | Problem Analysis Laboratory | Practical | 0 | 0 | 2 | 30 | 20 | 50 | 1 |
| Project | PRCE-103 | Major Project | Practical | 0 | 0 | 6 | 120 | 80 | 200 | 3 |
| Mandatory Course | MPD-104 | Mentoring and Professional Development | Practical | 0 | 0 | 1 | 100 | - | 100 | 1 |
| | | | **21** | **9** | **2** | **9** | **370** | **280** | **650** | **16** |

| **Choice – II (Training in 8th Semester)** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Seventh Semester** | | | | | | | | | | |
| **Category** | **Course Code** | **Course Title** | **Theory/ Practical** | **Hours Per Week** | | | **Marks Distribution** | | | **Credits** |
| | | | | **L** | **T** | **P** | **Int** | **Ext** | **Total** | |
| Professional Elective courses | PECE-XXX | Track Specific Course – III | Theory | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| Professional Elective courses | PECE-XXX | Track Specific Course – IV | Theory | 3 | 1 | 0 | 40 | 60 | 100 | 4 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Open Elective courses | OEZZ-XXX | Open Elective – II | Theory | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| Professional Core courses | LPCCE-110 | Problem Analysis Laboratory | Practical | 0 | 0 | 2 | 30 | 20 | 50 | 1 |
| Project | PRCE-103 | Major Project | Practical | 0 | 0 | 6 | 120 | 80 | 200 | 3 |
| Training | TR-103 | Training - III[#] | Practical | - | - | - | 60 | 40 | 100 | 1 |
| | | | **21** | **9** | **2** | **9** | **370** | **280** | **650** | **16** |

**Eighth Semester**

| **Category** | **Course Code** | **Course Title** | **Theory/ Practical** | **Hours Per Week** | | | **Marks** | | | **Credits** |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | **L** | **T** | **P** | **Int** | **Ext** | **Total** | |
| Training | TR-104 | Industrial Training | Practical | - | | | 350 | 150 | 500 | 15 |
| Mandatory Course | MPD-104 | Mentoring and Professional Development | Practical | 0 | 0 | 1 | 100 | - | 100 | 1 |
| | | | Total | | | | **450** | **150** | **600** | **16** |

** Industrial /Institutional Training will be imparted at the end of 2nd semester in the institute or students can go to industry for four weeks.*

*[#] There will be one period per week for Mentoring and Professional Development; final evaluation of this course will be done based on the combined assessment of odd and even semester of respective year of study.*

**List of Electives**

| **Geotechnical and Transportation Engineering** | | **Structural Engineering** | | **Environmental Engineering** | |
|---|---|---|---|---|---|
| **Course Code** | **Course Name** | **Course Code** | **Course Name** | **Course Code** | **Course Name** |
| PECE-101 | Foundation Engineering | PECE-131 | Masonry Structures | PECE-161 | Ecological Engineering |
| PECE-102 | Geotechnical Design | PECE-132 | Structural Analysis | PECE-162 | Environmental Change and Sustainable Development |
| PECE-103 | Reinforced Earth | PECE-133 | Advanced Structural Analysis | PECE-163 | Physico-Chemical Treatment Methods |
| PECE-104 | Earthen Embankment | PECE-134 | Design of Concrete Structures | PECE-164 | Biological Treatment Processes |
| PECE-105 | Rock Mechanics | PECE-135 | Prestressed Concrete | PECE-165 | Rural Water Supply and Onsite Sanitation Systems |
| PECE-106 | Environmental Geo-technology | PECE-136 | Design of Steel Structures | PECE-166 | Urban Hydrology and Hydraulics |
| PECE-107 | Ground Improvement | PECE-137 | Bridge Engineering | PECE-167 | Solid Waste Management |
| PECE-108 | Pavement Materials | PECE-138 | Industrial Structures | PECE-168 | Analytical Methods for Environmental Monitoring |
| PECE-109 | Pavement Design | PECE-139 | Civil Engineering | PECE-169 | Air Pollution Control |

| Geotechnical and Transportation Engineering | | Structural Engineering | | Environmental Engineering | |
|---|---|---|---|---|---|
| **Course Code** | **Course Name** | **Course Code** | **Course Name** | **Course Code** | **Course Name** |
| | | | Design-I | | |
| PECE-110 | Traffic Engineering and Management | PECE-140 | Civil Engineering Design-II | PECE-170 | Sustainable Engineering & Technology |
| PECE-111 | Urban Transportation Planning | PECE-141 | Repairs & Rehabilitation of Structures | PECE-171 | Environmental Impact Assessment and Life Cycle Analysis |
| PECE-112 | Geometric Design of Highways | PECE-142 | Sustainable Construction Methods | PECE-172 | Industrial Wastewater Management and Reuse |
| PECE-113 | Airport Planning and Design | | | | |
| PECE-114 | Railway Engineering | | | | |
| PECE-115 | Highway Construction and Management | | | | |
| PECE-116 | Port and Harbour Engineering | | | | |
| PECE-117 | High Speed Rail Engineering | | | | |
| PECE-118 | Transportation Economics | | | | |
| PECE-119 | Instrumentation & Sensor Technologies for Civil Engineering Applications | | | | |

**List of Open Electives**

| Course Code | Open electives |
|---|---|
| OECE-101 | Metro Systems and Engineering |
| OECE-102 | Numerical Methods in Engineering |
| OECE-103 | Project Management & Monitoring |
| OECE-104 | Traffic Management & Road Safety |
| OECE-105 | Environmental Impact Assessment |
| OECE-106 | Building Information Modelling |

# Study Scheme 2018 (without training)

| Third Semester | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Category** | **Course Code** | **Course Title** | **Theory/ Practical** | **Hours per week** | | | **Marks Distribution** | | | **Credits** |
| | | | | **L** | **T** | **P** | **Int** | **Ext** | **Total** | |
| Professional Core courses | PCCE-101 | Surveying & Geomatics | Theory | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| Professional Core courses | PCCE-102 | Solid Mechanics | Theory | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| Professional Core courses | PCCE-103 | Fluid Mechanics | Theory | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| Professional Core courses | PCCE-104 | Disaster Preparedness & Planning | Theory | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| Engineering Science Course | ESCE-101 | Basic Electronics & applications in Civil Engineering | Theory | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| Humanities and Social Sciences including Management | HSMCE-101 | Civil Engineering-Introduction, Societal & Global Impact | Theory | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| Professional Core courses | LPCCE-101 | Surveying & Geomatics Laboratory | Practical | 0 | 0 | 2 | 30 | 20 | 50 | 1 |
| Professional Core courses | LPCCE-102 | Fluid Mechanics Laboratory | Practical | 0 | 0 | 2 | 30 | 20 | 50 | 1 |
| Professional Core courses | LPCCE-103 | Solid Mechanics Laboratory | Practical | 0 | 0 | 2 | 30 | 20 | 50 | 1 |
| Training | TR-101 | Training - I | Practical | - | - | - | 60 | 40 | 100 | 1 |
| Mandatory course | | Mentoring and Professional Development | Practical | 0 | 0 | 1 | | - | - | 0 |
| | | **26** | | **18** | **1** | **7** | **390** | **460** | **850** | **23** |

| Fourth Semester | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Category** | **Course Code** | **Course Title** | **Theory/ Practical** | **Hours Per Week** | | | **Marks Distribution** | | | **Credits** |
| | | | | **L** | **T** | **P** | **Int** | **Ext** | **Total** | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Professional Core courses | PCCE-105 | Concrete Technology | Theory | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| Professional Core courses | PCCE-106 | Material, Testing & Evaluation | Theory | 4 | 0 | 0 | 40 | 60 | 100 | 4 |
| Professional Core courses | PCCE-107 | Hydrology & Water Resources Engineering | Theory | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| Professional Core courses | PCCE-108 | Transportation Engineering | Theory | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| Basic Science Course | BSCE-101 | Mathematics-III | Theory | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| Professional Core courses | LPCCE-104 | Concrete Testing Laboratory | Practical | 0 | 0 | 2 | 30 | 20 | 50 | 1 |
| Professional Core courses | LPCCE-105 | Transportation Laboratory | Practical | 0 | 0 | 2 | 30 | 20 | 50 | 1 |
| Project | PRCE-101 | Seminar and Technical Report Writing | Practical | 0 | 0 | 2 | 50 | - | 50 | 1 |
| Mandatory Courses (Non-credit) | MCCE-101 | Environment Science | Theory | 2 | 0 | 0 | 50* | - | 50* | 0 |
| Mandatory Courses | MPD-102 | Mentoring and Professional Development | Practical | 0 | 0 | 1 | 100 | - | 100 | 1 |
| | | **27** | | **18** | **2** | **7** | **410** | **340** | **750** | **22** |

*4 weeks Industrial/Institutional training for which viva will be conducted along End semester exam of Fifth semester.
*Grade will be awarded (Satisfactory/Unsatisfactory).

**Fifth Semester**

| **Category** | **Course Code** | **Course Title** | **Theory/ Practical** | **Hours Per Week** | | | **Marks Distribution** | | | **Credits** |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | **L** | **T** | **P** | **Int** | **Ext** | **Total** | |
| Professional Core courses | PCCE-109 | Engineering Geology | Theory | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| Professional Core courses | PCCE-110 | Engineering Economics, Estimation and Costing | Theory | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| Professional Core courses | PCCE-111 | Construction Engineering & Management | Theory | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| Professional Core courses | PCCE-112 | Environmental Engineering | Theory | 4 | 0 | 0 | 40 | 60 | 100 | 4 |
| Professional | PCCE-113 | Structural | Theory | 3 | 1 | 0 | 40 | 60 | 100 | 4 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Core courses | | Engineering | | | | | | | | |
| Professional Core courses | PCCE-114 | Geotechnical Engineering | Theory | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| Professional Core courses | LPCCE-106 | Geotechnical Laboratory | Practical | 0 | 0 | 2 | 30 | 20 | 50 | 1 |
| Professional Core courses | LPCCE-107 | Environmental Engineering Laboratory | Practical | 0 | 0 | 2 | 30 | 20 | 50 | 1 |
| Professional Core courses | LPCCE-108 | Structural Laboratory | Practical | 0 | 0 | 2 | 30 | 20 | 50 | 1 |
| Training | TR-102 | Training - II* | Practical | - | - | - | 60 | 40 | 100 | 1 |
| Mandatory Course | | Mentoring and Professional Development | Practical | 0 | 0 | 1 | - | - | | 0 |
| | | **28** | | **19** | **2** | **7** | **390** | **460** | **850** | **25** |
| **Sixth Semester** | | | | | | | | | | |
| **Category** | **Course Code** | **Course Title** | **Theory/ Practical** | **Hours Per Week** | | | **Marks Distribution** | | | **Credits** |
| | | | | **L** | **T** | **P** | **Int** | **Ext** | **Total** | |
| Professional Core courses | PCCE-115 | Irrigation Engineering | Theory | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| Professional Core courses | PCCE-116 | Building Construction Practice | Theory | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| Professional Elective courses | PECE-XXX | Track Specific Course – I | Theory | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| Professional Elective courses | PECE-XXX | Track Specific Course – II | Theory | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| Professional Core courses | LPCCE-109 | CAD & BIM Laboratory | Practical | 0 | 0 | 2 | 30 | 20 | 50 | 1 |
| Open Elective courses | OEZZ-XXX | Open Elective – I | Theory | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| Open Elective Courses (Non-credit) | MCI-102/ MCI-103 | Constitution of India/ Management –I (Organizational Behavior) | Theory | 2 | 0 | 0 | 50* | - | 50* | 0 |
| Project | PRCE-102 | Minor Project | Practical | 0 | 0 | 2 | 60 | 40 | 100 | 1 |
| Mandatory Course | MPD-103 | Mentoring and Professional Development | Practical | 0 | 0 | 1 | 100 | - | 100 | 1 |
| | | **25** | | **17** | **3** | **5** | **390** | **360** | **750** | **21** |
| #4 weeks Industrial/Institutional training for which viva will be conducted along End Semester Exam of | | | | | | | | | | |

Seventh semester.
*Grade will be awarded (Satisfactory/Unsatisfactory).

**Seventh Semester**

| Category | Course Code | Course Title | Theory/ Practical | Hours Per Week | | | Marks Distribution | | | Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | Int | Ext | Total | |
| Professional Elective courses | PECE-XXX | Track Specific Course – III | Theory | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| Professional Elective courses | PECE-XXX | Track Specific Course – IV | Theory | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| Open Elective courses | OEZZ-XXX | Open Elective – II | Theory | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| Professional Core courses | LPCCE-110 | Problem Analysis Laboratory | Practical | 0 | 0 | 2 | 30 | 20 | 50 | 1 |
| Seminar/Project | PRCE-104 | Project – I | Practical | 0 | 0 | 6 | 120 | 80 | 200 | 3 |
| Training | TR-103 | Training - III[#] | Practical | - | - | - | 60 | 40 | 100 | 1 |
| Mandatory Course | | Mentoring and Professional Development | Practical | 0 | 0 | 1 | | - | | 0 |
| | | **21** | | **09** | **2** | **9** | **330** | **320** | **650** | **16** |

**Eighth Semester**

| Category | Course Code | Course Title | Theory/ Practical | Hours Per Week | | | Marks | | | Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | Int | Ext | Total | |
| Professional Elective courses | PECE-XXX | Track Specific Course – V | Theory | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| Professional Elective courses | PECE-XXX | Track Specific Course – VI | Theory | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| Open Elective courses | OEZZ-XXX | Open Elective – III | Theory | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| Seminar/Project | PRCE-105 | Project – II | Practical | 0 | 0 | 6 | 120 | 80 | 200 | 3 |
| Seminar/Project | PRCE-106 | Seminar | Practical | 0 | 0 | 2 | 50 | - | 50 | 1 |
| Mandatory Course | MPD-104 | Mentoring and Professional Development | Practical | 0 | 0 | 1 | 100 | - | 100 | 1 |
| | | **20** | | **9** | **2** | **9** | **390** | **260** | **650** | **16** |

** Industrial /Institutional Training will be imparted at the end of 2nd semester in the institute or students can go to industry for four weeks.*

*[#] There will be one period per week for Mentoring and Professional Development; final evaluation of this course will be done based on the combined assessment of odd and even semester of respective year of study.*

**List of Electives**

| Geotechnical and Transportation Engineering | | Structural Engineering | | Environmental Engineering | |
|---|---|---|---|---|---|
| **Course Code** | **Course Name** | **Course Code** | **Course Name** | **Course Code** | **Course Name** |
| PECE-101 | Foundation Engineering | PECE-131 | Masonry Structures | PECE-161 | Ecological Engineering |
| PECE-102 | Geotechnical Design | PECE-132 | Structural Analysis | PECE-162 | Environmental Change and Sustainable Development |
| PECE-103 | Reinforced Earth | PECE-133 | Advanced Structural Analysis | PECE-163 | Physico-Chemical Treatment Methods |
| PECE-104 | Earthen Embankment | PECE-134 | Design of Concrete Structures | PECE-164 | Biological Treatment Processes |
| PECE-105 | Rock Mechanics | PECE-135 | Pre-stressed Concrete | PECE-165 | Rural Water Supply and Onsite Sanitation Systems |
| PECE-106 | Environmental Geo-technology | PECE-136 | Design of Steel Structures | PECE-166 | Urban Hydrology and Hydraulics |
| PECE-107 | Ground Improvement | PECE-137 | Bridge Engineering | PECE-167 | Solid Waste Management |
| PECE-108 | Pavement Materials | PECE-138 | Industrial Structures | PECE-168 | Analytical Methods for Environmental Monitoring |
| PECE-109 | Pavement Design | PECE-139 | Civil Engineering Design-I | PECE-169 | Air Pollution Control |
| PECE-110 | Traffic Engineering and Management | PECE-140 | Civil Engineering Design-II | PECE-170 | Sustainable Engineering & Technology |
| PECE-111 | Urban Transportation Planning | PECE-141 | Repairs & Rehabilitation of Structures | PECE-171 | Environmental Impact Assessment and Life Cycle Analysis |
| PECE-112 | Geometric Design of Highways | PECE-142 | Sustainable Construction Methods | PECE-172 | Industrial Wastewater Management and Reuse |
| PECE-113 | Airport Planning and Design | | | | |
| PECE-114 | Railway Engineering | | | | |
| PECE-115 | Highway Construction and Management | | | | |
| PECE-116 | Port and Harbour Engineering | | | | |
| PECE-117 | High Speed Rail Engineering | | | | |
| PECE-118 | Transportation Economics | | | | |
| PECE-119 | Instrumentation & Sensor | | | | |

| Geotechnical and Transportation Engineering | | Structural Engineering | | Environmental Engineering | |
|---|---|---|---|---|---|
| **Course Code** | **Course Name** | **Course Code** | **Course Name** | **Course Code** | **Course Name** |
| | Technologies for Civil Engineering Applications | | | | |

**List of Open Electives**

| Course Code | Open electives |
|---|---|
| OECE-101 | Metro Systems and Engineering |
| OECE-102 | Numerical Methods in Engineering |
| OECE-103 | Project Management & Monitoring |
| OECE-104 | Traffic Management & Road Safety |
| OECE-105 | Environmental Impact Assessment |
| OECE-106 | Building Information Modelling |

**Guru Nanak Dev Engineering College, Ludhiana**
**Civil Engineering Department**
**Subject Code:** PCCE-101

**Subject Name:** Surveying & Geomatics

| | |
|---|---|
| **Programme:** B.Tech. (CE) | **L:** 3 **T:** 1 **P:** 0 |
| **Semester:** 3 | **Teaching Hours:** 40 |
| **Theory/Practical:** Theory | **Credits:** 4 |
| **Internal Marks:** 40 | **Percentage of Numerical/Design/Programming Problems:** 50% |
| **External Marks:** 60 | **Duration of End Semester Exam (ESE):** 3hr |
| **Total Marks:** 100 | **Elective Status:** Compulsory |

**Prerequisites:** N/A

**Additional Material Allowed in ESE:** [Scientific Calculator]

**On completion of the course, the student will have the ability to:**

| CO# | Course Outcomes (CO) |
|---|---|
| 1 | Understand the concept, various methods and techniques of surveying. |
| 2 | Compute angles, distances and levels for a given area |
| 3 | Apply the concept of tachometry survey in difficult and hilly terrain. |
| 4 | Select appropriate instruments for data collection and survey purpose |
| 5 | Analyze and retrieve the information from remotely sensed data and interpret the data for survey. |
| 6 | Understand the concepts related to GIS and GPS and analyze the geographical data. |

**Detailed Contents:**

**Part-A**

***Introduction to Surveying*:** Principles, Survey stations, Survey lines- ranging, direct &indirect ranging, Bearing and its measurement with prismatic compass, calculation of angles from bearings, Local Attraction Levelling:, Principles of levelling- booking and reducing levels; differential, reciprocal leveling, profile levelling and cross sectioning. Digital and Auto Level, Errors in levelling; contouring: Characteristics, methods, uses; areas and volumes. Setting up the plane table and methods of plane tabling (Radiation and three point problem only).

***Triangulation and Trilateration*:** Theodolite survey: Instruments, Measurement of horizontal and vertical angle; Balancing of Traverse, Omitted Measurements, Tachometry: Definition, determination of tachometer constants and reduced level from tachometric observations. Triangulation - network- Signals. Baseline - choices - extension of base lines - corrections - Trigonometric leveling

***Curves:*** Elements of simple and compound curves – Method of setting out Transition curve – length of curve – Elements of transition curve.

**Part-B**

***Modern Field Survey Systems*:** Principle of Electronic Distance Measurement, Modulation, Types of EDM instruments, Distomat, Total Station – Parts of a Total Station – Accessories – Advantages and Applications, Field Procedure for total station survey, Errors in Total Station Survey; Global Positioning Systems- Segments, GPS measurements, errors and biases, Surveying with GPS, LADAR (drone and vehicle based)

***Photogrammetry Surveying*:** Introduction, Basic concepts, flight planning; Stereoscopy, photographic mapping- mapping using paper prints, mapping using stereoplotting instruments, mosaics, map substitutes.

***Remote Sensing*:** Introduction – Electromagnetic Spectrum, interaction of electromagnetic radiation with the atmosphere and earth surface, remote sensing data acquisition: platforms and sensors.

**Text Books**

1. Duggal, S.K., Surveying Vol I & II, Tata McGraw Hill
2. Punmia, B.C., Jain, Ashok Kumar and Jain, Arun Kumar, Surveying Vol. I, II & III, Laxmi Publications
3. Agor, R., Surveying, Khanna Publishers
4. Bhavikatti, S.S. Surveying & Levelling Volume I & II

**Reference Books**

**E-Books and online learning material**

**Online Courses and Video Lectures**

**Guru Nanak Dev Engineering College, Ludhiana**
**Civil Engineering Department**
**Subject Code:** PCCE-102

**Subject Name:** Solid Mechanics

| | |
|---|---|
| **Programme:** B.Tech. (CE) | **L:** 3 **T:** 0 **P:** 0 |
| **Semester:** 3 | **Teaching Hours:** 40 |
| **Theory/Practical:** Theory | **Credits:** 3 |
| **Internal Marks:** 40 | **Percentage of Numerical/Design/Programming Problems:** 80% |
| **External Marks:** 60 | **Duration of End Semester Exam (ESE):** 3hr |
| **Total Marks:** 100 | **Elective Status:** Compulsory |

**Prerequisites:** N/A

**Additional Material Allowed in ESE:** [Scientific Calculator]

**On completion of the course, the student will have the ability to:**

| CO# | Course Outcomes (CO) |
|---|---|
| 1 | Understand the concept of static equilibrium, deformations, and material constitutive behavior. |
| 2 | Describe the concepts of stress, strain and elastic behaviour of materials including Hooke's law relationships to analyze structural members subjected to tension, compression and torsion. |
| 3 | Apply the concept of Mohr's circle in the stress/strain calculations. |
| 4 | Develop SFD and BMD for different type of beams subjected to different types of loads |
| 5 | Plot elastic curves for beams undergoing displacements under different loadings |
| 6 | Understand the behaviour of columns and struts under axial loading. |

**Detailed Contents:**

**Part-A**

***Concept of Equilibrium:*** Loads, supports, reactions, displacements; General equilibrium equations; Equilibrium of a point and a member; Concept of free body diagram; Statical determinacy of a problem.

***Shear Force and Bending Moment Diagrams:*** Introduction to the concept of shear force, bending moment and the sign convention; Shear force and bending moment diagrams for cantilever, simply supported and overhang beams subjected to point loads, uniformly distributed loads, uniformly varying loads, moments or their combination, point of contra flexure.

***Displacements:*** Concept of displacements, types - deflections and rotations; assumptions; sign convention; different methods to compute displacements caused by different loadings.

***Bending and Shear Stresses****:* Assumptions - theory of simple bending; Derivation of bending equation; Centroid and section modulus of various cross sectional shapes including rectangular,

circular, I, channel, angle etc.; Determination of bending stresses, bending stress distribution across various beam sections; Determination of shear stress, shear stress distribution across various beam sections.

**Part-B**

***Stresses and Strains:*** Concept of stress and strain; Type of stresses and strains; Stress-strain diagrams for ductile, brittle materials; Generalized Hooke's law; Concept of working stress and factor of safety; Lateral strain, Poisson's ratio and Volumetric strain; Elastic moduli and relationship between them; Bars of varying section, composite bars, thermal stresses; Stresses and strains in thin cylinders, spherical shells subjected to internal pressures; Normal stress, tangential stress; Rectangular block subjected to normal stress along and across two planes, combination of normal and tangential stress; Concept of principal stresses, principal strains and principal planes; use of Mohr circle in computation of stresses and strains.

***Torsion of Circular Shafts:*** Derivation of torsion equation and its assumptions, application of equation to circular shafts; combined torsion and bending of circular shafts, principal stress and maximum shear stress under combined loading of torsion and bending.

***Columns and Struts:*** Stability of Columns; buckling load of axially loaded columns with various end conditions; Euler's and Rankine's formula; Columns under eccentric load, lateral load.

**Text Books**

1. 'Elements of Strength of Materials', Timoshenko, S. and Young, D. H., DVNC, New York, USA.
2. 'Solid Mechanics', Kazmi, S. M. A., TMH, New Delhi.
3. 'Mechanics of Materials', Hibbeler, R. C., Pearson Prentice Hall.
4. 'An Introduction to the Mechanics of Solids', Crandall, S. H., N. C. Dahl, and T. J. Lardner, McGraw Hill.
5. 'Mechanics of Materials', Ferdinand P. Beer, E. Russel Jhonston Jr. and John T. D. Ewolf, TMH.
6. 'Strength of Materials', James M. Gere and Barry J. Goodno, Cengage Learning India Pvt. Ltd., New Delhi.
7. 'Strength of Materials', R. Subramanian, Oxford University Press, New Delhi.

**Reference Books**

**E-Books and online learning material**

**Online Courses and Video Lectures**

**Guru Nanak Dev Engineering College, Ludhiana**
**Civil Engineering Department**
**Subject Code:** PCCE-103

**Subject Name:** Fluid Mechanics

| | |
|---|---|
| **Programme:** B.Tech. (CE) | **L:** 3 **T:** 0 **P:** 0 |
| **Semester:** 3 | **Teaching Hours:** 40 |
| **Theory/Practical:** Theory | **Credits:** 3 |
| **Internal Marks:** 40 | **Percentage of Numerical/Design/Programming Problems:** 70% |
| **External Marks:** 60 | **Duration of End Semester Exam (ESE):** 3hr |
| **Total Marks:** 100 | **Elective Status:** Compulsory |

**Prerequisites:** N/A

**Additional Material Allowed in ESE:** [Scientific Calculator]

**On completion of the course, the student will have the ability to:**

| CO# | Course Outcomes (CO) |
|---|---|
| 1 | Understand the basic terms used in fluid mechanics and its broad principles |
| 2 | Estimate the forces induced on a plane/ submerged bodies |
| 3 | Formulate expressions using dimensionless approach and able to determine design parameters by creating replica of prototype at appropriate scale. |
| 4 | Apply the continuity, momentum and energy principles and design the pipelines used for water supply or sewage under different situation. |
| 5 | Calculate drag force exerted by fluid on the body of varying shapes and able to minimize them. |
| 6 | Design and addressing problems in open channel ( lined/ unlined) of different shapes and size optimally as per site condition |

**Detailed Contents:**

**Part-A**

***Basic Concepts and Definitions –*** Distinction between a fluid and a solid; Density, Specific weight, Specific gravity, Kinematic and dynamic viscosity; variation of viscosity with temperature, Newton law of viscosity; surface tension, capillarity, Bulk modulus of elasticity, compressibility.

***Fluid Statics*** **-** Fluid Pressure: Pressure at a point, Pascals law, Piezometer, U-Tube Manometer, U-Tube Differential Manometer, Micromanometers. pressure gauges, Hydrostatic pressure and force: horizontal, vertical and inclined surfaces. Buoyancy and stability of floating bodies.

***Fluid Kinematics*** **-** Classification of fluid flow : steady and unsteady flow; uniform and non-uniform flow; laminar and turbulent flow; rotational and irrotational flow; compressible and incompressible flow; ideal and real fluid flow; one, two and three dimensional flows; Stream line, path line, streak line and stream tube; stream function, velocity potential function. One-, two- and three -dimensional continuity equations in Cartesian coordinates

***Fluid Dynamics*** **-** Surface and body forces; Equations of motion - Euler's equation; Bernoulli's equation – derivation; Energy Principle; Practical applications of Bernoulli's equation : venturimeter, orifice meter and pitot tube; Momentum principle; Forces exerted by fluid flow on pipe bend; Dimensional Analysis and Dynamic Similitude - Definitions of Reynolds Number, Froude Number, Mach Number, Weber Number and Euler Number; Buckingham's π-Theorem.

**Part-B**

***Laminar Flow & Turbulent Flow*** **-** Laminar flow through: circular pipes, parallel plates. Stoke's law, Reynolds experiment, Transition from laminar to turbulent flow. Prandtl's mixing length theory, universal velocity distribution equation. Resistance to flow of fluid in smooth and rough pipes, Moody's diagram. Flow through Pipes: Loss of head through pipes, Darcy-Wiesbatch equation, minor losses, total energy equation, hydraulic gradient line, Pipes in series, equivalent pipes, pipes in parallel

***Boundary Layer Analysis-*** Assumption and concept of boundary layer theory. Boundary-layer thickness, displacement, momentum & energy thickness, laminar and Turbulent boundary layers on a flat plate; Laminar sub-layer, smooth and rough boundaries. Local and average friction coefficients. Separation and Control.

***Open Channel Flow*** **-** Introduction, Comparison between open channel flow and pipe flow, geometrical parameters of a channel, Uniform Characteristics of uniform flow, Chezy's formula, Manning's formula. Most economical section of channel. Specific energy, Specific energy curve, critical flow, discharge curve Specific force Specific depth, and Critical depth. Channel Transitions. Theory of hydraulic jump, Elements and characteristics of hydraulic jump in a rectangular Channel, length and height of jump, location of jump, Types, applications and location of hydraulic jump. Energy dissipation and other uses.

**Text Books**

1. Fluid Mechanics and Machinery, C.S.P.Ojha, R. Berndtsson and P. N. Chadramouli, Oxford University Press, 2010
2. Hydraulics and Fluid Mechanics, P M Modi and S M Seth, Standard Book House
3. Theory and Applications of Fluid Mechanics, K. Subramanya, Tata McGraw Hill
4. Fluid mechanics and hydraulic machine: Bansal, R. K. (2011). SI units. New Delhi, India: Laxmi Publication.
5. Fluid Mechanics with Engineering Applications, R.L. Daugherty, J.B. Franzini and E.J. Finnemore, International Student Edition, Mc Graw Hill.
6. Fluid mechanics: fundamentals and applications. Cengel, Y. A. (2006). New Delhi, India: Tata McGraw-Hill Publishing.
7. Fluid mechanics and turbo machines. Das, M. M. (2010). New Delhi, India: PHI Learning..

**Reference Books**

**E-Books and online learning material**

**Guru Nanak Dev Engineering College, Ludhiana**

**Civil Engineering Department**

## Online Courses and Video Lectures

**Guru Nanak Dev Engineering College, Ludhiana**
**Civil Engineering Department**
**Subject Code:** PCCE-104

**Subject Name: Disaster Preparedness & Planning**

| | |
|---|---|
| **Programme:** B.Tech. (CE) | **L:** 3 **T:** 0 **P:** 0 |
| **Semester:** 3 | **Teaching Hours:** 40 |
| **Theory/Practical:** Theory | **Credits:** 3 |
| **Internal Marks:** 40 | **Percentage of Numerical/Design/Programming Problems:** 70% |
| **External Marks:** 60 | **Duration of End Semester Exam (ESE):** 3hr |
| **Total Marks:** 100 | **Elective Status:** Compulsory |

**Prerequisites:** N/A

**Additional Material Allowed in ESE: N/A**

**On completion of the course, the student will have the ability to:**

| CO# | Course Outcomes (CO) |
|---|---|
| 1 | Identify various types of disasters, their causes, effects & mitigation measures. |
| 2 | Demonstrate the understanding of various phases of disaster management cycle and create vulnerability and risk maps. |
| 3 | Understand the use of emergency management system to tackle the problems. |
| 4 | Discuss the role of media, various agencies and organizations for effective disaster management. |
| 5 | Design early warning system and understand the utilization of advanced technologies in disaster management. |
| 6 | Compare different models for disaster management and plan & design of infrastructure for effective disaster management. |

**Detailed Contents:**

**Part-A**

*Introduction to Disaster Management:* Define and describe disaster, hazard, vulnerability, risk-severity, frequency and details, capacity, impact, prevention, mitigation.

*Disasters:* Identify and describe the types of natural and man-made disasters, hazard and vulnerability profile of India, mountain and coastal areas, Factors affecting vulnerability such as impact of development projects and environment modifications (including dams, land-use changes, urbanization etc.), Disaster impacts (environmental, physical, social, ecological, economic etc.); health, psycho-social issues; demographic aspects (gender,age,special needs), Lessons and experiences from important disasters with specific reference to civil engineering.

*Disaster Mitigation and Preparedness:* Disaster Management Cycle-its phases; prevention, mitigation, preparedness, relief and recovery; structural and non structural measures; Preparedness for natural disasters in urban areas.

*Risk Assessment:* Assessment of capacity, vulnerability and risk, vulnerability and risk mapping, stages in disaster recovery and associated problems; Use of Remote Sensing Systems (RSS) and GIS in disaster Management, early warning systems.

**Part-B**

*Post disaster response:* Emergency medical and public health services; Environmental post disaster response (water, sanitation, food safety, waste management, disease control, security, communications); reconstruction and rehabilitation; Roles and responsibilities of government, community, local institutions, role of agencies like NDMA, SDMA and other International agencies, organizational structure, role of insurance sector, DM act and NDMA guidelines.

*Integration of public policy:* Planning and design of infrastructure for disaster management, Community based approach in disaster management, methods for effective dissemination of information, ecological and sustainable development models for disaster management.

**Text Books**

1. www.http//ndma.gov.in
2. http://www.ndmindia.nic.in
3. Natural Hazards in the Urban Habitat by Iyengar, C.B.R.I., Tata McGraw Hill, Publisher
4. Natural Disaster management, Jon Ingleton (Ed), Published by Tudor Rose, Leicester 92
5. Singh B.K., 2008, Handbook of disaster management: Techniques & Guidelines, Rajat Publications.
6. Disaster Management, R.B. Singh (Ed), Rawat Publications
7. ESCAP: Asian and the Pacific Report on Natural Hazards and Natural Disaster Reduction.

**Reference Books**

**E-Books and online learning material**

**Guru Nanak Dev Engineering College, Ludhiana**
**Civil Engineering Department**
**Subject Code:** ESCE-101

**Subject Name:** Basic Electronics & applications in Civil Engineering

| | |
|---|---|
| **Programme:** B.Tech. (CE) | **L:** 3 **T:** 0 **P:** 0 |
| **Semester:** 3 | **Teaching Hours:** 40 |
| **Theory/Practical:** Theory | **Credits:** 3 |
| **Internal Marks:** 40 | **Percentage of Numerical/Design/Programming Problems:** 0% |
| **External Marks:** 60 | **Duration of End Semester Exam (ESE):** 3hr |
| **Total Marks:** 100 | **Elective Status:** Compulsory |

**Prerequisites:** N/A

**Additional Material Allowed in ESE:** [Scientific Calculator]

**On completion of the course, the student will have the ability to:**

| CO# | Course Outcomes (CO) |
|---|---|
| 1 | Understand basics of electronics engineering |
| 2 | Understand the importance of electronic and soft computing in civil engineering |
| 3 | Providing inspiration to use the electronic products and other instruments to solve civil engineering problems |
| 4 | Use the computers / computing tools to solve civil engineering problems |
| 5 | Able to develop the program using basic language for solving civil engineering problems. |
| 6 | Appraise the use of sensors in civil engineering applications |

**Detailed Contents:**

**Part-A**

***Introduction:*** Role of Electronics in civil engineering, such as Intelligent Signalling, Intelligent Transportation, Instrumentation of bridges and buildings, and material testing.

***Diodes and Applications****:* PN junction diode, volt ampere characteristics Ideal versus Practical, Diode Equivalent Circuits, Special Diodes: Zener Diode, LED, Photo Diode; Applications of diodes in civil engineering.

***Transistor Characteristics****:* Bipolar Junction Transistor (BJT) –Construction, Operation, Common Base, Common Emitter and Common Collector Configurations, Transistor as an Amplifier in CE configuration, Operating Point, Transistor Biasing meaning, Essentials of a Transistor Biasing circuit, Voltage Divider Bias Circuits; Introduction to Field Effect Transistor (FET).

**Part-B**

***Digital Electronics Basics:*** Logic Gates: OR, AND, NOT, NOR, NAND, EX-OR; Pin diagram and description of ICs of logic gates, Number Systems: binary, octal and hexadecimal; Binary

Operations: addition, Subtraction; BCD code and BCD additions. 7 segment LCD Display, Introduction to Data Acquisition Systems. Integrated Circuits (ICs): Meaning, advantages and disadvantages.

***Transducers & Sensors:*** Transducing Principles, Ultrasonic, Optical and Infrared Sensors, Inductive, Capacitive and Resistive Transducers, Applications of Transducers/ Sensors for measurements of Length, Thickness, Displacement, Pressure, Temperature, Flow, Humidity, and Moisture.

***Computing tools/languages*:** Introduction and application of different languages, such as C, C+, python, VBA, spread sheets, etc. And its use in solving civil engineering problems

**Text Books**

1. V.K Mehta and Rohit Mehta, Principles of Electronics, S Chand Publishers.
2. A.K. Sawhney, A course in Electrical & Electronic Instrumentation, Dhanpat Rai and Sons.

**Reference Books**

**E-Books and online learning material**

**Online Courses and Video Lectures**

NPTEL / other online resources.

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**Guru Nanak Dev Engineering College, Ludhiana**
**Civil Engineering Department**
**Subject Code:** HSMCE-101

**Subject Name:** Civil Engineering- Introduction, Societal & Global Impact

| | |
|---|---|
| **Programme:** B.Tech. (CE) | **L:** 3 **T:** 0 **P:** 0 |
| **Semester:** 3 | **Teaching Hours:** 40 |
| **Theory/Practical:** Theory | **Credits:** 3 |
| **Internal Marks:** 40 | **Percentage of Numerical/Design/Programming Problems:** 0% |
| **External Marks:** 60 | **Duration of End Semester Exam (ESE):** 3hr |
| **Total Marks:** 100 | **Elective Status:** Compulsory |

**Prerequisites:** N/A

**Additional Material Allowed in ESE:** [Scientific Calculator]

**On completion of the course, the student will have:**

| CO# | Course Outcomes (CO) |
|---|---|
| 1 | Introduction to what constitutes Civil Engineering |
| 2 | **Understanding the vast interface of this field with the society at large** |
| 3 | Inspiration for doing creative and innovative work for the benefit of the society |
| 4 | **Need to think innovatively to ensure sustainability** |
| 5 | Depth of engagement possible within civil engineering and exploration of various possibilities of a career in this field |
| 6 | Introduction and overview to Futuristic engineering systems |

**Detailed Contents:**

**Part-A**

Civil Engineering and its historical developments; Understanding the importance of Civil Engineering in shaping and impacting the world; the ancient and modern Marvels and Wonders in the field of Civil Engineering; Scope of work involved in various branches of Civil Engineering and future vision; Recent Civil Engineering breakthroughs and innovations; Avenues for entrepreneurial working.

Understanding the past to look into the future; Pre-industrial revolution days, Agricultural revolution, first and second industrial revolutions, IT revolution and how these eras helped the civil engineering to grow; Concept of sustainability and the steady erosion of the environment due to haphazard developments; Global warming, its impact and possible causes; Atmospheric pollution; Pollution Mitigation measures; Health & Safety aspects for stakeholders; Environmental Impact Analysis: Concept and procedures; Innovations and methodologies for ensuring Sustainability.

**Part-B**

Infrastructure development and growth of the Nation; its effects on the GDP, employment, living standards of the people, etc.; Introduction and overview to Futuristic systems: Megacities, Smart

Cities, Stadia; Roads, Railways, Metros, Hyper Loop, Airports, Seaports, River ways, Sea canals, Tunnels, bridges; Energy generation: Hydro, Solar, Wind, Wave, Tidal, Geothermal, Thermal energy; Telecommunication needs: towers, above-ground and underground cabling; Flood control: Dams, Canals, River interlinking; Energy efficient built-environments and LEED ratings; Awareness of various Codes & Standards governing Infrastructure development.

**Text Books**

1. Salvadori, M and Heller, M, Structures in Architectures, PHI.
2. Fintel, C, Handbook of Civil Engineering, CBS Publications.

**Reference Books**

**E-Books and online learning material**

**Online Courses and Video Lectures**

**Guru Nanak Dev Engineering College, Ludhiana**
**Civil Engineering Department**
**Subject Code:** LPCCE-101

**Subject Name:** Surveying & Geomatics Laboratory

| | |
|---|---|
| **Programme:** B.Tech. (CE) | **L:** 0 **T:** 0 **P:** 2 |
| **Semester:** 3 | **Teaching Hours:** 24 |
| **Theory/Practical:** Practical | **Credits:** 1 |
| **Internal Marks:** 30 | **Percentage of Numerical/Design/Programming Problems:**100% |
| **External Marks:** 20 | **Duration of End Semester Exam (ESE):** 1.5 hr |
| **Total Marks:** 50 | **Elective Status:** Compulsory |

**Prerequisites:**

**On Completion of the course, the student will have the ability to:**

| CO# | Course Outcomes(CO) |
|---|---|
| 1 | Assess horizontal & vertical angles by Theodolite. |
| 2 | Survey the area using different methods of plane tabling and compass survey and to adjust the compass traverse graphically. |
| 3 | Compute the reduce levels using various methods of leveling. |
| 4 | Predict the location of any point horizontally and vertically using Tachometry. |
| 5 | Setting out curves in the field. |
| 6 | Use electronic survey instruments. |

| S. No. | Name of Practical |
|---|---|
| 1. | Measurement of bearing and angles with compass, adjustment of traverse by graphical method. |
| 2. | Different methods of levelling, height of instrument, rise & fall methods. |
| 3. | Measurement of horizontal and vertical angle by theodolite. |
| 4. | Determination of tachometric constants and determination of reduced levels by tachometric observations. |
| 5. | Plane table survey, different methods of plotting, Three point problems. |
| 6. | Determination of height of an inaccessible object. |
| 7. | Setting out of circular curves in the field using different methods. |
| 8. | Plotting of traverse using the Total Station and GPS. |

**Reference Material**

Manuals available in Laboratory

**Guru Nanak Dev Engineering College, Ludhiana**
**Civil Engineering Department**
**Subject Code:** LPCCE-102

**Subject Name:** Fluid Mechanics Laboratory

| | |
|---|---|
| **Programme:** B.Tech. (CE) | **L:** 0 **T:** 0 **P:** 2 |
| **Semester:** 3 | **Teaching Hours:** 24 |
| **Theory/Practical:** Practical | **Credits:** 1 |
| **Internal Marks:** 30 | **Percentage of Numerical/Design/Programming Problems:**100% |
| **External Marks:** 20 | **Duration of End Semester Exam (ESE):** 1.5 hr |
| **Total Marks:** 50 | **Elective Status:** Compulsory |

**Prerequisites:**

**On Completion of the course, the student will have the ability to:**

| CO# | Course Outcomes(CO) |
|---|---|
| 1 | **Select appropriate pressure measuring device under different conditions of flow.** |
| 2 | Determine the stability of a floating body. |
| 3 | Understand and apply Bernoulli's theorem practically. |
| 4 | Find discharge of fluid through pipe, orifices and in open channel. |
| 5 | Estimate the major and minor losses in pipe. |
| 6 | Estimate the various elements and energy losses in hydraulic jump. |

| S. No. | Name of Practical |
|---|---|
| 1. | To study of pressure measuring devices as peizometer, U-tube manometer, and pressure gauges. |
| 2. | To verify Bernoulli's Theorem |
| 3. | To determine the meta centric height of a of Floating Body under different condition. |
| 4. | To determine the coefficient of discharge of a Venturimeter. |
| 5. | To determine the coefficient of discharge of a Orifice Meter |
| 6. | To determine the coefficient of friction of different diameter pipes. |
| 7. | To estimate the minor losses as energy loss in pipe bend, sudden contraction or enlargement in pipe. |
| 8. | To determine the coefficient of discharge on rectangular and V-notches. |
| 9. | To determine the various element of a hydraulic jump. |

R**eference Material**


1. Fluid Mechanics and Machinery, C.S.P.Ojha, R. Berndtsson and P. N. Chadramouli, Oxford University Press, 2010
2. Hydraulics and Fluid Mechanics, P M Modi and S M Seth, Standard Book House
3. Theory and Applications of Fluid Mechanics, K. Subramanya, Tata McGraw Hill
4. Fluid Mechanics with Engineering Applications, R.L. Daugherty, J.B. Franzini and E.J. Finnemore, International Student Edition, Mc Graw Hill.

**Guru Nanak Dev Engineering College, Ludhiana**
**Civil Engineering Department**

**Guru Nanak Dev Engineering College, Ludhiana**
**Civil Engineering Department**
**Subject Code:** LPCCE-103

**Subject Name:** Solid Mechanics Laboratory

| | |
|---|---|
| **Programme:** B.Tech. (CE) | **L:** 0 **T:** 0 **P:** 2 |
| **Semester:** 3 | **Teaching Hours:** 24 |
| **Theory/Practical:** Practical | **Credits:** 1 |
| **Internal Marks:** 30 | **Percentage of Numerical/Design/Programming Problems:**100% |
| **External Marks:** 20 | **Duration of End Semester Exam (ESE):** 1.5 hr |
| **Total Marks:** 50 | **Elective Status:** Compulsory |

**Prerequisites:**

**On Completion of the course, the student will have the ability to:**

| CO# | Course Outcomes(CO) |
|---|---|
| 1 | Understand the importance of physical properties of steel. |
| 2 | Identify and comprehend code provisions for testing different properties of steel. |
| 3 | Develop stress-strain curve for axial compression, axial tension and shear. |
| 4 | Assess hardness and impact strength of steel. |
| 5 | Assess flexural strength of a given material. |
| 6 | Evaluate fatigue and impact strength of steel. |

| S. No. | Name of Practical |
|---|---|
| 1. | Determination of physical properties of steel including strength and ductility. |
| 2. | Study of tensile and compressive stress-strain behaviour of steel. |
| 3. | Development of shear stress-strain curve for steel in torsion. |
| 4. | Determination of hardness of a material by Rockwell and Brinell hardness testing machine. |
| 5. | Determination of impact strength of a material by Izod and Charpy tests. |
| 6. | Determination of bending strength of a wooden beam specimen. |
| 7. | Determination of fatigue strength of a material. |

R**eference Material**

1. Laboratoryoratory Manual of Testing Materials, William Kendrick Hall Hydraulics and Fluid Mechanics, P M Modi and S M Seth, Standard Book House

**Subject Code:** PCCE-105

**Subject Name:** Concrete Technology

| | |
|---|---|
| **Programme:** B.Tech. (CE**)** | **L:** 3 **T:** 0 **P:** 0 |
| **Semester:** 4 | **Teaching Hours:** 40 |
| **Theory/Practical:** Theory | **Credits:** 3 |
| **Internal Marks:** 40 | **Percentage of Numerical/Design/Programming Problems:** 50% |
| **External Marks:** 60 | **Duration of End Semester Exam (ESE):** 3hr |
| **Total Marks:** 100 | **Elective Status:** Compulsory |

**Guru Nanak Dev Engineering College, Ludhiana**
**Civil Engineering Department**

**Prerequisites:** N/A

**Additional Material Allowed in ESE:** [Scientific Calculator]

**On completion of the course, the student will have the ability to:**

| CO# | Course Outcomes (CO) |
|---|---|
| 1 | Understand the relevance of different properties of constituent materials on properties of concrete. |
| 2 | Understand the behavior and durability aspects of concrete under different loading and exposure conditions. |
| 3 | Understand the issues involved in production and use of concrete. |
| 4 | Design of concrete mixes as per BIS specifications. |
| 5 | Understand various testing methods for concrete and their applicability. |
| 6 | Knowledge of special type of non-conventional concretes. |

**Detailed Contents:**

**Part-A**

***Concrete and its ingredients:*** Properties of cement, aggregate, admixture, water and other additives; Related Indian Standard codes & guidelines.

***Concrete behaviour in fresh and hardened states:*** Workability, Elasticity, Shrinkage, Creep, Fatigue, Strength in compression, tension, shear and bond; Influence of various factors on test results; Concrete cracking and type of cracks; Permeability and durability characteristics of concrete including resistance to sulphate & acid attack, alkali-aggregate reaction, freezing and thawing; Fire resistance

***Production of concrete:*** Mixing, handling, placing, compaction of concrete and related issues; Quality control; Behaviour in extreme environmental conditions like hot weather, cold weather and under water conditions

**Part-B**

***Concrete mix design:*** Basic considerations, proportioning of material, effect of various parameters, trial mixes, IS code

***Inspection and testing of concrete:*** Defects in concrete; Deterioration of concrete; Strength tests including compressive, split tensile, flexural, pullout etc.; Durability tests including permeability, carbonation, rapid chlorine ion penetration etc.; Destructive and Non-destructive testing of concrete; Acceptance and compliance requirements of concrete as per IS codes

***Special concretes:*** Types and specifications; Fibre reinforced and steel reinforced concrete; Polymer concrete; Light weight concrete, High strength concrete, Prestressed concrete, Self Compacting Concrete, Pervious Concrete, Self Healing Concrete

**Text Books**

1. 'Properties of Concrete', A. M. Neville, Prentice Hall
2. 'Concrete Technology', M. S. Shetty, S.Chand & Co.
3. 'Concrete Technology', M. L. Gambhir, Tata McGraw Hill Publishers, New Delhi
4. 'Concrete Technology', A. R. Santha Kumar, Oxford University Press, New Delhi

**Reference Books**

**E-Books and online learning material**

**Online Courses and Video Lectures**

**Guru Nanak Dev Engineering College, Ludhiana**
**Civil Engineering Department**
**Subject Code:** PCCE-106

**Subject Name:** Materials, Testing a& Evaluation

| | |
|---|---|
| **Programme:** B.Tech. (CE) | **L:4 T:** 0 **P:** 0 |
| **Semester:** 4 | **Teaching Hours:** 40 |
| **Theory/Practical:** Theory | **Credits: 4** |
| **Internal Marks:** 40 | **Percentage of Numerical/Design/Programming Problems:** 50% |
| **External Marks:** 60 | **Duration of End Semester Exam (ESE):** 3hr |
| **Total Marks:** 100 | **Elective Status:** Compulsory |

**Prerequisites:** N/A

**Additional Material Allowed in ESE:** [Scientific Calculator]

**On completion of the course, the student will have the ability to:**

| CO# | Course Outcomes (CO) |
|---|---|
| 1 | Appraisal about the role of materials in civil engineering |
| 2 | Introduce common measurement instruments, equipments and devices to capture the material response under loading |
| 3 | Exposure to a variety of established material testing procedures/techniques and the relevant codes of practice |
| 4 | **Ability to write a technical Laboratory report** |
| 5 | **Draw inferences from observations/reports for selection of suitable material** |
| 6 | Use and draw relevant information from the standards and guidelines |

**Detailed Contents:**

**Part-A**

Material - Definition, classifications (engineering/non-engineering and structural/non-structural), types (brittle, ductile, composites and cementitious materials, etc.) and its role in engineering design & construction; desirable properties and specifications; Material microstructure (e.g. of concrete, etc) and its effect on their engineering properties.

Strength-deformation and fracture behavior of materials; Characteristics strength of materials, determination & its reporting; Material behavior under different stress conditions; Parameters affecting the material strength; Different equipments, devices, and instruments to characterize the material response/ behavior; Current testing technology (displacement-controlled and load-controlled) and its selection for capturing the response of the material.

**Part-B**

Force and strain measurements, Important instrument considerations - Fatigue, impact, toughness, crushing, abrasion, permeability and other time-dependent properties, such as shrinkage, creep; Durability considerations.

Documenting the experimental program, including the test procedures, collected data, method of interpretation and final results; Use of test data/ testing reports in the material selection for various civil engineering projects /construction

Quality control - Sampling, Acceptance criterion, Code of practice and guidelines in this regards for Cements; Aggregates; Admixtures; Concrete (plain, reinforced and steel fibre/ glass fibre-reinforced, light-weight concrete, High Performance Concrete, permeable Concrete); Soils; Bitumen and asphaltic materials; Timbers; Glass and Plastics; Structural Steel; Aluminum; Geo-textiles; Carbon composites.

**Text Books**

1. Chudley, R., Greeno (2006), 'Building Construction Handbook' (6th ed.),R. Butterworth-Heinemann
2. Khanna, S.K., Justo, C.E.G and Veeraragavan, A, ' Highway Materials and Pavement Testing', Nem Chand & Bros,
3. Various related updated & recent standards of BIS, IRC, ASTM, RILEM, ACI, AASHTO, etc. corresponding to materials used for Civil Engineering applications
4. Kyriakos Komvopoulos (2011), Mechanical Testing of Engineering Materials, Cognella
5. E.N. Dowling (1993), Mechanical Behaviour of Materials,Prentice Hall International Edition
6. Mehta, P K and Monteiro P J M (1997), Concrete: Microstructure, Properties and Materials, Tata McGraw Hill.

**Reference Books**

**E-Books and online learning material**

1. Related papers published in international journals

**Online Courses and Video Lectures**

**Guru Nanak Dev Engineering College, Ludhiana**
**Civil Engineering Department**
**Subject Code:** PCCE-107

**Subject Name:** Hydrology & Water Resources Engineering

| | |
|---|---|
| **Programme:** B.Tech. (CE) | **L:** 3 **T:** 1 **P:** 0 |
| **Semester:** 4 | **Teaching Hours:** 40 |
| **Theory/Practical:** Theory | **Credits: 4** |
| **Internal Marks:** 40 | **Percentage of Numerical/Design/Programming Problems:** 70% |
| **External Marks:** 60 | **Duration of End Semester Exam (ESE):** 3hr |
| **Total Marks:** 100 | **Elective Status:** Compulsory |

**Prerequisites:** N/A

**Additional Material Allowed in ESE:** [Scientific Calculator]

**On completion of the course, the student will have the ability to:**

| CO# | Course Outcomes (CO) |
|---|---|
| 1 | Express the interaction among various processes in the hydrologic cycle |
| 2 | Calculate the average annual rainfall of any area using the rain gauge data and compile interrelations of various parameters as infiltration, evapotranspiration etc |
| 3 | Define the various components of hydrographs and calculate the estimated run off. |
| 4 | Find the water requirement for different crops and plan appropriate method of applying water. |
| 5 | Develop the distribution system of canal and various components of irrigation system. |
| 6 | Classify dams and plan dams according to suitability of sites available, their problems and able to determine forces exerted by fluid on dams. |

**Detailed Contents:**

**Part-A**

***Introduction-*** Hydrologic Cycle, Water-Budget Equation, History of Hydrology, World Water Balance, Applications in Engineering, Sources of Data.

***Precipitation-*** Forms of Precipitation, Characteristics of Precipitation in India, Measurement of Precipitation, Rain Gauge Network, Mean Precipitation over an Area, Depth Area-Duration Relationships, Maximum Intensity/Depth-Duration-Frequency Relationship, Probable Maximum Precipitation (PMP), Rainfall Data in India.

***Abstractions from precipitation-*** Evaporation Process, Evaporimeters, Analytical Methods of Evaporation Estimation, Reservoir Evaporation and Methods for its Reduction, Evapotranspiration, Interception, Depression Storage, Infiltration, Infiltration Capacity, Measurement of Infiltration, Modelling Infiltration Capacity, Classification of Infiltration Capacities, Infiltration Indices.

***Runoff-*** Hydrograph, Factors Affecting Runoff and Runoff Hydrograph, Components of Hydrograph, Base Flow Separation, Effective Rainfall, Unit Hydrograph, S-curve hydrograph, Snyder's synthetic unit hydrograph. Surface Water Resources of India

## Part-B

***Water withdrawals and uses–*** Water for Energy Production, Water for Agriculture, Water for Hydroelectric Generation; Flood Control, Analysis of Surface Water Supply, Water Requirement of Crops-Crops and Crop Seasons in India, Cropping Pattern, Duty And Delta; Quality of Irrigation Water; Soil-Water Relationships, Root Zone Soil Water, Infiltration, Consumptive use, Irrigation Requirement, Frequency of Irrigation; Methods of Applying Water to The Fields: Surface, Sub-Surface, Sprinkler and Trickle / Drip Irrigation.

***Distribution systems-*** Canal Systems, Alignment of Canals, Canal Losses, Estimation of Design Discharge, Design of Channels- Rigid Boundary Channels, Alluvial Channels, Kennedy's and Lacey's Theory of Regime Channels, Canal Outlets: Non-Modular, Semi-Modular And Modular Outlets.

***Water Logging-*** Causes, Effects And Remedial Measures. Lining of Canals, Types of Lining. Drainage of Irrigated Lands: Necessity, Methods.

***Dams and spillways-*** embankment dams: Classification, design considerations, estimation and control of seepage, slope protection. Gravity dams: forces on gravity dams, causes of failure, stress analysis, elementary and practical profile. Arch and buttress dams. Spillways: components of spillways, types of gates for spillway crests; Reservoirs- Types, capacity of reservoirs, yield of reservoir, reservoir regulation, sedimentation, economic height of dam, selection of suitable site.

**Text Books**

1. K Subramanya, Engineering Hydrology, Mc-Graw Hill.
2. K N Muthreja, Applied Hydrology, Tata Mc-Graw Hill.
3. K Subramanya, Water Resources Engineering through Objective Questions, Tata McGraw Hill.
4. G L Asawa, Irrigation Engineering, Wiley Eastern
5. L W Mays, Water Resources Engineering, Wiley.
6. J. D Zimmerman, Irrigation, John Wiley & Sons
7. C S P Ojha, R Berndtsson and P Bhunya, Engineering Hydrology, Oxford.

**Reference Books**

**E-Books and online learning material**

**Online Courses and Video Lectures**

**Guru Nanak Dev Engineering College, Ludhiana**
**Civil Engineering Department**
**Subject Code:** PCCE-108

**Subject Name:** Transportation Engineering

| | |
|---|---|
| **Programme:** B.Tech. (CE) | **L:** 3 **T:** 1 **P:** 0 |
| **Semester:** 4 | **Teaching Hours:** 40 |
| **Theory/Practical:** Theory | **Credits: 4** |
| **Internal Marks:** 40 | **Percentage of Numerical/Design/Programming Problems:** 40% |
| **External Marks:** 60 | **Duration of End Semester Exam (ESE):** 3hr |
| **Total Marks:** 100 | **Elective Status:** Compulsory |

**Prerequisites:** N/A

**Additional Material Allowed in ESE:** [Scientific Calculator]

**On completion of the course, the student will have the ability to:**

| CO# | Course Outcomes (CO) |
|---|---|
| 1 | Appreciate the importance of different modes of transportation and characterize the road transportation. |
| 2 | Alignment and geometry of pavement as per Indian Standards according to topography. |
| 3 | **Assess the properties of highway materials in Laboratory** |
| 4 | Understand the importance of railway infrastructure planning and design. |
| 5 | Identify the functions of different component of railway track. |
| 6 | Outline the importance of Airport Infrastructure |

**Detailed Contents:**

**Part-A**

***Introduction:*** Importance of Transportation, Different Modes of Transportation, Characteristics of Road Transport.

***Transportation Systems:*** Multi modal transportation system, Characteristics of Mass Transit systems including technical, demand operational and economic problems, fixed Track Facility, Mass Rapid Transit System-Elevated, Surface and Underground construction, Express Bus System, integrated Operating Characteristics of Terminal and Transfer facilities.

***Highway Development & Planning:*** Principles of Highway Planning, Road Development in India, Classification of Roads, Road Patterns, Planning Surveys; Highway Construction: Right of way; Earthen/Gravel Road, Water Bound Macadam, Wet Mix Macadam, Bituminous Pavements, Cement Concrete Pavements

***Railway Engineering:*** History of Railways, Development of Indian Railway, Organisation of Indian Railway, Important Statistics of Indian Railways. Railway Gauges: Definition, Gauges on World Railways, Choice of Gauge, Uniformity of Gauge, Loading Gauge, Construction Gauge.

**Part-B**

***Railway Track:*** Requirements of a Good Track, Track Specifications, Detailed Cross-Section of Single/Double Track used in Indian Railways. Components of permanent way - Rails, Sleepers, Ballast, Sub-grade and Formation, Track Fixtures & Fastenings, Coning of Wheels, Tilting of Rails, Adzing of Sleepers, Rail Joints, Creep of Rails.

***Airport Engineering*:** Introduction, Air Transport Scenario in India and Stages of Development, National and International Organizations; Airport planning - Site selection, runway orientation, etc. Concept of Head Wind, Cross Wind, Wind Rose Diagram, Runway Configuration

***Aircraft Parking System & Visual Aids:*** Main Taxiway, Exit Taxiway, Separation Clearance, Holding Aprons.: Marking and Lighting of Runway and Taxiway, Landing Direction Indicator, and Wind Direction Indicator, IFR/VFR.

**Text Books**

1. Khanna S.K., and Justo, C.E.G. “Highway Engineering”, Nem Chand and Brothers, Roorkee,1998.
2. Kadiyali, L.R. “Principles and Practice of Highway Engineering”, Khanna Publishers, New Delhi, 1997.
3. Flaherty, C.A.O. “Highway Engineering”, Volume 2, Edward Arnold, London, 1986.
4. Sharma, S.K. “Principles, Practice & Design of Highway Engineering”, S. Chand & Company Ltd., New Delhi, 1985.
5. Mannering, “Principles of Highway Engineering & Traffic Analysis”, Wiley Publishers, NewDelhi.

**Reference Books**

**E-Books and online learning material**

**Online Courses and Video Lectures**

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**Guru Nanak Dev Engineering College, Ludhiana**
**Civil Engineering Department**
**Subject Code:** BSCE-101

**Subject Name:** Mathematics-III

| | |
|---|---|
| **Programme:** B.Tech. (CE) | **L:** 3 **T:** 0 **P:** 0 |
| **Semester:**4 | **Teaching Hours:** 40 |
| **Theory/Practical:** Theory | **Credits:** 3 |
| **Internal Marks:** 40 | **Percentage of Numerical/Design/Programming Problems:**100% |
| **External Marks:** 60 | **Duration of End Semester Exam (ESE):** 3hr |
| **Total Marks:** 100 | **Elective Status:** Compulsory |

**Prerequisites:** N/A

**Additional Material Allowed in ESE:** [Scientific Calculator]

**On completion of the course, the student will have the ability to:**

| CO# | Course Outcomes (CO) |
|---|---|
| 1 | Study the use / application of mathematic theory in the solution of engineering problems. |
| 2 | Identify appropriate method / functions for obtaining solution |
| 3 | Use power series method to solve differential equation and its application to Bessel's and Legendre's equations. |
| 4 | Analyze Ordinary and Partial differential equations and learn simplest means to solve them. |
| 5 | Learn and apply binary operations, Laplace, Fourier transform methods to civil engineering applications |
| 6 | Use the concepts of limit, continuity and derivative of complex variables and use analytic functions which are widely applicable to two dimensional problems in engineering. |

**Detailed Contents:**

**Part-A**

***Transform Calculus* -1:** Laplace Transform, Properties of Laplace Transform, Laplace transform of periodic functions. Finding inverse Laplace transform by different methods, convolution theorem, Solving ODEs by Laplace Transform method

***Transform Calculus*-2:** The Fourier integral, The Fourier transform, Fourier sine and cosine transform, properties of Fourier transform, Convolution theorem, Parseval's Identities, application of Fourier transforms to solve PDE.

**Part-B**

***Logic and Partially ordered sets*:** Introduction to first order logic and first order theory. Complete partial ordering, chain, lattice, complete, distributive, modular and complemented lattices.

***Algebraic Structures*:** Algebraic structures with one binary operation – semigroup, monoid and group. Cosets, Lagrange's theorem, normal subgroup, homomorphic subgroup, Congruence relation and quotient structures

**Text Books**

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
3. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
4. Veerarajan T., Engineering Mathematics, Tata McGraw-Hill, New Delhi, 2008.
6. K. H. Rosen, "Discrete Mathematics", MGH Publication.
7. John A. Dossey, "Discrete Mathematics",Addison Wesley Publishing Company.
8. T. Sengadir, "Discrete Mathematics",Pearson Education.
9. G. Shanker Rao, "Discrete Mathematics",New Age International Pvt. Ltd Publishers.

**Reference Books**

**E-Books and online learning material**

**Online Courses and Video Lectures**

**Guru Nanak Dev Engineering College, Ludhiana**
**Civil Engineering Department**
**Subject Code:** LPCCE-104

**Subject Name:** Concrete Testing Laboratory

| | |
|---|---|
| **Programme:** B.Tech. (CE) | **L:** 0 **T:** 0 **P:** 2 |
| **Semester:**4 | **Teaching Hours:** 24 |
| **Theory/Practical:** Practical | **Credits:** 1 |
| **Internal Marks:** 30 | **Percentage of Numerical/Design/Programming Problems:** |
| **External Marks:** 20 | **Duration of End Semester Exam (ESE):** |
| **Total Marks:** 50 | **Elective Status:** Compulsory |

**Prerequisites:**

**On Completion of the course, the student will have the ability to:**

| CO# | Course Outcomes(CO) |
|---|---|
| 1 | Evaluate properties of building materials, such as cement and aggregates. |
| 2 | **Conduct experiments to check the acceptance criteria (if any).** |
| 3 | Design concrete mixes as per BIS provisions. |
| 4 | Analyze the properties of concrete in fresh and hardened state. |
| 5 | Create a well organized document and present the results appropriately. |
| 6 | Understand and apply non destructive testing (NDT) for evaluating concrete quality. |

| S. No. | Name of Practical |
|---|---|
| 1. | Tests on cement<br>• Fineness<br>• Consistency<br>• Setting time<br>• Soundness<br>• Specific gravity<br>• Strength |
| 2. | Tests on aggregates (fine and coarse)<br>• Specific gravity<br>• Bulk Density<br>• Fineness Modulus<br>• Moisture content<br>• Water Absorption<br>• Bulking of sand |
| 3. | Design mix of concrete as per BIS method. |
| 4. | Workability tests on concrete<br>• Slump test<br>• Compaction Factor test<br>• Vee-Bee test |
| 5. | Strength tests on concrete<br>• Compressive strength (Cube and Cylinder)<br>• Split Tensile strength |

| | |
|---|---|
| | • Flexural strength<br>• Abrasion resistance |
| 6. | Non-Destructive Techniques<br>• Rebound hammer test<br>• Ultra sonic pulse velocity test |

**Reference Material**

1. 'Concrete Laboratory Manual', M. L. Gambhir, Dhanpat Rai & Sons, New Delhi.
2. 'Concrete Laboratory Manual', TTTI Chandigarh.

**Guru Nanak Dev Engineering College, Ludhiana**
**Civil Engineering Department**
**Subject Code:** LPCCE-105

**Subject Name:** Transportation Laboratory

| | |
|---|---|
| **Programme:** B.Tech. (CE) | **L:** 0 **T:** 0 **P:** 2 |
| **Semester:** 4 | **Teaching Hours:** 24 |
| **Theory/Practical:** Practical | **Credits:** 1 |
| **Internal Marks:** 30 | **Percentage of Numerical/Design/Programming Problems:** |
| **External Marks:** 20 | **Duration of End Semester Exam (ESE):** |
| **Total Marks:** 50 | **Elective Status:** Compulsory |

**Prerequisites:**

**On Completion of the course, the student will have the ability to:**

| CO# | Course Outcomes(CO) |
|---|---|
| 1 | Characterize the pavement materials as per the Indian Standard guidelines. |
| 2 | Evaluate the strength of subgrade soil by CBR test. |
| 3 | Conduct experiments to evaluate aggregate properties. |
| 4 | Determine properties of bitumen material and mixes |
| 5 | Evaluate the pavement condition by rough meter and Benkelman beam test. |
| 6 | Create a well organized report and present the results appropriately |

| S. No. | Name of Practical |
|---|---|
| 1. | *Tests on Sub-grade Soil*<br>• California Bearing Ratio Test |
| 2. | *Tests on Road Aggregates*<br>• Crushing Value Test<br>• Los Angles Abrasion Value Test<br>• Impact Value Test<br>• Shape Test (Flakiness and Elongation Index) |
| 3. | *Tests on Bituminous Materials and Mixes*<br>• Penetration Test<br>• Ductility Test<br>• Softening Point Test<br>• Flash & Fire Point Test<br>• Bitumen Extraction Test |
| 4. | *Field Tests*<br>• Study of Roughometer/Bump Indicator<br>• Study of Benkelman Beam Method |

R**eference Material**

1. Khanna S.K., and Justo, C.E.G. “Highway Material & Pavement Testing”, NemChand andBrothers, Roorkee., International Student Edition, Mc Graw Hill.

**Guru Nanak Dev Engineering College, Ludhiana**
**Civil Engineering Department**
**Subject Code:** PRCE-101

**Subject Name:** Seminar and Technical Report Writing

| | |
|---|---|
| **Programme:** B.Tech. (CE) | **L:** 0 **T:** 0 **P:** 2 |
| **Semester:** 4 | **Teaching Hours:** 24 |
| **Theory/Practical:** Practical | **Credits:** 1 |
| **Internal Marks:** 50 | **Percentage of Numerical/Design/Programming Problems:** |
| **External Marks: nil** | **Duration of End Semester Exam (ESE):** |
| **Total Marks:** 50 | **Elective Status:** Compulsory |

**Prerequisites:**

**On Completion of the course, the student will have the ability to:**

| CO# | Course Outcomes(CO) |
|---|---|
| 1 | Find relevant sources of information, research and gather information. |
| 2 | Create a well organized document using appropriate format and grammatical structure. |
| 3 | **Acknowledge the work of others in a consistent manner.** |
| 4 | Understanding of ethical and professional issues. |
| 5 | Demonstrate effective written and oral communication. |
| 6 | Awareness of implications to society at large. |

| S. No. | Content |
|---|---|
| 1. | This is an structured open-ended course in which the students under the overall supervision of a faculty member of his discipline, must submit report as a culmination of his endeavor and investigation. The focus area of the seminar can be any topic from the civil engineering discipline.<br><br>The course will aim to evaluate student's Understanding, Broadness, Diversity, Self-Learning and Service in the area of civil engineering.<br><br>Students will prepare the individual seminar report as per the prescribed format and present it before the group of students. |

**Guru Nanak Dev Engineering College, Ludhiana**
**Civil Engineering Department**
**Subject Code:** MCI-101

**Subject Name:** Environmental Science

| | |
|---|---|
| **Programme:** B.Tech. (CE) | **L:** 2 **T:** 0 **P:** 0 |
| **Semester:**4 | **Teaching Hours:** 26 |
| **Theory/Practical:** Theory | **Credits:** 0 |
| **Internal Marks:** 40+10 | **Percentage of Numerical/Design/Programming Problems:** 0% |
| **External Marks:** -- | **Duration of End Semester Exam (ESE):** |
| **Total Marks:** 50 | **Elective Status:** Mandatory |

**Prerequisites:** N/A

**Additional Material Allowed in ESE: [**NIL]

**On completion of the course, the student will have the ability to:**

| CO# | Course Outcomes (CO) |
|---|---|
| 1 | Measure environmental variables and interpret results. |
| 2 | Evaluate local, regional and global environmental topics related to resource use and management. |
| 3 | Propose solutions to environmental problems related to resource use and management. |
| 4 | Interpret the results of scientific studies of environmental problems. |
| 5 | Describe threats to global biodiversity, their implications and potential solutions. |

**Detailed Contents:**

**Part-A**

***Natural Resources*** - Renewable and non renewable resources: Natural resources and associated problems: Forest resources: Use and over-exploitation, deforestation, case studies, Timber extraction, mining, dams and their effects on forests and tribal people,

***Water resources****:* Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dam's benefits and problems, Food Resources: World food problems, changes caused by agriculture and over grazing, effects of modern agriculture, fertilizers- pesticides problems, water logging, salinity, case studies, Energy Resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies, Land Resources: Land as a resource, land degradation, man induces landslides, soil erosion, and desertification.

***Eco Systems****:* Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers, decomposers, Energy flow in the ecosystems, Ecological succession, Food chains, food webs and ecological pyramids, Introduction, types, characteristic features, structure and function of the following ecosystems: Forest ecosystem, Grass land ecosystem, Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

**Part-B**

***Biodiversity and it's Conservation**:* Introduction-Definition: genetics, species and ecosystem diversity, Biogeographically classification of India, Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values, Biodiversity at global, national and local level, India as a mega diversity nation, Hot-spots of biodiversity, Threats to biodiversity: habitats loss, poaching of wild life, man wildlife conflicts, Endangered and endemic spaces of India, Conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.

***Environmental Pollution**:* Definition, causes, effects and control measures of: Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards.

**Solid waste Management**: Causes, effects and control measures of urban and industrial wastes, Role of an individual in prevention of pollution, Pollution case studies.

***Social issues and the Environment:*** Form unsustainable to sustainable development, Water conservation, rain water harvesting, water shed management, Resettlement and rehabilitation of people; its problems and concerns, case studies, Environmental ethics: issues and possible solutions, Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies, Environment protection Act, Air (prevention and control of pollution) Act, Water (prevention and control of pollution) Act, Wildlife protection act, Forest conservation act

***Human population and the environment**:* Population growth and variation among nations, Population explosion- family welfare program, Environment and human health, Human rights, Value education, HIV / AIDS, Women and child welfare

**Text Books**

1. Textbook of Environmental studies, Erach Bharucha, UGC
2. Fundamental concepts in Environmental Studies, D D Mishra, S Chand & Co Ltd
3. Environment Biology by Agarwal, K. C., Nidi Publ. Ltd. Bikaner.
4. Principle of Environment Science by Cunninghan, W.P.
5. Essentials of Environment Science by Joseph.
6. Perspectives in Environmental Studies by Kaushik, A.
7. Elements of Environment Science & Engineering by Meenakshi.
8. Elements of Environment Engineering by Duggal.

**Reference Books**

**E-Books and online learning material**

: https://www.ugc.ac.in/oldpdf/modelcurriculum/env.pdf

**Online Courses and Video Lectures**

**Guru Nanak Dev Engineering College, Ludhiana**
**Civil Engineering Department**
**Subject Code:** TR-101

**Subject Name: Training - I**

| | |
|---|---|
| **Programme:** B.Tech. (CE) | **L:** 0 **T:** 0 **P:** 0 |
| **Semester:** | **Teaching Hours:** 4 Weeks |
| **Theory/Practical:** Practical | **Credits:** 1 |
| **Internal Marks:** 60 | **Percentage of Numerical/Design/Programming Problems:** |
| **External Marks:** 40 | **Duration of End Semester Exam (ESE):** |
| **Total Marks:** 100 | **Elective Status:** Compulsory |

**Prerequisites:**

**On Completion of the course, the student will have the ability to:**

| CO# | Course Outcomes(CO) |
|---|---|
| 1 | Visualize things/ concepts and express the thoughts in the form of sketches, models, etc |
| 2 | Create a model through programming language using computer. |
| 3 | Know about the different materials used at construction sites. |
| 4 | Understanding of ethical and professional issues. |
| 5 | Demonstrate effective oral and written communication. |
| 6 | Work in team. |

| S. No. | Content |
|---|---|
| 1. | Solid modeling through Python<br><br>Collection and compilation of different materials used in civil engineering projects in the form of Scrapbook, etc.<br><br>Sketching / Drafting practice for different buildings, its components, views, sections, etc. and compilation in the form of a drawing notebook and models.<br><br>Visits to some construction sites/ concrete batching plants, etc. |

**Subject Code:** PCCE-109
**Subject Name:** Engineering Geology

| | |
|---|---|
| **Programme:** B.Tech (Civil Engineering) | **L:** 3 **T:** 0 **P:** 0 |
| **Semester:** 5 | **Teaching Hours:** 45 Hours |
| **Theory/Practical:** Theory | **Credits:** 03 |
| **Internal Marks:** 40 | **Percentage of Numerical/Design Problems:** 0% |
| **External Marks:** 60 | **Duration of End Semester Exam(ESE):** 3 hours |
| **Total Marks:** 100 | **Elective Status:** Compulsory |

**Additional Material Allowed in ESE:** NIL

**On Completion of the course, the student will have the ability to:**

| CO | Course Outcomes |
|---|---|
| 1. | Understand the geological considerations in civil engineering projects. |
| 2. | Predict the different properties of rocks. |
| 3. | Identify the geological problems associated with civil engineering structures and suggest remedies. |
| 4. | Analyze geological data for civil engineering projects. |
| 5. | **Predict the engineering properties of rocks in laboratory and field** |
| 6. | **Plan appropriate techniques for improvement of engineering properties of rocks.** |

**Detailed Contents:**

**Part-A**

**Introduction: 6 hours**

Branches of geology useful to civil engineering, scope of geological studies in various civil engineering projects. Department dealing with this subject in India and their scope of work Mineralogy-Mineral, Origin and composition. Physical properties of minerals. Rock forming minerals, megascopic identification of common primary & secondary minerals.

**Petrology: 8 hours**

Rock forming processes. Specific gravity of rocks. Ternary diagram. Igneous petrology- Volcanic Phenomenon and different materials ejected by volcanoes. Types of volcanic eruption. Concept of Hot spring and Geysers. Characteristics of different types of magma. Division of rock on the basis of depth of formation, and their characteristics. Chemical and Mineralogical Composition. Texture and its types. Various forms of rocks. Classification of Igneous rocks on the basis of Chemical composition. Detailed study of Acidic Igneous rocks like Granite. Engineering aspect to granite. Basic Igneous rocks Like Gabbro, Dolerite, Basalt. Engineering aspect to Basalt. Sedimentary petrology- mode of formation, Mineralogical Composition. Texture and its types, Structures, Gradation of Clastic rocks. Classification of sedimentary rocks and their characteristics. Detailed study of Conglomerate, Breccia, Sandstone, Mudstone and Shale, Limestone Metamorphic petrology- Agents and types of metamorphism, metamorphic grades, Mineralogical composition, structures & textures in metamorphic rocks. Important Distinguishing features of rocks as Rock cleavage, Schistosity, Foliation. Classification. Detailed study of Gneiss, Schist, Slate with engineering consideration.

**Physical Geology:** **5 hours**

Weathering. Erosion and Denudation. Factors affecting weathering and product of weathering. Engineering consideration. Superficial deposits and its geotechnical importance: Water fall and Gorges, River meandering, Alluvium, Glacial deposits, Laterite (engineering aspects), Desert Landform, Loess, Solifluction deposits, mudflows, Coastal deposits.

**Strength Behavior of Rocks:** **6 hours**

Stress and Strain in rocks. Concept of Rock Deformation & Tectonics. Dip and Strike. Outcrop and width of outcrop. Inliers and Outliers. Main types of discontinuities according to size. Fold- Types and nomenclature, Criteria for their recognition in field. Faults: Classification, recognition in field, effects on outcrops. Joints & Unconformity; Types, Stresses responsible, geotechnical importance. Importance of structural elements in engineering operations. Consequences of failure as land sliding, Earthquake and Subsidence. Strength of Igneous rock structures.

**Part-B**

**Geological Hazards:** **5 hours**

Types of landslide. Prevention by surface drainage, slope reinforcement by Rock bolting and Rock anchoring, retaining wall, Lowering of water table and Subsidence. Earthquake: Magnitude and intensity of earthquake. Seismic sea waves. Revelation from Seismic Records of structure of earth.–Seismic Zone in India.

**Rock masses as construction material:** **5 hours**

Definition of Rock masses. Main features constituting rock mass. Main features that affects the quality of rock engineering and design. Basic element and structures of rock those are relevant in civil engineering areas. Main types of works connected to rocks and rock masses. Important variables influencing rock properties and behavior such as Fresh rock Influence from some minerals. Effect of alteration and weathering. Measurement of velocity of sound in rock. Classification of Rock material strength. Rock Quality Designation.

**Geology of dam and reservoir site:** **5 hours**

Required geological consideration for selecting dam and reservoir site. Failure of Reservoir. Favorable & unfavorable conditions in different types of rocks in presence of various structural features, precautions to be taken to counteract unsuitable conditions, significance of discontinuities on the dam site and treatment giving to such structures.

**Rock Mechanics:** **5 hours**

Sub surface investigations in rocks and engineering characteristics or rocks masses; Structural geology of rocks. Classification of rocks, Field & laboratory tests on rocks, Stress deformation of rocks, Failure theories and shear strength of rocks, Bearing capacity of rocks.

**Text Books:**

1. Rock Mechanics for Engineers - B.P. Verma - Khanna Publishers New Delhi.
2. Engineering Geology - D.S.Arora – Mohindra Capital Publishers 2000.

3. Engineering Geology - Parbin Singh - 8th Edition S.K. Kataria & Sons.

**Reference Books:**

1. Introduction to Rock Mechanics - Richard E. Goodman – wiley.
2. Engg. Behaviour of rocks - Farmar, I.W - Kluwer Academic Publishers.
3. Rock Mechanics and Engg. - C Jaeger – Cambridge University Press.
4. Text Book of Engineering Geology – Kesavvalu - MacMillan India.
5. Geology for Geotechnical Engineers - J.C.Harvey - Cambridge University Press.

**E-Books and online learning material:**

The Elements of Geology by William Harmon Norton
https://www.freebookcentre.net/earth-science-books-download/The-Elements-of-Geology.html
Structural Geology by Stephen J. Martel
https://www.freebookcentre.net/earth-science-books-download/Structural-Geology-by-Stephen-J.-Martel.html
Geology Lecture Notes and Supplementary Material by Scott T. Marshall
https://www.freebookcentre.net/earth-science-books-download/Geology-Lecture-Notes-and-Supplementary-Materials.html
Physical Geology by Stephen A. Nelson
https://www.freebookcentre.net/earth-science-books-download/Physical-Geology.html

**Online Courses and Video Lectures:**

1. https://www.youtube.com/watch?v=aTVDiRtRook&list=PLDF5162B475DD915F
2. https://www.youtube.com/watch?v=fvoYHzAhvVM
3. https://www.youtube.com/watch?v=9K2Zu-phR4Q
4. https://www.youtube.com/watch?v=UzZFMWH-lSQ
5. https://freevideolectures.com/course/87/engineering-geology

**Subject Code:** PCCE-110
**Subject Name:** Engineering Economics, Estimation and Costing

| | |
|---|---|
| **Programme:** B.Tech. (Civil Engineering) | **L:** 3 **T:** 1 **P:** 0 |
| **Semester: 5** | **Teaching Hours:** 48 Hours |
| **Theory/Practical:** Theory | **Credits:** 4 |
| **Internal Marks:** 40 | **Percentage of Numerical/Design Problems:** 70% |
| **External Marks:** 60 | **Duration of End Semester Exam (ESE):** 3 Hours |
| **Total Marks:** 100 | **Elective Status:** Compulsory |

**Prerequisites:** Math-1

**Additional Material Allowed in ESE:** Non programmable calculator

**On Completion of the course, the student will have the ability to:**

| CO# | Course Outcomes |
|---|---|
| 1. | Applying different concepts of economics in engineering projects |
| 2. | **Perform and evaluate present worth, future worth and annual worth analyses on one of many economic alternatives.** |
| 3. | **Evaluate benefit/cost, life cycle and breakeven analyses on one or many economic alternatives** |
| 4. | **Formulate technical specifications for various works to be performed for a project and their impact on the cost of a structure** |
| 5. | **Quantify the cost of a structure by evaluating quantities of its constituent materials** |
| 6. | Write and prepare tender documents |

**Detailed Syllabus**

**Part-A**

Basic Principles and Methodology of Economics: Demand/Supply – elasticity – Government Policies and Application; Theory of the Firm and Market Structure; Basic Macro-economic Concepts (including GDP/GNP/NI/Disposable Income) and Identities for both closed and open economies; Aggregate demand and Supply (IS/LM); Price Indices (WPI/CPI), Interest rates, Direct and Indirect; Components of Monetary and Financial System Taxes; Monetary and Fiscal Policy Tools & their impact on the economy – Inflation and Phillips Curve. (6 Hours)

Elements of Business/Managerial Economics: Cost & Cost Control –Techniques, Types of Costs, Life-cycle costs, Budgets, Break even Analysis, Capital Budgeting, Application of Linear Programming. Investment Analysis – NPV, ROI, IRR, Payback Period, Depreciation, Time value of money (present and future worth of cash flows). Business Forecasting – Elementary techniques. Statements – Cash flow, Financial. Case Study Method (6 Hours)

Introduction to Acts pertaining to-Minimum wages, Workman's compensation, Contracts, Arbitration, Easement rights (2 Hours)

**Part-B**

Introduction to the process of Estimation; Use of relevant Indian Standard Specifications for the same, taking out quantities from the given requirements of the work, comparison of different alternatives, Bar bending schedules, Mass haul Diagrams, Estimating Earthwork and Foundations, Estimating Concrete and Masonry, Finishes, Interiors, MEP works; BIM and quantity take-offs; Material survey - Thumb rules for computation of materials requirement for different materials for buildings, percentage breakup of the cost, cost sensitive index, market survey of basic materials. (12 Hours)

Specifications & Analysis of rates - Types, requirements and importance, detailed specifications for buildings, roads, minor bridges and industrial structures; Rate analysis - Purpose & importance, factors affecting, task work, daily output from different equipment/ productivity, labour costs. (14 Hours)

Tender - Preparation of tender documents; importance of inviting tenders; contract types, relative merits, prequalification; general and special conditions; termination of contracts, extra work and Changes, penalty and liquidated charges; Settlement of disputes; R.A. Bill & Final Bill; Payment of advance, insurance, claims, price variation, etc; Preparing Bids- Bid Price buildup: Material, Labour, Equipment costs, Risks, Direct & Indirect Overheads; Profits; Bid conditions; alternative specifications; Alternative Bids. Bid process management. (8 Hours)

**Text/Reference Books:**

1. Mankiw Gregory N. (2002), Principles of Economics, Thompson Asia
2. V. Mote, S. Paul, G. Gupta (2004), Managerial Economics, Tata McGraw Hill
3. Misra, S.K. and Puri (2009), Indian Economy, Himalaya
4. Pareek Saroj (2003), Textbook of Business Economics, Sunrise Publishers
5. M Chakravarty, Estimating, Costing Specifications & Valuation
6. Joy P K, Handbook of Construction Management, Macmillan
7. B.S. Patil, Building & Engineering Contracts
8. Relevant Indian Standard Specifications.
9. World Bank Approved Contract Documents.
10. FIDIC Contract Conditions.
11. Acts Related to Minimum Wages, Workmen’s Compensation, Contract, and Arbitration
12. Typical PWD Rate Analysis documents.
13. UBS Publishers & Distributors, Estimating and Costing in Civil Engineering: Theory and Practice including Specification and Valuations, 2016
14. Dutta, B.N., Estimating and Costing in Civil Engineering (Theory & Practice), UBS Publishers, 2016

**Subject Code:** PCCE-111
**Subject Name:** Construction Engineering and Management

| | |
|---|---|
| **Programme:** B.Tech. (Civil Engineering) | **L:** 3 **T: 0 P:** 0 |
| **Semester: 5** | **Teaching Hours:** 36 Hours |
| **Theory/Practical:** Theory | **Credits:** 3 |
| **Internal Marks:** 40 | **Percentage of Numerical/Design Problems:** 20% |
| **External Marks:** 60 | **Duration of End Semester Exam (ESE):** 3 Hours |
| **Total Marks:** 100 | **Elective Status:** Compulsory |

**Additional Material Allowed in ESE:** NIL

**On Completion of the course, the student will have the ability to:**

| CO# | Course Outcomes |
|---|---|
| 1. | Identify various construction methods with their respective features. |
| 2. | Decide various resources required for a particular construction project. |
| 3. | **Use CPM and PERT techniques to identify the best course of action for the given parameters.** |
| 4. | **Explain different techniques and elements of monitoring for a construction project.** |
| 5. | Draw a comprehensive checklist required for quality control at a construction project. |
| 6. | **Differentiate and explain various types of civil engineering contracts including their important features.** |

**Detailed Contents:**

**Part-A**

**Basics of Construction** **2 hr**

Unique features of construction, construction projects- types and features, phases of a project, agencies involved and their methods of execution;

**Construction Methods and Equipment** **8 hr**

Formwork and Staging, conventional walls and slabs; conventional framed structure with blockwork walls; Modular construction methods for repetitive works; Precast concrete construction methods; Basics of Slip forming for tall structures. Equipment for Earthmoving, Dewatering; Concrete mixing, transporting & placing; Cranes, Hoists and other equipment for lifting; Equipment for transportation of materials. Equipment Productivities.

**Planning and Organizing Construction Site and Resources** **8 hr**

Site- site layout including enabling structures, developing site organization, documentation at site; Manpower- planning, organizing, staffing; Materials- planning, procurement, inventory control; Equipment- productivity, planning, organizing; Funds- cash flow, sources of funds; Resource Scheduling- Bar chart, line of balance technique, resource constraints and conflicts; resource

aggregation, allocation, smoothening and leveling. Make-up of construction costs; Classification of costs, time- cost trade-off in construction projects, compression and decompression.

**Part-B**

**Construction Project Planning** **10 hr**

Stages of project planning- pre-tender planning, pre-construction planning, detailed construction planning, role of client and contractor. Process of development of plans and schedules- work break-down structure, assessment of work content and durations, activity lists, sequence of activities. Techniques of planning- Bar charts, Gantt Charts. CPM Network- basic terminology, types of precedence relationships, activity on link and activity on node representation, computation of float values, critical and semi critical paths, calendaring networks. PERT- Assumptions underlying PERT analysis, determining three-time estimates, analysis, slack computations, calculation of probability of completion.

**Project Monitoring, Control & Safety** **5 hr**

Supervision, record keeping, periodic progress reports. Updating of plans: purpose, frequency and methods of updating. Common causes of time and cost overruns and corrective measures, Use of Building Information Modelling (BIM) in project management; Quality control: concept of quality, quality of constructed structure, use of manuals and checklists for quality control, role of inspection, basics of statistical quality control. Safety, Health and Environment on project sites: accidents; their causes, effects and preventive measures.

**Contracts Management Basics** **3 hr**

Importance of contracts; Types of Contracts, parties to a contract; Common contract clauses (Notice to proceed, rights and duties of various parties, notices to be given), Contract Duration and Price. Performance parameters; Delays, penalties and liquidated damages; Force Majeure, Suspension and Termination. Changes & variations, Dispute Resolution methods.

**Text Books:**

1. Nunnally, S.W. Construction Methods and Management, Prentice Hall, 2006
2. Jha, Kumar Neeraj., Construction Project management, Theory & Practice, Pearson Education India, 2015
3. Punmia, B.C., Khandelwal, K.K., Project Planning with PERT and CPM, Laxmi Publications, 2016.

**Reference Books/Codes:**

1. Peurifoy, R.L. Construction Planning, Methods and Equipment, McGraw Hill, 2011
2. Varghese, P.C., “Building Construction”, Prentice Hall India, 2007.
3. Chudley, R., Construction Technology, ELBS Publishers, 2007.
4. National Building Code, Bureau of Indian Standards, New Delhi, 2017.

**Subject Code:** PCCE-112
**Subject Name:** Environmental Engineering

| | |
|---|---|
| **Programme:** B.Tech (Civil Engineering) | **L:** 4 **T:** 0 **P:** 0 |
| **Semester:** 5 | **Teaching Hours:** 52 Hours |
| **Theory/Practical:** Theory | **Credits:** 4 |
| **Internal Marks:** 40 | **Percentage of Numerical/Design Problems:** 30% |
| **External Marks:** 60 | **Duration of End Semester Exam (ESE):** 3 hours |
| **Total Marks:** 100 | **Elective Status:** Compulsory |

**Prerequisites:** Nil

**Additional Material Allowed in ESE:** Graph papers

**On Completion of the course, the student will have the ability to:**

| CO# | Course Outcomes |
|---|---|
| 1. | Identify different types of water demands and select suitable source of water. |
| 2. | **Analyze water and wastewater quality for a given end use and its disposal** |
| 3. | **Design an appropriate sewerage system.** |
| 4. | Examine physical and chemical composition of solid wastes and to investigate the activities associated with the management of solid waste. |
| 5. | Define various sources of air pollution and their effects on environment. |
| 6. | Select the most appropriate technique for the treatment of water, wastewater, solid waste and contaminated air. |

**Detailed Contents:**

**Part-A**

**Unit 1: Water:-** General requirement for water supply, population forecasting and water demand, sources, intake, pumping and transportation of water; Physical, chemical and bacteriological characteristics of water and their significance, Water quality criteria, Water borne diseases, Natural purification of water sources. Engineered systems for water treatment: aeration, sedimentation, softening, coagulation, filtration, adsorption, ion exchange, membrane processes and disinfection. **(14 hours)**

**Unit 2: Wastewater:-** Generation of domestic wastewater, sullage, storm water, Wastewater flow variations; Conveyance of wastewater- Sewers, shapes design parameters, Design of sewerage systems, wastewater pumping, sewer appurtenances. Wastewater collection from buildings; Physical, chemical and bacteriological characteristics of wastewater, Wastewater treatment, Primary, secondary and tertiary treatment of wastewater, wastewater disposal standards, aerobic and anaerobic treatment systems, suspended and attached growth systems, sludge digestion and handling, recycling of sewage – quality requirements for various purposes. **(20 hours)**

**Part-B**

**Unit 3: Solid Waste:-** Engineering principles; Sources, Composition and Properties of Municipal Solid Waste, Onsite handling, storage and processing, Collection, transfer and transport, Recovery of resources, Conversion products and energy, Disposal of solid waste including sanitary landfill. Introduction to biomedical and hazardous waste management. **(12 hours)**

**Unit 4: Air and Noise Pollution:-** Air Pollutants, their sources, harmful effects on environment, metrology and atmospheric diffusion of pollutants, air sampling and pollutant measurement methods, ambient air quality and emission standards, control, removal of gaseous pollutants, particulate emission control, control of automobile pollution. Noise: Basic concept, measurement and various control methods. **(06 hours)**

**Text/Reference Books:**

1. Peavy H.S., Rowe D.R. and Tchobanoglous G. "*Environmental Engineering*", 1st Edition, McGraw-Hill Education (Indian Edition), 2017.
2. Davis M.L and Cornwell D.A. "Introduction to Environmental Engineering", 5th Edition, McGraw-Hill Education, 2012
3. Nathanson J.A. and Schneider R.A. "Basic Environmental Technology", 6th Edition, Pearson Education India, 2016
4. Masters G.M. and Ela W.P. "Introduction to Environmental Engineering and Science" 3rd Edition, Pearson International, 2014
5. Garg S.K. "Water Supply Engineering", 33rd Edition, Khanna Publishers, 2010.
6. Garg S.K., "Sewage Disposal and Air Pollution", 39th Edition, Khanna Publishers, 2019.
7. MetCalf and Eddy, "Wastewater Engineering- Treatment and Reuse", 4th Edition, McGraw-Hill Education (Indian Edition), 2017.
8. "Manual on Operation and Maintenance of Water Supply System", Central Public Health & Environmental Engineering Organisation, Ministry of Housing and Urban Affairs, Govt. of India, 2005.
9. "Manual on Sewerage and Sewage Treatment Systems", Central Public Health & Environmental Engineering Organisation, Ministry of Housing and Urban Affairs, Govt. of India, 2013.
10. "Manual on Municipal Solid Waste Management", Central Public Health & Environmental Engineering Organisation, Ministry of Housing and Urban Affairs, Govt. of India., 2016.

**Subject Code:** PCCE-113
**Subject Name:** Structural Engineering

| | |
|---|---|
| **Programme:** B.Tech. (Civil Engineering) | **L:** 3 **T:** 0 **P:** 0 |
| **Semester: 5** | **Teaching Hours:** 40 Hours |
| **Theory/Practical:** Theory | **Credits:** 3 |
| **Internal Marks:** 40 | **Percentage of Numerical/Design Problems:** 70% |
| **External Marks:** 60 | **Duration of End Semester Exam (ESE):** 3 Hours |
| **Total Marks:** 100 | **Elective Status:** Compulsory |

**Prerequisites:** Math-1

**Additional Material Allowed in ESE:** Non programmable calculator, IS 456, IS 800, IS 875

**On Completion of the course, the student will have the ability to:**

| CO# | Course Outcomes |
|---|---|
| 1. | Calculation of loads and its effects in structural members. |
| 2. | **Selection of appropriate structural type and load under given set of constraints** |
| 3. | Analyse structural system and determination of forces and displacements |
| 4. | Select suitable material for construction of structural system |
| 5. | Design of different structural elements |
| 6. | Detail different structural element as per different applicable BIS guidelines |

**Detailed Syllabus**

**Part-A**

The concept of structure, what makes a structure, its need and types; First principles of planning and design process: Load, types of load and its assessment; Concept of equilibrium - Principles of structural stability & robustness; Concept and importance of load path, its selection. [5 hours]

Structural analysis: Concept of redundancy and its importance - determinate and redundant structural systems; Effect of load on the structural member - displacements, simple stresses and strains, their importance and calculation for determinate problems only; Classical methods of analysis - beam, pin- and rigid-jointed frames (only portal types frames and beams having DoR up to 2, just to illustrate the concept). [14 hours]

**Part-B**

Materials - Concrete and steel, their mechanical properties; Safety and structural design criteria; Role of standards (BIS) in the design process. [4 hours]

Design of structural elements using structural steel and reinforced concrete - Slabs (one-way cases only), Beams, Axially loaded columns, Isolated footings; Checks to ensure completeness of a selected load path; Fire protection and durability aspects; Detailing, its importance. [17 hours]

**Text/Reference Books**

Devdas Menon, Reinforced Concrete Design. McGraw Hill, 2017
Devdas Menon, Structural Analysis. Narosa, 2010
Gambhir M L, Design of Reinforced Concrete Structures. PHI, 2008
Gambhir M L, Fundamental of Structural Steel Design, McGraw Hill, 2017
Gambhir M L, Fundamental of Structural Mechanics and Analysis, PHI, 2011
Nilson, A. H. Design of Concrete Structures. 13th edition. McGraw Hill, 2004
McCormac, J.C., Nelson, J.K. Jr., Structural Steel Design. 3rd edition. Prentice Hall, N.J., 2003.
Galambos, T.V., Lin, F.J., Johnston, B.G., Basic Steel Design with LRFD, Prentice Hall, 1996
Salmon, C.G. and Johnson, J.E., Steel Structures: Design and Behavior, 3rd Edition, Harper & Row, Publishers, New York, 1990.
NBC, National Building Code, BIS (2017).

**Subject Code:** PCCE – 114
**Subject Name:** Geotechnical Engineering

| | |
|---|---|
| **Programme:** B.Tech. | **L:** 3 **T:** 0 **P:** 0 |
| **Semester:** 5 | **Teaching Hours:** 42 |
| **Theory/Practical:** Theory | **Credits:** 3 |
| **Internal Marks:** 40 | **Percentage of Numerical/Design Problems**: 70% |
| **External Marks:** 60 | **Duration of End Semester Exam (ESE):** 3hours |
| **Total Marks:** 100 | **Elective Status:** Compulsory |

**Prerequisites:** NIL

**Additional Material Allowed in ESE:** Scientific Calculator, graph (natural scale and semi-log)

**On Completion of the course, the student will have the ability to:**

| CO# | Course Outcomes |
|---|---|
| 1. | Classify different types of soils based on their origin & formation, and derive various phase relationships of the soil |
| 2. | **Determination of index properties of soil** |
| 3. | **Determination of engineering characteristics of soil** |
| 4. | **Evaluate shear strength and permeability parameters of different soils** |
| 5. | **Compute elastic and consolidation settlements** |
| 6. | **Apply the principles of compaction to field problems** |

**Detailed Contents:**

**Part-A**

**Introduction and basic concepts** **6hours**

Types of soils, their formation and deposition, Definitions: soil mechanics, soil engineering, rock mechanics, geotechnical engineering. Scope of soil engineering. Comparison and difference between soil and rock. Basic Definitions and Relationships-Soil as three-phase system in terms of weight, volume, voids ratio, and porosity. Definitions: moisture content, unit weights, degree of saturation, voids ratio, porosity, specific gravity, mass specific gravity, etc. Relationship between volume weight, voids ratio- moisture content, unit weight- percent air voids, saturation- moisture content, moisture content- specific gravity etc. Determination of various parameters such as: Moisture content by oven dry method, pycnometer, sand bath method, torsional balance method, nuclear method, alcohol method and sensors. Specific gravity by density bottle method, pycnometer method, measuring flask method. Unit weight by water displacement method, submerged weight method, core-cutter method, sand-replacement method.

**Plasticity Characteristics of Soil** **6hours**

Introduction to definitions of: plasticity of soil, consistency limits-liquid limit, plastic limit, shrinkage limit, plasticity, liquidity and consistency indices, flow & toughness indices, definitions of activity and sensitivity. Determination of: liquid limit, plastic limit and shrinkage limit. Use of consistency limits. Classification of Soils-Introduction of soil classification: Indian standard soil

classification system. Identification: field identification of soils, general characteristics of soil in different groups.

**Permeability and seepage of Soil** **8hours**

Darcy's law, validity of Darcy's law. Determination of coefficient of permeability: Laboratory method: constant-head method, falling-head method. Permeability aspects: permeability of stratified soils, factors affecting permeability of soil. Seepage Analysis- Introduction, stream and potential functions, characteristics of flow nets, graphical method to plot flow nets. Effective stress principle, nature of effective stress, effect of water table. Fluctuations of effective stress, effective stress in soils saturated by capillary action, seepage pressure, quicksand condition.

**Part-B**

**Compaction of Soil** **4hours**

Introduction, theory of compaction, laboratory determination of optimum moisture content and maximum dry density, concept of O.M.C. and zero Air Void Line. Compaction in field, compaction specifications and field control.

**Consolidation of Soil** **10hours**

Introduction, comparison between compaction and consolidation, initial, primary & secondary consolidation, spring analogy for primary consolidation, interpretation of consolidation test results, One – dimensional Terzaghi's theory of consolidation, final settlement of soil deposits, computation of consolidation settlement and secondary consolidation

**Shear Strength** **8hours**

Mohr circle and its characteristics, principal planes, relation between major and minor principal stresses, Mohr-Coulomb theory, types of shear tests: direct shear test, merits of direct shear test, triaxial compression tests, test behaviour of UU, CU and CD tests, pore-pressure measurement, computation of effective shear strength parameters: unconfined compression test, vane shear test

**Text Books:**

1. Arora K.R., "Soil Mech. & Foundation Engineering", Standard Publishers Distributors, 2011
2. Ranjan G. and Rao A.S., "Basic and applied Soil Mechanics", New Age International Publishers
3. Murthy V.N.S., "Soil Mech. & Foundation Engineering", CBS Publishers & Distributors

**Reference Books:**

1. Principles of Geotechnical Engineering, by Braja M. Das, Cengage Learning
2. Principles of Foundation Engineering, by Braja M. Das, Cengage Learning

3. Soil Mechanics by Craig R.F., Chapman & Hall
4. Fundamentals of Soil Engineering by Taylor, John Wiley & Sons
5. Geotechnical Engineering by Gulati and Datta, Tata McGraw Hill
6. Geotechnical Engineering by Principles & Practices by Donald. P. Coduto, Pearson Education.

**E-Books and online learning material:**

1. Soil Mechanics and Foundation by BC Punmia, Ashok K Jain, Arun K Jain
https://easyengineering.net/soil-mechanics-and-foundations-by-punmia
2. Geotechnical Engineering by C. Venkatramaiah
http://93.174.95.29/main/1DC69D69B5C9EEE6A7B8747692402614

**Online Courses and Video Lectures:**

1. https://nptel.ac.in/courses/105/101/105101201 Accessed on Nov. 13, 2019
2. https://nptel.ac.in/courses/105/105/105105185 Accessed on Nov. 26, 2018
3. https://nptel.ac.in/courses/105/105/105105168 Accessed on Dec. 21, 2017

**Subject Code:** LPCCE106
**Subject Name:** Geotechnical Lab

| | |
|---|---|
| **Programme:** B.Tech. | **L: 0 T: 0 P:** 2 |
| **Semester:** 5 | **Teaching Hours:** 24 Hours |
| **Theory/Practical:** Theory | **Credits:** 1 |
| **Internal Marks:** 30 | **Percentage of Numerical/Design Problems:** 100% |
| **External Marks:** 20 | **Duration of End Semester Exam (ESE):** 1.5hours |
| **Total Marks:** 50 | **Elective Status:** Compulsory |

**Prerequisites:** Basics of Soil Mechanics

**Additional Material Allowed in ESE:** NIL

**On Completion of the course, the student will have the ability to:**

| CO# | Course Outcomes |
|---|---|
| 1. | Comprehend the procedure for classifying coarse grained and fine-grained soils |
| 2. | Evaluate the index properties of soil |
| 3. | Determine the engineering properties of soil |
| 4. | Interpret the results of compaction test for relative compaction in the field |
| 5. | Apply modern engineering tools effectively and efficiently for geotechnical engineering analysis. |
| 6. | **Conduct experiments for analyze and interpretion of results for geotechnical engineering design** |

**Detailed Contents:**

1. Determination of in-situ density by core cutter method and Sand replacement method.
2. Determination of moisture content in soil sample using oven drying method.
3. Determination of Liquid Limit & Plastic Limit.
4. Determination of specific gravity of soil solids by pyconometer method.
5. Grain size analysis of sand and determination of uniformity coefficient (Cu) and coefficient of curvature (Cc).
6. Compaction test of soil.
7. Unconfined Compression Test for fine grained soil.
8. Direct Shear Test
9. Determination of Relative Density of soil.
10. Determination of permeability by Constant Head Method.
11. Demonstration of miscellaneous equipments such as Augers, Samplers, Rapid Moisture meter, Proctor's needle
12. Preparing a consolidated report of index properties and strength properties of soil

**Text Books:**

1. Soil Testing Engineering, Manual by Shamsher Prakash and P.K. Jain, Nem Chand & Brothers
2. A Laboratory Manual on Soil Mechanics: Testing and Interpretation by Ravi Kumar Sharma, I.K. International Publishing House Pvt. Ltd.

**Reference Books:**

1. Soil Mechanics and Foundation Engg.- Punmia B.C. (2005), 16th Edition Laxmi Publications Co. , New Delhi.
2. BIS Codes of Practice: IS 2720 (Part 2, 3, 4, 5, 7, 10, 13, 14, 17) – Methods of test for soils
3. Soil Testing for Engineers- Lambe T.W., Wiley Eastern Ltd., New Delhi
4. Manual of Soil Laboratory Testing- Head K.H., (1986)- Vol. I, II, III, Princeton Press, London.

**E-Books and online learning material:**

1. http://home.iitk.ac.in/~madhav/geolab.html

**Online Courses and Video Lectures:**

1. https://nptel.ac.in/courses/105/101/105101160/
2. www.nitttrchd.ac.in/sitenew1/nctel/civil.php
3.

**Subject Code:** LPCCE-107
**Subject Name:** Environmental Engineering Laboratory

| | |
|---|---|
| **Programme:** B.Tech. | **L:** 0 **T:** 0 **P:** 2 |
| **Semester:** 5 | **Teaching Hours:** 26 Hours |
| **Theory/Practical:** Practical | **Credits:** 1 |
| **Internal Marks:** 30 | **Percentage of Numerical/Design Problems:** -- |
| **External Marks:** 20 | **Duration of End Semester Exam (ESE):** Viva-voce |
| **Total Marks:** 50 | **Elective Status:** Compulsory |

**Prerequisites:** Nil

**On Completion of the course, the student will have the ability to:**

| CO# | Course Outcomes |
|---|---|
| 1. | Conduct experiments as per standard methods of sampling and analysis. |
| 2. | **Demonstrate the characterization of water and wastewater samples.** |
| 3. | Understand the importance of laboratory analysis as a controlling factor in the treatment of water and wastewater. |
| 4. | Record the experimental observations and interpret the analysis results. |
| 5. | Use the analysis results for making informed decision about the potability of water and disposal of wastewater. |
| 6. | Recognize the working of air pollution monitoring equipment and noise meter. |

| S. No. | Name of Practical |
|---|---|
| 1. | Determination of pH value of a water/wastewater sample. |
| 2. | Determination of Turbidity of a water sample. |
| 3. | Determination of Hardness- total, calcium and magnesium hardness of a water sample. |
| 4. | Determination of solids- total, dissolved, suspended, settleable solids of a water/wastewater sample. |
| 5. | Determination of acidity and alkalinity of a water sample |
| 6. | Determination of chlorides and sulphates in a water sample. |
| 7. | Determination of Dissolved Oxygen (DO) and Biochemical Oxygen Demand (BOD) of a wastewater sample. |
| 8. | Determination of Chemical Oxygen Demand (COD) of a wastewater sample. |
| 9. | Determination of bacteriological quality of a water/wastewater sample. |
| 10. | Determination of nutrients in wastewater (TKN, TN and TP). |
| 11. | Demonstration of air pollution monitoring equipment. |
| 12. | Demonstration of noise level meter. |

**Text/Reference Books:**

1. Standard Methods for the Examination of Water and Waste Water, American Public Health Association, American Water Works Association, 2017.
2. Sawyer C.N., McCarty P.L. and Parkin G.F., Chemistry for Environmental Engineering and Science, 5th Edition, McGraw Hill, 2003.
3. Manuals of analytical equipments.

**Subject Code:** LPCCE108
**Subject Name:** Structural Lab

| | |
|---|---|
| **Programme:** B.Tech. | **L:** 0 **T:** 0 **P:** 2 |
| **Semester:** 5 | **Teaching Hours:** 24 Hours |
| **Theory/Practical:** Practical | **Credits:** 01 |
| **Internal Marks:** 30 | **Percentage of Numerical/Design Problems: -** |
| **External Marks:** 20 | **Duration of End Semester Exam(ESE):** 1.5 Hours |
| **Total Marks:** 50 | **Elective Status:** Compulsory |

**Prerequisites:** NIL

**Additional Material Allowed in ESE:** NIL

**On Completion of the course, the student will have the ability to:**

| CO# | Course Outcomes |
|---|---|
| 1. | Verify theoretical formulas by conducting experiments. |
| 2. | Predict the behavior of statically determinate beams and trusses. |
| 3. | Depict the behavior of two hinged arch and three hinged arch structures. |
| 4. | Demonstrate the influence lines for statically determinate and indeterminate beams. |
| 5. | Observe and compute deflections of simply supported beams, curved beams and frames using classical methods. |
| 6. | Outline the deflected shapes of columns and struts with different end conditions. |

**Detailed Contents:**

1. Deflection of a simply supported beam and verification of Clark-Maxwell's theorem.
2. To determine the Flexural Rigidity of a given beam.
3. To verify the Moment- area theorem for slope and deflection of a given beam.
4. Deflection of a fixed beam and influence line for reactions.
5. Deflection studies for a continuous beam and influence line for reactions.
6. Study of behaviour of columns and struts with different end conditions.
7. Experiment on three-hinged arch.
8. Experiment on two-hinged arch.
9. Deflection of a statically determinate pin jointed truss.
10. Forces in members of redundant frames.
11. Experiment on curved beams.
12. Unsymmetrical bending of a cantilever beam.

**Text Books:**

Laboratory Manual on Structural Mechanics by Dr. Harvinder Singh; New Academic Publishing Comp. Ltd

**E-Books and online learning material:**

1. Structural Analysis Lab by Lakshman Singh
http://www.dbit.ac.in/ce/syllabus/structural-analysis-lab.pdf

**Online Courses and Video Lectures:**

https://lecturenotes.in/practicals/36000-lab-manual-for-structural-analysis2-sa2-by-prashant-kumar?reading=true

**Subject Code:** PCCE – 115
**Subject Name:** Irrigation Engineering

| | |
|---|---|
| **Programme:** B.Tech. | **L:** 3 **T:** 1 **P:** 0 |
| **Semester:** 6 | **Teaching Hours:** 40 |
| **Theory/Practical:** Theory | **Credits:** 4 |
| **Internal Marks:** 40 | **Percentage of Numerical/Design Problems**: 70% |
| **External Marks:** 60 | **Duration of End Semester Exam (ESE):** 3 hours |
| **Total Marks:** 100 | **Elective Status:** Compulsory |

**Prerequisites:** NIL

**Additional Material Allowed in ESE:** Khosla Curves and graphs

**On Completion of the course, the student will have the ability to:**

| CO# | Course Outcomes |
|---|---|
| 1. | Understand the functioning and design consideration of various components of diversion head work. |
| 2. | Analyze the various parameters of hydraulic structures for seepage and uplift pressure. |
| 3. | Recognize the concept and principles of silt control devices. |
| 4. | Design water distribution systems, regulators, canal falls, outlets, cross drainage works, weirs and barrages of irrigation network. |
| 5. | Apply knowledge to select the best canal fall, outlet and cross drainage works to real time situation. |
| 6. | Identify appropriate energy dissipation devices suitable for hydraulic structures as per site condition. |

**Detailed Contents:**

**Part-A**

**Head Works:** Types of head works, Functions and investigations of a diversion head work: component of a diversion head work and their design considerations, silt control devices.

**Theories of Seepage**: Seepage force and exit gradient, assumptions and salient features of Bligh's Creep theory, Limitations of Bligh's Creep theory, salient features of Lane's weighted Creep theory and Khosla's theory, Comparison of Bligh's Creep theory and Khosla's theory, Determination of uplift pressures and floor thickness

**Design of Weirs**: Weirs versus barrage, types of weirs, main components of weir, causes of failure of weir and design considerations with respect to surface flow, hydraulic jump and seepage flow, Design of barrage or weir

**Energy Dissipation Devices**: Use of hydraulic jump in energy dissipation, Types of energy dissipaters and their hydraulic design

**Part-B**

**Canal Regulators**: Offtake alignment, cross-regulators – their functions and design, Distributory head regulators-their functions and design, canal escape.

**Canal Falls**: Necessity and location, types of falls and their description, selection of type of falls, Design of Sarda type, straight glacis and Inglis or baffle wall falls.

**Cross-Drainage works**: Definitions, choice of type, Hydraulic design consideration, Aqueducts their types and design, siphon aqueducts – their types and design considerations, super passages, canal siphons and level crossing

**Canal Out-lets**: Essential requirements, classifications, criteria for outlet behaviors, flexibility, proportionality, sensitivity, sensitiveness etc., Details and design of non-modular, semi-modular and modular outlets

**Text Books:**

1. Irrigation Practice and Design Vol. I to VII by K.B. Khushlani, Oxford IBH Pub
2. Design of Irrigation Structures by R.K. Sharma, Oxford IBH Pub.
3. Irrigation Engg. Vol. I & II by Ivan E. Houk, John Wiley and sons.
4. P.N. Modi; Irrigation with Resources and with Power Engineering, Standard Book House
5. Irrigation Engg. and Hydraulics Structures by S.R. Sahasrabudhe, Katson Publishing
6. Irrigation Engg. & Hydraulic Structure by Santosh Kumar Garg, Khanna Publishers.

Guru Nanak Dev Engineering College, Ludhiana
Department of Civil Engineering
Syllabus
B.Tech. (Civil Engineering)
2018 Admission Batch Onwards
**Subject Code:** PCCE – 116
**Subject Name:** Building Construction Practice

| | |
|---|---|
| **Programme:** B. Tech. | **L:** 3 **T:** 0 **P:** 0 |
| **Semester:** 6 | **Teaching Hours:** 36 |
| **Theory/Practical:** Theory | **Credits:** 4 |
| **Internal Marks:** 40 | **Percentage of Numerical/Design Problems**: 20% |
| **External Marks:** 60 | **Duration of End Semester Exam(ESE):** 3 hours |
| **Total Marks:** 100 | **Elective Status:** Compulsory |

**Prerequisites:** NIL

**Additional Material Allowed in ESE:** Nil

**On Completion of the course, the student will have the ability to:**

| CO# | Course Outcomes |
|---|---|
| 1. | Apply know-how to execute different types of construction using masonry and concrete |
| 2. | Plan and freeze specifications in light of BIS guidelines |
| 3. | Decide appropriate type of equipments needed to execute the construction activity |
| 4. | Select appropriate type of construction method and formwork |
| 5. | Construct various structural and non-structural building components |
| 6. | Execute different construction activities related to substructure and superstructure |

**Detailed Contents**

**Section-A**

Construction Practice: Load Bearing Structure, Framed Structure and High rise Building Technology, Load transfer mechanism in different types, Environmental impact of materials – responsible sourcing, Specifications, Details and sequence of activities, Construction co-ordination, Site Clearance, Marking, Earthwork, masonry – stone masonry – Bond in masonry – laying brick and concrete hollow block masonry, flooring, damp proof courses, construction joints – movement and expansion joints, precast pavements, Building foundations, basements, temporary shed, centering and shuttering – slip forms – scaffoldings – de-shuttering forms, Fabrication and erection of steel trusses, Related BIS guidelines

[12 hrs]

Construction equipment: Selection of equipment for earth work, earth moving operations, types of earthwork equipment -tractors, motor graders, scrapers, front end waders, earth movers, Equipment for foundation and pile driving, Equipment for compaction, batching, mixing and concreting, Equipment for material handling and erection of structures, Types of cranes, Equipment for dredging, trenching, tunneling [6 hrs]

**Section-B**

Sub-structure construction: Techniques of Box jacking and Pipe Jacking, Under water construction of diaphragm walls and basement, Tunneling techniques, Piling techniques, Well and caisson – sinking coffer dam, Cable anchoring and grouting, Driving diaphragm walls, sheet piles, Shoring for deep cutting – well points, Dewatering and stand by Plant equipment for underground open excavation

[9 hrs]

Super structure construction: Launching girders, bridge decks, off-shore platforms, Special forms for shells, Techniques for heavy decks, In-situ pre-stressing in high rise structures, Material handling – erecting light weight components on tall structures, Support structure for heavy Equipment and conveyors, Erection of articulated structures

[9 hrs]

**Text Books:**

1. Building Materials and Construction by GC Sahu and Jaygopal Jena, McGraw-Hill Education Publisher.
2. Fundamentals of Building Construction Materials and Methods by Edward Allen and Joseph Iano, Wiley Publisher
3. Construction Practice by Brian Cooke, Wiley Publisher.
4. Building Construction: Principles, Materials, And Systems by Madan L Mehta Ph.d., Walter Scarborough, Diane Armpries, Pearson Publisher
5. Building Construction by Varghese, P.C., , Prentice Hall India
6. National Building Code, Bureau of Indian Standards, New Delhi

Guru Nanak Dev Engineering College, Ludhiana
Department of Civil Engineering
Syllabus
B.Tech. (Civil Engineering)
2018 Admission Batch Onwards
**Subject Code:** PECE-101
**Subject Name:** Foundation Engineering

| | |
|---|---|
| **Programme:** B.Tech. (Civil Engineering) | **L:** 3 **T: 1 P:** 0 |
| **Semester:** - | **Teaching Hours:** 36 Hours |
| **Theory/Practical:** Theory | **Credits:** 3 |
| **Internal Marks:** 40 | **Percentage of Numerical/Design Problems:** 60% |
| **External Marks:** 60 | **Duration of End Semester Exam (ESE):** 3 Hours |
| **Total Marks:** 100 | **Course Category:** Elective |

**Additional Material Allowed in ESE:** NIL

**On Completion of the course, the student will have the ability to:**

| CO# | Course Outcomes |
|---|---|
| 1. | Evaluate relative merits and demerits of various soil investigation techniques to understand the characteristics of subsoil for the design of foundations. |
| 2. | Analyze the settlement of substructure in cohesive and non-cohesive soils. |
| 3. | Predict the soil failure by understanding its criteria of failure. |
| 4. | Apply the knowledge of soil bearing capacity for the design of shallow foundation. |
| 5. | Demonstrate the knowledge of earth pressure for the lateral stability of retaining wall and well foundations. |
| 6. | Understand the concept of deep foundation (pile foundation and well foundation) |

**Detailed Contents:**

**Part-A**

**Soil Investigation: 4 hr**

Object of soil investigation for new and existing structures. Depth of exploration for different structures, Spacing of bore Holes. Methods of soil exploration and relative merits and demerits, Types of soil sample. Design features of sampler affecting sample disturbance, Essential features and application of the following types of samples-Open Drive samples, Stationery piston sampler,. Rotary sampler, Geophysical exploration by seismic and resistivity methods, Bore hole log for S.P.T

**Earth Pressure 4 hr**

Earth Pressure Terms and symbols used for a retaining wall. Movement of all and the lateral earth pressure. Earth pressure at rest, Rankine states of plastic equilibrium, Ka and Kp for horizontal backfills. Rankine's theory both for active and passive earth pressure for Cohesionless backfill with surcharge and fully submerged case. Cohesive backfill condition, Coulomb's method for cohesion less backfill, Merits and demerits of Ranking and Coulomb's theories, Culmann's graphical construction (without surcharge load)

**Shallow Foundation 10 hr**

Type of shallow foundations, Depth and factors affecting it, Definition of ultimate bearing capacity, safe bearing capacity and allowable bearing capacity,. Rankine's analysis and Terzaghi's analysis,

types of failures, Factors affecting bearing capacity, Skemptons Equation, B.I.S recommendations for shape, depth and inclination factors. Plate Load test and standard penetration Test Bosussinesq equation for a point load, uniformly loaded circular and rectangular area, pressure distribution diagrams, Newmarks chart and its construction, 2:1 method of load distribution, Comparison of Bosussinesq and Westerguard analysis for a point load, Causes of settlement of structures, Comparison of immediate and consolidation settlement, calculation of settlement by plate load Test and Static Cone penetration test data, Allowable settlement of various structures according to I.S. Code, Situation most suitable for provision of rafts, Proportioning of rafts, Methods of designing raft, Floating foundation

**Part-B**

**Pile Foundations** **10 hr**

Necessity and uses of piles, Classification of piles, Merits and demerits of different types based on composition, Types of pile driving hammers & their comparison, Effect of pile driving on adjacent ground, Use of Engineering News Formula and Hiley's Formula for determination of allowable load, Limitations of pile driving formulae, Cyclic Pile Load Test, Separation of skin friction and point resistance using cyclic pile load test, Determination of point resistance and frictional resistance of a single pile by Static formulas Piles in Clay, Safe load on a Friction and point Bearing pile, Pile in sand, Spacing of piles in a group, Factors affecting capacity of a pile group, Efficiency of pile group by converse – Labare formula and feeds formula, Bearing capacity of a pile group in clay by block failure and individual action approach, Calculation of settlement of friction pile group in clay, Related Numerical problems, Settlement of pile groups in sand, Negative skin friction, Related numerical problem

**Caissons and Wells** **8 hr**

Major areas of use of caissons, advantages and disadvantages of open box and pneumatic caissons, Essential part of a pneumatic caisson, Components of a well foundation, Calculation of allowable bearing pressure,. Conditions for stability of a well, Forces acting on a well foundation, Computation of scour depth

**Text Books:**

1. Soil Mech. & Foundation Engg, by K.R. Arora, Standard Publishers Distributors
2. Soil Mech. & Foundation Engg., by V.N.S. Murthy
3. Principle of Foundation Engineering by B.M.Das, CL Engineering

**Reference Books/Codes:**

1. Geotechnical Engineering, by P. Purshotama Raj
2. Basic and applied Soil Mechanics by Gopal Ranjan and A.S.R.Rao, New Age International
3. Soil Mech. & Foundations by Muni Budhu Wiley, John Wiley & Sons
4. Geotechnical Engineering by Gulhati and Datta, Tata McGraw - Hill Education
5. Foundation Engineering by Varghese P.C, PHI Learning.

6. Soil mechanics and Foundation Engineering by B.P.Verma, Khanna Publication.

**7.** Foundation Analysis and Design by Bowles J.E, Tata McGraw - Hill Education

Guru Nanak Dev Engineering College, Ludhiana
Department of Civil Engineering
Syllabus
B.Tech. (Civil Engineering)
2018 Admission Batch Onwards
**Subject Code:** PECE-112
**Subject Name:** Geometric Design of Highways

| | |
|---|---|
| **Programme:** B.Tech. (Civil Engineering) | **L:** 3 **T: 0 P:** 0 |
| **Semester:** - | **Teaching Hours:** 31 Hours |
| **Theory/Practical:** Theory | **Credits:** 3 |
| **Internal Marks:** 40 | **Percentage of Numerical/Design Problems:** 20% |
| **External Marks:** 60 | **Duration of End Semester Exam (ESE):** 3 Hours |
| **Total Marks:** 100 | **Course Category:** Elective |

**Additional Material Allowed in ESE:** Relevant IRC codes

**On Completion of the course, the student will have the ability to:**

| CO# | Course Outcomes |
|---|---|
| 1. | Develop an understanding of overall traffic pattern and its behavior. |
| 2. | Develop understanding and design of various sight distances and design elements |
| 3. | Design the components of horizontal and vertical alignment of different classes of highways. |
| 4. | Design the cross-sectional elements for different classes of highways. |
| 5. | Appreciate the various types of intersections and suggest the suitable measures. |
| 6. | Suggest the required facilities for pedestrians, bicycles, buses and parking. |

**Detailed Contents:**

**Part-A**

**Introduction** **2hrs**

Classification of rural highways and urban roads, Objectives and requirements of highway geometric design, Design Control and Criteria

**Design Elements** **10hrs**

Sight distances - types, analysis, factors affecting, measurements, Horizontal alignment - design considerations, stability at curves, super-elevation, widening, transition curves; curvature at intersections, vertical alignment - grades, ramps, design of summit and valley curves, combination of vertical and horizontal alignment including design of hair pin bends, IRC standards and guidelines for design problems

**Cross Section Elements** **8hrs**

Right of way and width considerations, roadway, shoulders, kerbs traffic barriers, medians, frontage roads; Facilities for pedestrians, bicycles, buses and trucks, Pavement surface characteristics - types, cross slope, skid resistance, unevenness.

**Part-B**

**Geometric Design Of Intersections** **7 hrs**

Types of Intersections; Design Principles for Intersections; Design of At-grade Intersections – Channelization, Objectives; Traffic Islands and Design standards; Rotary Intersection – Concept, Advantages and Disadvantages; Grade separated Interchanges – Types, warrants and Design standards. Critical and semi critical paths, calendaring networks, PERT- Assumptions underlying PERT analysis, determining three-time estimates, analysis, slack computations, calculation of probability of completion.

**Miscellaneous Elements** **4hrs**

Requirements of Pedestrians; Pedestrian facilities on Urban Roads; Cycle Tracks – Guidelines and Design standards; Bus bays –Types and Guide lines; Design of On-street and Off street Parking facilities – Guidelines for lay out Design, Traffic Signs and Markings.

**Text Books:**

1. Khanna S.K. and Justo, C.E.G. `Highway Engineering', Nem Chand and Bros.,2000.
2. Principles and Practice of Highway Engineering, L.R. Kadiyali and N.B. Lal, Khanna, 2007.
3. AASHO, “A Policy on Geometric Design of Highways and Streets', American Association of StateHighway and Transportation Officials, Washington D.C.
4. C. JotinKhistya and B. Kent Lall, “Transportation Engineering”, by Prentice Hall of India Private Limited

**Reference Books/Codes:**

1. DSIR, `Roads in Urban Areas', HMSO, London.
2. Jack E Leish and Associates, `Planning and Design Guide: At-Grade Intersections'. Illinios.
3. Relevant IRC Codes & Publications

Guru Nanak Dev Engineering College, Ludhiana
Department of Civil Engineering
Syllabus
B.Tech. (Civil Engineering)
2018 Admission Batch Onwards
**Subject Code:** PECE-132
**Subject Name:** Structure Analysis

| | |
|---|---|
| **Programme**: B.Tech. (Civil Engineering) | **L:** 3 **T:** 1 **P:** 0 |
| **Semester: -** | **Teaching Hours:** 40 Hours |
| **Theory/Practical**: Theory | **Credits:** 04 |
| **Internal Marks**: 40 | **Percentage of Numerical/Design Problems:** 70% |
| **External Marks**: 60 | **Duration of End Semester Exam (ESE):** 3 Hours |
| **Total Marks**: 100 | **Elective Status:** Program Elective |

**Prerequisites**: Mathematics-1 and Structural Engineering

**Additional Material Allowed in ESE**: Non programmable calculator

On Completion of the course, the student will have the ability to:

| CO# | Course Outcomes |
|---|---|
| 1. | Understand the concept of structural systems, loads, supports and displacements |
| 2. | Develop and use the concept of influence line diagram for calculating maximum values of different structural quantities in a statically determinate structure, like BM, SF and displacement. |
| 3. | Analyze different types of statically determinate structures including cables, beams, arches, frames and trusses. |
| 4. | Assess the effect of rolling loads, support displacements and temperatures on response of statically determinate structures. |
| 5. | Compute reactive forces in the beams, pin-jointed and rigid jointed frames using conventional methods of analysis. |
| 6. | Analyze different types of statically indeterminate structures including beams, frames and trusses. |

**Detailed Syllabus**

**Part-A**

**Analysis of Determinate Structures:**

- Force Method: Statically determinate structures (method of joints: method of sections for trusses)
- Displacement Method: Statically determinate structures (Unit load method; Energy method)

[9 hours]

**Moving Loads and Influence Line Diagrams**: Concept of influence line diagram, rolling loads; Bending moment and shear force diagrams due to single and multiple concentrated rolling loads,

uniformly distributed moving loads; Equivalent UDL; Muller Breslau principle; Influence lines for beams, girders with floor beams and frames; calculation of the maximum and absolute maximum shear force and bending moment; Concept of envelopes; Influence line for displacements; Influence line for bar force in trusses.

[8 hours]

**Part-B**

**Analysis of indeterminate structures:**

- Force methods: Statically indeterminate structures (method of consistent deformations and theorem of least work).
- Displacement Methods: Kinematically indeterminate structures (slope-deflection method and moment distribution method). [20 hours]

**Influence Line Diagrams:** Concept and application in the analysis of statically indeterminate structures; Influence line for bar forces in the statically indeterminate trusses, beams and frames.

[3 hours]

**Text/Reference Books**

1. Intermediate structural analysis - C K. Wang. McGraw Hill
2. Indeterminate structural analysis - J. Sterling Kinney Addison-Wesley Educational Publishers
3. Basic structural analysis - C. S. Reddy Tata McGraw-Hill
4. Devdas Menon, Structural Analysis, Narosa, 2010
5. Gambhir M L, Fundamental of Structural Mechanics and Analysis, PHI, 2011

Guru Nanak Dev Engineering College, Ludhiana
Department of Civil Engineering
Syllabus
B.Tech. (Civil Engineering)
2018 Admission Batch Onwards
**Subject Code:** PECE – 134
**Subject Name:** Design of Concrete Structures

| | |
|---|---|
| **Programme:** B.Tech. | **L:** 3 **T:** 1 **P:** 0 |
| **Semester:** - | **Teaching Hours:** 40 + 13 (T)= 53 Hours |
| **Theory/Practical:** Theory | **Credits:** 4 |
| **Internal Marks:** 40 | **Percentage of Numerical/Design Problems**: 90% |
| **External Marks:** 60 | **Duration of End Semester Exam (ESE):** 3 hours |
| **Total Marks:** 100 | **Elective Status:** Elective |

**Prerequisites:** NIL

**Additional Material Allowed in ESE:** Scientific Calculator, IS 456-2000, IS 3370-2009, SP16

**On Completion of the course, the student will have the ability to:**

| CO# | Course Outcomes |
|---|---|
| 1. | Compare the fundamental concepts of different design philosophies available for RC elements |
| 2. | Execute the solution using a logic and structured approach based on limit state method and IS code provisions for various RC elements, such as slabs and stairs. |
| 3. | Design various substructure components like foundations, retaining walls |
| 4. | Design various superstructure components like columns, continuous beams |
| 5. | Apply the concepts of structure design to special structural elements like water retaining structures |
| 6. | Employ the code of practice for design of reinforced concrete structural members and elementary structural systems. |

**Detailed Contents:**

**Part-A**

**Design Philosophies** **2+0T = 3 hours**
Working Stress Method, Limit State Method

**Slabs** **4+2T = 6hours**
Design of Two way Slabs

**Design of Continuous beams** **3+1T = 4hours**
Design for Bending, Shear, Bond, Anchorage, Development Length and Torsion

**Stairs** **3+1T = 4hours**
Design of staircase – laterally supported and longitudinally supported

**Part-B**

**Compression Members** **6+2T = 8hours**
Design of Short Compression Members under Axial Load with uniaxial and biaxial Bending, Design of Slender Columns

**Foundations** **8+3T = 11hours**

Combined Footing (Rectangular, Trapezoidal, Strap), Raft Footing

**Retaining walls** **8+2T = 10hours**

Design of Cantilever type retaining wall, Counter-fort type retaining wall

**Liquid retaining structures** **6+2T = 8hours**

Design of circular and rectangular water tanks resting on ground

*## All design and analysis should be based on Limit State Methods.*

**Text Books:**

1. Reinforced Concrete Design; Pillai & Menon; Tata McGraw-Hill Education
2. Limit state Design of Reinforced Concrete; Varghese P C; Prentice-Hall of India Pvt. Ltd
3. Reinforced Cement Concrete, Mallick and Rangasamy; Oxford-IBH

**Reference Books:**

1. IS 456-2000: Indian Standard. Plain and Reinforced concrete -Code of practice
2. IS 3370-2009: Code of practice for concrete structures for storage of liquids
3. SP 16: Design Aids
4. SP 24: Explanatory hand book
5. SP 34: Detailing of Reinforcement

Guru Nanak Dev Engineering College, Ludhiana
Department of Civil Engineering
Syllabus
B.Tech. (Civil Engineering)
2018 Admission Batch Onwards
**Subject Code:** PECE – 163
**Subject Name:** Physico-Chemical Treatment Methods

| | |
|---|---|
| **Programme:** B.Tech. | **L:** 3 **T:** 1 **P:** 0 |
| **Semester:** | **Teaching Hours:** 40 |
| **Theory/Practical:** Theory | **Credits:** 4 |
| **Internal Marks:** 40 | **Percentage of Numerical/Design Problems**: 50% |
| **External Marks:** 60 | **Duration of End Semester Exam (ESE):** 3 hours |
| **Total Marks:** 100 | **Elective Status:** Elective |

**Prerequisites:** NIL

**Additional Material Allowed in ESE:** Nil

**On Completion of the course, the student will have the ability to:**

| CO# | Course Outcomes |
|---|---|
| 1. | Know the sampling and analysis techniques required for the monitoring of water treatment plants and for the characterization of the water. |
| 2. | Understand the water quality guidelines, criteria and standards. |
| 3. | Evaluate various physical and chemical treatment options for treatment of water and wastewater. |
| 4. | Explain the mechanism behind the treatment processes and their advantages and disadvantages. |
| 5. | Exhibit greater flexibility and originality in the definition and innovative solution of water pollution problems. |
| 6. | Firmly understand fundamental principles, be more aware of the similarities or differences among many of the engineered systems for water treatment. |

**Detailed Contents:**

**Part-A**

**Water – Quality, Standards and Criteria**: Physical, chemical and biological water quality parameters; Water quality guidelines, criteria and standards; Wastewater Effluent standards

**Purification of water**- Natural treatment processes- Physical, chemical and biological processes. Water treatment technologies- overview, Primary, Secondary and tertiary treatment-Unit operations & unit processes

**Screening & Grit removal:** Screens; grit chambers

**Settling Tanks, Coagulation and Flocculation**: Theory of settling; Types of settling; Settling Tanks; Coagulation-flocculation; Flash mixing tanks and flocculation tanks; Tube settlers and plate settlers.

**Part-B**

**Aeration**: Diffused, surface and gas transfer processes.

**Filtration Systems**: Filtration theory and filter hydraulics; Slow sand filters; Rapid gravity filters; Pressure filters; Multimedia filters.

**Disinfection**: Chlorination; Ozonation; UV radiation

**Other Water Treatment Technologies**: Ion-exchange process; Adsorption process- Adsorption equilibria- adsorption isotherms; membrane processes (nano-filtration, ultra-filtration and reverse osmosis).

**Text Books:**

1. Metcalf and Eddy, "Wastewater Engineering – Treatment and Reuse", Tata McGraw Hill.
2. Syed R. Qasim, Edward Motley, Guang Zhu, "Water Works Engineering"- Planning, Design and Operation, PHI
3. Weber W.J., "Physico-chemical Processes for Water Quality Control", John-Wiley
4. Howard S. Peavy, Donald R. Rowe & George Tchobanoglous, "Environmental Engg.", McGraw Hill
5. Viessman Jr, Hammer J. M, Perez, E.M, and Chadik, P. A, Water Supply and Pollution Control, PHI Learning
6. Hammer, M.J. and Hammer, M.J. Jr., "Water and Wastewater Technology", PHI Learning

Guru Nanak Dev Engineering College, Ludhiana
Department of Civil Engineering
Syllabus
B.Tech. (Civil Engineering)
2018 Admission Batch Onwards
**Subject Code:** PECE – 167
**Subject Name:** Solid Waste Management

| | |
|---|---|
| **Programme:** B.Tech. | **L:** 3 **T:** 1 **P:** 0 |
| **Semester:** - | **Teaching Hours:** 40 |
| **Theory/Practical:** Theory | **Credits:** 4 |
| **Internal Marks:** 40 | **Percentage of Numerical/Design Problems**: 30% |
| **External Marks:** 60 | **Duration of End Semester Exam (ESE):** 3 hours |
| **Total Marks:** 100 | **Elective Status:** Elective |

**Prerequisites:** NIL

**Additional Material Allowed in ESE:** Nil

**On Completion of the course, the student will have the ability to:**

| CO# | Course Outcomes |
|---|---|
| 1. | Examine physical and chemical composition of wastes and to analyze activities associated with the management of solid waste. |
| 2. | Employ method to recover materials, conserve products, and to generate energy from solid and wastes. |
| 3. | Design and locate waste containment systems as per regulatory standards and to appreciate the increasing importance of waste and resource management in achieving environmental sustainability. |
| 4. | Define and explain important concepts in the field of solid waste management and suggest suitable technical solutions for treatment of municipal and industrial waste. |
| 5. | Imply the role legislation and policy drivers play in stakeholders' response to the waste. |
| 6. | Apply the basic scientific principles for solving practical waste management challenges including landfill operations |

**Detailed Contents:**

**Part-A**

**Introduction:** Definition of solid wastes, Nuisance potential and extent of solid waste problems, Objectives and scope of integrated solid waste management.

**Characterization and Quantification:** Types, composition, characteristics and quantities of wastes, Methods of quantification and characterization of wastes.

**Collection, Storage and Transportation of Wastes:** Types of collection systems and their components, Concept of waste segregation at source and recycling and reuse of wastes; Household, street and community level collection bins and storage containers.

**Part-B**

**Solid Waste Processing and Treatment:** Waste processing – processing technologies – biological and chemical conversion technologies – Composting - thermal conversion technologies - energy recovery

**Sanitary Landfills:** Design, development, operation and closure of landfills, Management of leachate and landfill gases, environmental monitoring of landfill sites.

**Legal Requirements:** Municipal solid waste rules; Hazardous waste rules; Biomedical waste rules; E-waste rules; Rules related to recycled plastics, used batteries, flyash, etc.

**Text Books:**

1. Pichtel, J., Waste Management Practices – Municipal, Hazardous and Industrial, CRC Press.
2. Vesilind, P.A., Solid Waste Engineering, Thomson Learning Inc.
3. Tchobanoglous, G., Vigil, S.A. and Theisen, H., Integrated Solid Waste Management: Engineering Principles and Management Issues, McGraw Hill
4. Howard S. Peavy, Donald R. Rowe & George Tchobanoglous, "Environmental Engg.", McGraw Hill
5. CPHEEO, Manual on Municipal Solid waste management, Central Public Health and Environmental Engineering Organization, Government of India

Guru Nanak Dev Engineering College, Ludhiana
Department of Civil Engineering
Syllabus
B.Tech. (Civil Engineering)
2018 Admission Batch Onwards

**Subject Code:** PRCE-102

**Subject Name:** Minor Project

| | |
|---|---|
| **Programme:** B.Tech. (Civil Engineering) | **L: 0 T: 0 P:** 2 |
| **Semester: 6** | **Teaching Hours:** 24 Hours |
| **Theory/Practical:** Practical | **Credits:** 1 |
| **Internal Marks:** 60 | **Percentage of Numerical/Design Problems:** 90% |
| **External Marks:** 40 | **Duration of End Semester Exam (ESE):** |
| **Total Marks:** 100 | **Course Category:** Core |

**Additional Material Allowed in ESE:** Relevant IRC codes

**On Completion of the course, the student will have the ability to:**

| CO# | Course Outcomes |
|---|---|
| 1. | Formulate detailed estimate of a building. |
| 2. | Compute quantity of materials required for civil engineering works as per specifications. |
| 3. | Analyze rates for items not covered in CSR. |
| 4. | Create well organized document |
| 5. | Acknowledge the work of others in consistent manner. |

**Detailed Contents:**

This is a structured open-ended course in which the students under the overall supervision of a faculty member of his discipline will perform a detailed cost estimate of a project and submit report as a culmination of his endeavor and investigation. The focus area of the work can be any project of civil engineering such as Building, Highway, Industrial Project, Bridges, Canal, Dam etc.

Guru Nanak Dev Engineering College, Ludhiana
Department of Civil Engineering
Syllabus
B.Tech. (Civil Engineering)
2018 Admission Batch Onwards

**Subject Code:** OECE-101
**Subject Name:** Metro Systems and Engineering

| | |
|---|---|
| **Programme:** B.Tech. (Civil Engineering) | **L:** 3 **T: 0 P:** 0 |
| **Semester: 6** | **Teaching Hours:** 40 Hours |
| **Theory/Practical:** Theory | **Credits:** 3 |
| **Internal Marks:** 40 | **Percentage of Numerical/Design Problems:** 30% |
| **External Marks:** 60 | **Duration of End Semester Exam (ESE):** 3 Hours |
| **Total Marks:** 100 | **Course Category:** Open Elective |

**Additional Material Allowed in ESE:** NIL

**On Completion of the course, the student will have the ability to:**

| CO# | Course Outcomes |
|---|---|
| 1. | Understand overview of metro systems. |
| 2. | Analyse vehicle dynamics and structure; tunnel ventilation systems; electrical systems. |
| 3. | Apply electronic signalling systems and automatic fare collection. |
| 4. | Understand the basics of construction planning & management. |
| 5. | Evaluate the construction quality & safety systems. |

**Detailed Contents:**

## Part-A

**Introduction to Metro systems** **5 hours**

Overview of Metro Systems; Need for Metros; Routing studies; Basic Planning and Financials.

**Planning and Development** **9 hours**

Overview and construction methods for: Elevated and underground Stations; Viaduct spans and bridges; Underground tunnels; Depots; Commercial and Service buildings. Initial Surveys & Investigations;

**Traffic Management Systems** **9 hours**

Basics of Construction Planning & Management, Construction Quality & Safety Systems. Traffic integration, multimodal transfers and pedestrian facilities; Environmental and social safeguards; Track systems-permanent way. Facilities Management Module

**PART B**

**Signalling Systems** **5 hours**

Introduction to Signalling systems; Automatic fare collection; Operation Control Centre (OCC and BCC); SCADA and other control systems; Platform Screen Doors.

**Electrical Systems** **7 hours**

OHE, Traction Power; Substations- TSS and ASS; Power SCADA; Standby and Back-up systems; Green buildings, Carbon credits and clear air mechanics.

**Mechanical Systems** **5 hours**

Ventilation systems; Air conditioning for stations and buildings; Fire control systems; Lifts and Escalators

**Text Books:**

1. "Electric Traction for Railway Trains: A Book for Students, Electrical and Mechanical Engineers, Superintendents of Motive Power and Others" Edward Parris BurchPalala Press 2018.
2. "Metropolitan Railways: Rapid Transit in America (Railroads Past and Present)",Middleton, Indiana University Press 2013.
3. "World Metro Systems", Garbutt, Capital Transport Publishing; 2nd Revised edition 1997.

Guru Nanak Dev Engineering College, Ludhiana
Department of Civil Engineering
Syllabus
B.Tech. (Civil Engineering)
2018 Admission Batch Onwards

**Subject Code: OECE-102**

**Subject Name:** Numerical Methods in Engineering

| | |
|---|---|
| **Programme:** B.Tech. (Civil Engineering) | **L:** 3 **T: 0 P:** 0 |
| **Semester: 6** | **Teaching Hours:** 40 Hours |
| **Theory/Practical:** Theory | **Credits:** 3 |
| **Internal Marks:** 40 | **Percentage of Numerical/Design Problems:** 70% |
| **External Marks:** 60 | **Duration of End Semester Exam (ESE):** 3 Hours |
| **Total Marks:** 100 | **Course Category:** Open Elective |

**Additional Material Allowed in ESE:** NIL

**On Completion of the course, the student will have the ability to:**

| CO# | Course Outcomes |
|---|---|
| 1. | Demonstrate the concept of approximations and errors in the implementation and development of numerical methods. |
| 2. | Select an appropriate solution to an engineering problem dealing with the roots of equations by numerical methods. |
| 3. | Execute the solution of problems involving linear algebraic equations and appreciate the application of these problems in field of engineering. |
| 4. | Apply the techniques to fit curve to data and be capable of choosing the preferred method for any particular problem. |
| 5. | Evaluate the solution of the problems through the numerical integration and differentiation and solve ordinary and partial differential equations and eigen value problems through various techniques. |
| 6. | Able to use newmarks method for civil engineering problems. |

**Detailed Contents:**

## Part-A

**Equation** **8 hr**

Roots of algebraic transcendental equation, Solution of linear simultaneous equations by different methods using Elimination, Iteration, Inversion, Gauss-Jordan and Method, Homogeneous and Eigen Value problem, Non-linear equations, Interpolation

**Finite Difference Technique** **8 hr**

Initial and Boundary value problems of ordinary and partial differential equations, Solution of Various types of plates and other civil engineering related problems

**New Marks Methods** **6 hr**

Solution of determinate and indeterminate structures using New-marks Procedure (Beam)

## Part-B

**Statistical Methods** **6 hr**

Method of correlation and Regression analysis for fitting a polynomial equation by least square

**Initial Value problem** **6 hr**

Galerkin's method of least square, Initial Value problem by collocation points, Runge-kutta Method

**Solution** **6 hr**

Implicit and explicit solution, solution for nonlinear problems and convergence criteria

**Text Books:**

1. James B. Numerical Mathematical Analysis. Scarborough Oxford and IBH Publishing, 2005.
2. Sastry S.S. Introductory Methods of Numerical Analysis, PHI Learning, 2012.
3. Jia X. and Liu S. Introduction to Computer Programming and Numerical Methods.Kendall/Hunt Publishing Co., 2007.
4. Dixit J.B. Numerical Methods. USP (Laxmi publication), 2011.

**Reference Books/Codes:**

1. Grewal B. S. Numerical Methods in Engineering and Science, (with programming in C and C++). Khanna Publishers, 2012.
2. Gerald F.C. and Wheatley P.O. Applied Numerical Analysis. Pearson Education Inc., 2008.

Guru Nanak Dev Engineering College, Ludhiana
Department of Civil Engineering
Syllabus
B.Tech. (Civil Engineering)
2018 Admission Batch Onwards
**Subject Code:** OECE-103
**Subject Name:** Project Management & Monitoring

| | |
|---|---|
| **Programme:** B.Tech. (Civil Engineering) | **L:** 3 **T: 0 P:** 0 |
| **Semester: 6** | **Teaching Hours:** 40 Hours |
| **Theory/Practical:** Theory | **Credits:** 3 |
| **Internal Marks:** 40 | **Percentage of Numerical/Design Problems:** 30% |
| **External Marks:** 60 | **Duration of End Semester Exam (ESE):** 3 Hours |
| **Total Marks:** 100 | **Course Category:** Open Elective |

**Additional Material Allowed in ESE:** NIL

**On Completion of the course, the student will have the ability to:**

| CO# | Course Outcomes |
|---|---|
| 1. | Understand the need of project planning and device a plan to define the work to be performed in construction project. |
| 2. | Utilize various tools and techniques of project management and develop more realistic schedule by identifying the central problem and analyze the alternatives. |
| 3. | Analyze time estimates of different activities and events in a network for better controlling of project by identifying critical path. |
| 4. | Determine minimum total cost and minimum project time by conducting a crash program. |
| 5. | Develop understanding about techniques of updating, allocation of resources and rescheduling a project. |
| 6. | Apply computer skills to project management and evaluation. |

**Detailed Contents:**

**Part-A**

**Introduction** **6 hr**

Need for project planning & management, time, activity & event, bar-chart, Milestone chart, uses & draw backs

**PERT** **12 hr**

Construction of PERT network, time estimates, network analysis, forward pass &backward pass, slack, critical path, data reduction, suitability of PERT for research project, numerical problems.

**Part-B**

**CPM** **12 hr**

Definitions, network construction, critical path, fundamental rules, determination of project schedule, activity time estimates, float types, their significance, numerical problems.

**Cost Analysis and Contract** **12 hr**

Type of costs, cost time relationships, cost slopes, conducting a crash programme, determining the minimum total cost of project, numerical problems, updating a project, when to update, time grid diagram, resource scheduling, planning of different components of engineering projects. Introduction of relevant open-source software(s).

**Text Books:**

1. Srinath L.S.PERT and CPM - Principles and Applications. East West Press, 2001.
2. Jha K.N. Construction Project Management: Theory and Practices. 2nd edition, Pearson Education India, 2015.
3. Verma M. Construction Equipment & Planning and Application. Metropolitan Book Co, 1975.
4. Shrivastava U.K. Construction Planning and Management. Galgotia Publications Pvt. Ltd., 2000.

**Reference Books/Codes:**

1. Punmia B.C. and Khandelwal K.K. Project Planning and Control with PERT and CPM. 4th edition, Laxmi Publications Private Limited, 2016.
2. Wiest J.D. & levy F.K. Management Guide to PERT & CPM. Prentice Hall, 1970.

Guru Nanak Dev Engineering College, Ludhiana
Department of Civil Engineering
Syllabus
B.Tech. (Civil Engineering)
2018 Admission Batch Onwards
**Subject Code:** OECE-104
**Subject Name:** Traffic Management & Road Safety

| | |
|---|---|
| **Programme:** B.Tech. (Civil Engineering) | **L:** 3 **T: 0 P:** 0 |
| **Semester:** 6 | **Teaching Hours:** 40 Hours |
| **Theory/Practical:** Theory | **Credits:** 3 |
| **Internal Marks:** 40 | **Percentage of Numerical/Design Problems:** 20% |
| **External Marks:** 60 | **Duration of End Semester Exam (ESE):** 3 Hours |
| **Total Marks:** 100 | **Course Category:** Open Elective |

**Additional Material Allowed in ESE:** NIL

**On completion of the course, the student will have the ability to:**

| CO# | Course Outcomes |
|---|---|
| 1. | Understand the traffic flow parameters and measures related to traffic control and management. |
| 2. | Analyze the feasibility of different control devices for traffic management. |
| 3. | Create the solution of the problem related to traffic congestion and safety. |
| 4. | Outline the causes of road accidents and procedure to assess the road safety audit. |
| 5. | Apply the methods to identify the black spots and propose the solutions to improve road safety. |
| 6. | Assess the need of modernization in traffic management and road safety. |

**Detailed Contents:**

## Part A

**Fundamentals of Traffic Management** **7 hr**

Principles of Traffic management; Highway capacity and Level of service; Mixed Traffic flow: PCU concept and its limitations; Traffic stream parameters: Interrupted and Uninterrupted flow

**Traffic Regulation and Control devices** **8 hr**

Road Signs and markings; Channelization; At-grade and Grade separated intersections; Traffic Rotary; Design principles of traffic signals

**Traffic Management techniques** **5 hr**

Regulatory measures for Traffic management; Travel Demand Management; Role of ITS in traffic management

## Part B

**Road accidents** **6 hr**

Causes of road accidents: Vehicle design factors & Driver characteristics influencing road safety, Road condition, Parking and its influence on traffic safety

**Road safety measures** **9 hr**

Accident data collection methods; Representation of accident data: Collision and condition diagram; Methods to Identify and Prioritize Black spots; Road safety: 3'E' measures

**Road safety audits** **5 hr**

Key elements in Road safety audit; Road safety audit procedure and investigations; Role of ITS in Road safety

**Text Books:**

1. Fred L. Mannering, Scott S. Washburn. Principles of Highway Engineering and Traffic Analysis.7th Edition, Wiley, 2019.
2. Kadiyali L.R. Traffic Engineering & Transport Planning. Khanna Publications, 2013.
3. Khisty C.J. and Lall B.K. Transportation Engineering – An Introduction. 3rd Edition, Pearson, 2017.
4. Khanna S.K., Justo C.E.G and Veeraragavan A. Highway Engineering. Revised 10th Edition, Nem Chand & Bros, 2017.

**Reference Books/Codes:**

1. IPC SO 088-2010 Manual on Road Safety Audit, Indian Road Congress, New Delhi, 2010.
2. Highway Capacity Manual: A Guide for Multimodal Mobility Analysis. 6th Edition, TRB, Washington, DC: The National Academies Press, 2016.
3. Garber N.J and Hoel L.A. Principles of Traffic and Highway Engineering.Fifth edition, Cengage Learning India Pvt. Ltd, 2013.