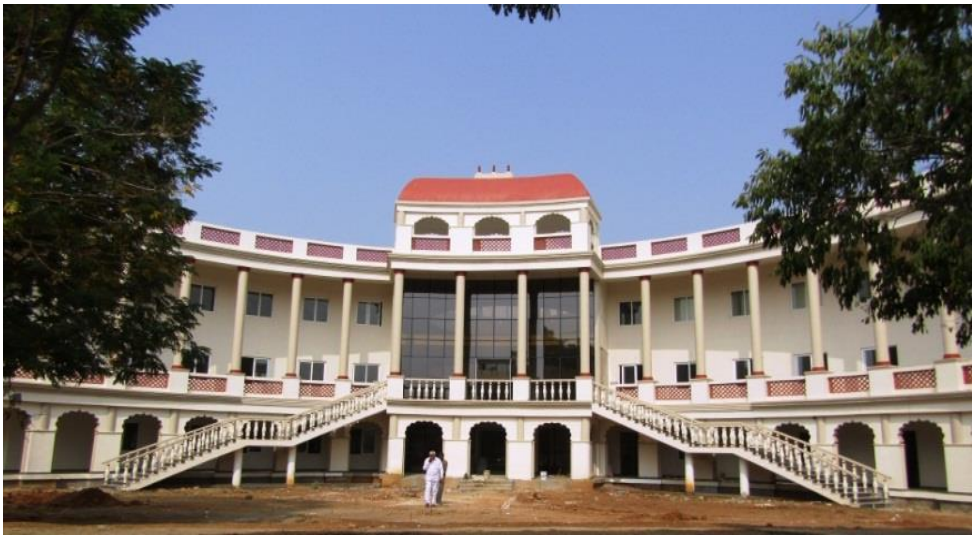
# ACADEMIC REGULATIONS & CURRICULUM

**Applicable to the students admitted from the Academic Year 2019-2020**



# CIVIL ENGINEERING

**(B.Tech. Programme)**

## MAHARAJ VIJAYARAM GAJAPATHI RAJ COLLEGE OF ENGINEERING

## (Autonomous)

(Approved by AICTE, New Delhi, and permanently affiliated to JNTUK, Kakinada)

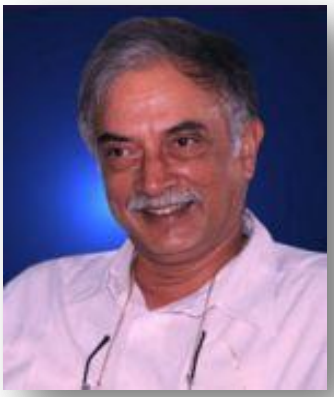
Listed u/s 2(f) & 12(B) of UGC Act 1956.

Vijayaram Nagar Campus, Chintalavalasa,Vizianagaram-535005, Andhra Pradesh

# The visionaries

**Late Dr. P V G Raju**
Raja Saheb of Vizianagaram
Founder Chairman-MANSAS
Ex-Minister for Education and Health, Govt. of AP
Ex Member of Parliament

**Late Dr. P. Anand Gajapathi Raju**
**Ex-Chairman-MANSAS**
Ex-Minister for Education and Health
Govt. of AP
Ex Member of Parliament



**P. Ashok Gajapathi Raju**
**Chairman-MANSAS**
Ex-Union Minister for Civil Aviation,
Govt. of India
Ex-Minister for Finance, Govt. of AP

# Vision

Maharaj Vijayaram Gajapathi Raj College of Engineering strives to become a centre par excellence for technical education where aspiring students can be transformed into skilled and well-rounded professionals with strong understanding of fundamentals, a flair for responsible innovation in engineering practical solutions applying the fundamentals, and confidence and poise to meet the challenges in their chosen professional spheres.

## Mission

The management believes imparting quality education in an atmosphere that motivates learning as a social obligation which we owe to the students, their parents/guardians and society at large and hence the effort is to leave no stone unturned in providing the same with all sincerity. Towards that end, the management believes special focus has to be on the following areas:

M1: Have on-board staff with high quality experience and continuously updating themselves with latest research developments and sharing that knowledge with students.

M2: Having a well stream-lined teaching learning process that is continuously assessed for effectiveness and fine-tuned for improvement.

M3: Having state-of-the-art lab and general infrastructure that gives students the necessary tools and means to enhance their knowledge and understanding.

M4: Having a centralized department focused on improving placement opportunities for our students directly on campus and coordinating the training programs for students to complement the curriculum and enhance their career opportunities.

M5: Having advanced research facilities and more importantly atmosphere to encourage students to pursue self-learning on advanced topics and conduct research.

**ABOUT THE INSTITUTION:**

Maharajah Alak Narayan Society of Arts and Science (MANSAS) is an Educational Trust founded by Dr. (late) P.V.G Raju, Raja Saheb of Vizianagaram in the hallowed memory of his father Maharajah Alak Narayan Gajapati with a view to confound socio-economic inequalities in the Vizianagaram principality executing a trust deed on 12-11-1958 duly established Maharajah's College and other educational institutions in and around Vizianagaram. The Trust is a charitable one published under Section 6 a (1) of A.P Charitable and Hindu Religious Institutions and Endowment Act 30 of 1987.

The object of the Trust is to manage the properties of educational institutions under it and to promote and advance the cause of education in general, besides awarding scholarships to deserving students enabling them to undergo special training in science and industries in and out of India. The Trust has made an uncompromising contribution to the nation by presenting the stalwarts.

Trust offers KG to PhD level education in Arts, Sciences, Law, Pharmacy, Humanities Education, Engineering and Management and presently houses 13 Educational Institutions. MVGR College of Engineering is one of the 13 Institutes.

## Other Institutions under MANSAS

1. M.R. HIGH SCHOOL 1857
2. M.R COLLEGE **(NAAC ACCREDITED)** 1879
3. M.R. COLLEGE OF EDUCATION 1950
4. M.R. WOMENS COLLEGE **(NAAC ACCREDITED)** 1962
5. M.R. GIRLS HIGH SCHOOL 1974
6. M.R. MODEL HIGH SCHOOL 1974
7. M.R. ENGLISH MEDIUM SCHOOL 1979
8. M.R.V.R.G.R LAW COLLEGE 1987
9. M.R. P.G. COLLEGE **(NAAC ACCREDITED)** 1987
10. M.R.SCHOOL OF MANAGEMENT STUDIES 1994
11. M.R.V.R.G.R – II MEMORIAL JR. COLLEGE 1994
12. M.R. COLLEGE OF PHARMACY 2004

Maharaj Vijayaram Gajapathi Raj (MVGR) College of Engineering was established in the year 1997 by Maharaj Alak Narayan Society for Arts and Sciences (MANSAS) to impart quality technical education. The Institution is located in lush green, serene and pollution free environment spread over 60 acres of land in Chintalavalasa village situated in the outskirts of Vizianagaram, a fort city in the north coastal region of Andhra Pradesh.

Institution at a glance:

- MVGR is a 23 years old institution, established in 1997
- All eligible UG Programs (CHEMICAL, CIV, CSE, ECE, EEE, IT & MECHANICAL) were reaccredited by NBA.
- MBA program was also re-accredited by NBA.
- Had been re-accredited with Grade 'A' by NAAC of UGC
- Has Permanent affiliation with JN Technological University-Kakinada
- Listed under sections 2(f) & 12(b) of UGC act 1956.
- Approved by AICTE-New Delhi
- EIGHT departments are recognized as RESEARCH CENTERS by JNTU-K
- Granted Autonomy by UGC in 2015
- Campus of 60 acre
- Offering 7 UG and 5 M.Tech., and 1 MBA program
- About 250 faculty of which 84 Ph.D. Degree holders
- 83 Laboratories with an investment of about 13 Crores
- Total built up area of about 7 Lakh Sft
- About 42,000 volumes and Access to 8 international online journal packages like IEEE, SPRINGER, etc.
- 1420 Systems & 395 Mbps band width internet facility
- About Rs. 4 Crore worth of on-going R&D projects
- Actively involved in civil engineering consultancy work as Third Party Quality Auditor for Vizianagaram Municipality
- WIPRO Recognized technology learning center and MISSION 10X partner institution
- Recognized National Instruments Academy for Training in LabView
- SIRO Recognition by DSIR
- Recognized PTC Centre of Excellence for Creo Training
- Identified by MSME as Business Incubation Centre
- APSSDC-Siemens Technical Skill Development Institute
- Recognized CMs SKILL EXCELLENCY CENTER (SEC)
- Microsoft Ed-vantage Platinum Partner
- Institutional member of IUCEE
- Institutional Member of CII
- Member, Chamber of Commerce, Vizianagaram
- Green Campus award by Govt. of AP

MVGR College of Engineering is rated as one among the best engineering colleges in the state of Andhra Pradesh as it set up highest standards in all areas of curricular, co-curricular and extra-curricular activities and in students' placements. Based on industry and expert's feedback, the college is updating the curriculum from time to time. The college offers many value added add-on courses students and conducts training programs to meet the industries' requirements.

# Academic Regulations for B.Tech., Program

Applicable to the students admitted from the Academic year 2019-2020 onwards.

## 1. PROGRAM STRUCTURE:

**B.Tech.:**

| Sl. No | Category | Credits |
|---|---|---|
| 1 | Humanities and Social Sciences including Management courses | 12 |
| 2 | Basic Science courses | 25 |
| 3 | Engineering Science courses including workshop, drawing, basics of electrical/mechanical/computer etc. | 26 |
| 4 | Professional core courses | 54 |
| 5 | Professional Elective courses relevant to chosen specialization/branch | 18 |
| 6 | Open subjects – Electives from other technical and /or emerging subjects | 12 |
| 7 | Project work, seminar and internship in industry or elsewhere | 13 |
| 8 | Mandatory Courses [Environmental Sciences, Induction training, Indian Constitution, Essence of Indian Traditional Knowledge] | 0 |
| | **Total** | 160 |

- Open electives offered by the parent department are listed in the course structure and are offered to students of other programs. The students of parent departments may also opt the course, provided it shall not be listed in the curriculum.
- For audit course a student is deemed to satisfy the minimum contact hours, as prescribed by the department and shall also comply with the requirements for submission of assignments/projects. A student shall also opt for MOOCs and submit the certificate.

| 1. HSS Courses | | |
|---|---|---|
| Sl. No. | Subject | Credits |
| 1 | English -1 | 3 |
| 2 | English -2 (Technical English) | 3 |
| 3 | Elective-1 (Management Related course (MEFA or MS or Operations Research) | 3 |
| 4 | Elective-2 (Professional Ethics and Human Values) | 3 |
| | Total | **12** |

| 2. Basic Science Courses | | |
|---|---|---|
| Sl. No. | Subject | Credits |
| 1 | Mathematics-I | 3 |
| 2 | Mathematics-II | 3 |
| 3 | Mathematics-III | 3 |
| 4 | Mathematics-IV | 3 |
| 5 | Applied / Engineering Physics (Theory + Lab) | 5 |
| 6 | Engineering Chemistry (Theory + Lab) | 5 |
| 7 | Biology for Engineers | 3 |
| | Total | **25** |

| 3. Engineering Science Courses | | |
|---|---|---|
| Sl. No. | Subject | Credits |
| 1 | Programming for Problem Solving (Theory + Lab) | 5 |
| 2 | Internet of Things (IOT) | 3 |
| 3 | Computer aided Engineering Graphics | 3 |
| 4 | Basic Electrical Engineering (Theory + Lab) | 5 |
| 5 | Department wise Engineering Science Course-I (AI Tools , Techniques & Applications) | 5 |
| 6 | Department wise Engineering Science Course-II (Design thinking and Product Innovation) | 3 |
| 7 | Workshop (Department Specific) | **2** |
| | Total | **26** |

| | Subjects | Credits |
|---|---|---|
| 1 | Professional Core Courses | 54 |
| 2 | Professional Elective Courses Relevant to Chosen Specialization/Branch | 18 |
| 3 | Open Subjects – Electives from other Technical and / or Emerging Subjects | 12 |
| | | **84** |

| 7. Project | | |
|---|---|---|
| Sl. No. | Subject | Credits |
| 1 | Socially Relevant Project | 1 |
| 2 | Mini Project | 2 |
| 3 | Project Phase - I | 2 |
| 4 | Project Phase - II | 8 |
| | Total | **13** |

| 8. Audit Courses (Non Credit Course) | | |
|---|---|---|
| Sl. No. | Subject | |
| 1 | Induction Program | |
| 2 | Constitution of India | |
| 3 | Indian Traditional Knowledge | |
| 4 | Environmental Science | |

BOS Chairman shall notify the list of MOOCs offered (Open Elective & Professional Elective) in the beginning of the semester.

## 2. PROGRAM PATTERN:

**B.Tech.:** The program is for 4 academic years / 8 semesters.

**B.Tech. (Lateral Entry):** The program is for 3 academic years / 6 semesters.

## 3. AWARD OF DEGREE:

### B.TECH:

A student will be declared eligible for the award of degree if he/she fulfills the following academic regulations.

a) A student shall be declared eligible for the award of degree, if he/she pursues a course of study for not less than four academic years and not more than eight academic years from the date of admission.

b) The student shall register for **160** credits and secure all **160** credits.

c) The medium of instruction for the entire under graduate program in Engineering & Technology will be in **English** only.

d) A student shall also register and successfully complete audit programs (Non-credit) as recommended by Academic Council.

e) A student on completing 1$^{st}$ year class work may opt for a break of 1 year which shall be deemed as GAP year, as recommended by APSCHE, for undertaking successful entrepreneurial ventures.

f) Students who fail to complete Four Years Course of study within 8 years shall forfeit their seat and their admission shall stand cancelled.

**B.TECH (Lateral Entry):**

A student will be declared eligible for the award of degree on fulfilling the following academic requirements.

a) A student shall be declared eligible for the award of the degree, if he/she pursues a course of study for not less than three academic years and not more than six academic years.

b) The student shall register for **126** credits and secure all **126** credits.

c) A student shall also register and successfully complete audit programs (Non-credit) as recommended by Academic Council.

d) Students who fail to complete their three Years Course of study within 6 years shall forfeit their seat and their admission shall stand cancelled.

e) Student shall register for bridge programs, if any, as administered by the respective departments at the beginning of 2nd year and successfully complete as per the guidelines of the Institution.

## 4. CERTIFICATION PROGRAMS:

| Sl. No. | Dept. | Name of the Program |
|---|---|---|
| 1 | MECH | Windchill 10.2 PDM by Adroitec Engineering Solutions Pvt. Ltd., Hyderabad |
| 2 | MECH | Creo 2.0 by PTC |
| 3 | MECH | Edgecam by Verosoft, UK |
| 4 | MECH | ANSYS Training and Certification by Mechanical Department |
| 5 | MECH | AUTOCAD Training and Certification by Mechanical Department |
| 6 | MECH | Catia by APSSDC-Dassault Systems, CM's Center of Excellence |
| 7 | MECH | Delmia by APSSDC-Dassault Systems, CM's Center of Excellence |
| 8 | MECH | Simulia by APSSDC-Dassault Systems, CM's Center of Excellence |
| 9 | MECH | 2-Wheeler Automobile Certification by APSSDC-SIEMENS |
| 10 | MECH | 4-Wheeler Automobile Certification by APSSDC-SIEMENS |
| 11 | MECH | Welding Certification by APSSDC-SIEMENS |
| 12 | MECH | CNC Certification by APSSDC-SIEMENS |
| 13 | MECH | Commercial Electrical Certification by APSSDC-SIEMENS |
| 14 | MECH | Solid Edge Certification by APSSDC-SIEMENS |
| 15 | CHEM | Chemical Process Design and Simulation by Simtech Simulations, Hyderabad |
| 16 | ECE | Embedded Systems by Think LABS, Mumbai |
| 17 | ECE | Labview by National Instruments Systems India Pvt. Ltd. |
| 18 | ECE | Unified Technology Learning Program (UTLP) by Wipro Mission 10X |
| 19 | CSE, IT | PEGA by Virtusa Corporation |
| 20 | CSE, IT | Microsoft technologies by Microsoft Corp. |
| 21 | CSE, IT | Ethical Hacking by EC-Council Academia |
| 22 | CSE, IT | Java and C by Talent Sprint |
| 23 | CSE, IT | Network Analyst (CCNA) by Cisco Systems Inc |
| 24 | CSE, IT | Java Programming (OCJP) and DBMS by Oracle |
| 25 | EEE | PLC, Drives and Automation by Siemens |
| 26 | EEE | PLC by New Dawn Automation |
| 27 | EEE | Home Electrical Certification by APSSDC-SIEMENS |
| 28 | Civil | Remote Sensing and GIS by Indian Institute of Remote Sensing |

a) The Institution shall offer the certification programs by itself or in collaboration with industry/such other Institutions deemed to have specialized expertise in the proposed area of training.
b) Only students of the Institution shall be eligible to register on payment of prescribed fee.
c) However, subject to availability of resources and the demand the Institution may offer the program to external candidates meeting the pre-qualification requirements and in the order of the merit.
d) The duration of the course and design of the content shall be done by the respective departments of the Institution by themselves or in collaboration with industry/such other institutions deemed to have specialized expertise in the proposed area of training.
e) If the duration of the course is less than or equal to 40 hours, it can be completed in one semester, otherwise, it can suitably distributed over a number of semesters.
f) Mere enrolment/registration for the program shall not entitle any claim for award of certificate.
g) A candidate shall be deemed eligible for the award of the certificate if he/she
   - Attends at least 75% of scheduled training sessions
   - Complies to all the requirements of submission of the assignments, presentations, seminars, projects, etc., and also appears for periodic tests.
   - Shall attain minimum levels of performance in tests as prescribed.
   - Shall remit such fee as deemed fit for the certification
   - A candidate registered and failed to meet the requirements shall be permitted to repeat the said training one another time after remitting 25% of the fee fixed for the program as re-registration fee.

If the student is absent for the periodic tests, the test shall be re-conducted on payment of 10% of fee.

## 5. COURSES OFFERED:

| Name of the Program | Degree |
|---|---|
| UG Programs (Engineering & Technology) | B.Tech. (Civil)<br>B.Tech. (EEE)<br>B.Tech. (Mech.)<br>B.Tech. (ECE)<br>B.Tech. (CSE)<br>B.Tech. (CHEM)<br>B.Tech. (IT) |
| PG Programs (Engineering & Technology) | M.Tech. (Structural Engineering)<br>M.Tech. (Power Systems)<br>M.Tech. (PDM)<br>M.Tech. (VLSI)<br>M.Tech. (CN&IS) |
| Other PG Programs | MBA |
| Research Programs | Ph.D. in Civil, EEE, MECH, ECE, CSE, CHEM, MBA and MATHS |

## 6. DISTRIBUTION AND WEIGHTAGE OF MARKS:

**B.Tech.:**

a). All Theory courses will have 5 units and assessed for 100 marks, of which, 40 marks for internal assessment and 60 marks for semester end external examination.

**Internal Assessment:**

Subjective tests - 20 Marks
Objective tests - 10 Marks
Assignments - 10 Marks

- Two subjective tests shall be conducted.
- Each subjective test shall be conducted for 90 Minutes and have 3 questions each for 7 marks (No choice) and the same shall be scaled down to 20 Marks.
- Average of two subjective tests shall be considered.
- Two objective tests (online) shall be conducted each for 20 marks.
- Each objective test shall be conducted for 20 minutes and have 20 Multiple Choice Questions each for 1 mark and the same shall be scaled down to 10 Marks.
- Average of two objective tests shall be considered.
- Assignments shall be assessed for 10 marks.

**External Assessment:**

- External examination is for 60 marks (180 min). Question paper contains 10 questions (2 questions from each unit) and each question carries 12 marks. Student shall answer 5 questions (1 question from each unit).

**i) Design Thinking and Product Innovation - Evaluation pattern**

**Internal Assessment: 40 Marks**

Project based learning - 20 Marks
Assignments - 20 Marks

**Project based learning:** The student has to identify a problem and provide a solution by applying design thinking methodologies and submit a report, which is assessed for 20 Marks.

**Assignments:** The student has to submit 4 assignments (1 for each unit) and assessed for 20 marks. Each assignment shall consist of 4 questions (4X10 = 40 marks) and the same shall be scaled down to 20 marks. Average of 4 assignments shall be considered as final assignment marks.

**External Assessment: 60 Marks**

External examination is for 60 marks (180 min). Question paper contains 8 questions from first IV units (2 questions from each unit) and each question carries 10 marks. Student shall answer 4 questions from first IV units (1 question from each unit) and case study (20 Marks) from V unit.

**ii) Internet of Things (IoT) , Surveying and Geomatics, MAT Lab Programming, Programming with Lab View, Embedded Processor - Evaluation pattern**

**Internal Assessment: 40 Marks**

Subjective Test - 20 Marks

Project based learning - 20 Marks

- Two subjective tests shall be conducted.
- Each subjective test shall be conducted for 90 Minutes and have 3 questions each for 7 marks (No choice) and the same shall be scaled down to 20 Marks.
- Average of two subjective tests shall be considered.
- Project based learning shall be assessed for 20 Marks.
- In Project based learning, a student has to identify a problem such that at least 3 or 4 modular learning of experiments shall be integrated and submit comprehensive report with solution at the end of the semester.

**External Assessment: 60 Marks**

External examination is for 60 marks (180 min). Question paper contains 10 questions (2 questions from each unit) and each question carries 12 marks. Student shall answer 5 questions (1 question from each unit).

b). **Laboratory/Practice:**

All Laboratory/Practice courses are assessed for 100 marks, of which, 40 marks for internal assessment and 60 marks for semester end external examination.

**Internal Assessment : (40 Marks)**

Continuous assessment : 15 Marks
Project based learning : 15 Marks
Internal test : 10 Marks

- Continuous assessment for 15 marks for each experimental session finally averaged to 15 marks.
- Project based learning shall be assessed for 15 Marks.
- In Project based learning, a student has to identify a problem such that at least 3 or 4 modular learning of experiments shall be integrated and submit comprehensive report with solution at the end of the semester.
- An internal assessment test conducted at the end of the semester shall be assessed for 10 marks.

**Semester End Assessment:**

- Semester end examination is for 60 marks (180 min) conducted and assessed by both external and internal examiners.

- Both internal and external examination shall include assessment of the student on
    a) Knowledge of principles/concepts involved
    b) Experimental design
    c) Result interpretation and analysis
    d) Experimental report

c). **Drawing/Design/Estimation:**

**i) Computer Aided Engineering Graphics:**

**Evaluation Procedure:**

The course will have 5 units and assessed for 100 marks, of which, 40 marks for internal assessment and 60 marks for semester end external examination.

**Internal Assessment : (40 Marks)**

| | |
|---|---|
| Continuous assessment | : 15 Marks |
| Project based learning | : 15 Marks |
| Internal test | : 10 Marks |

**Semester End Assessment:**

- Semester end examination is for 60 marks (180 min) conducted and assessed by both external and internal examiners.
- Question paper contains 3 questions (with internal choice). **E**ach question carries 20 marks (5 marks for free hand drawing and list of commands & 15 marks for final drawing prepared in AUTOCAD). A Student shall answer all questions.

**ii) Computer Aided Geometric Design and Assembly:**

**Evaluation Procedure:**

The course will have 5 units and assessed for 100 marks, of which, 40 marks for internal assessment and 60 marks for semester end external examination.

**Internal Assessment : (40 Marks)**

| | |
|---|---|
| Continuous assessment | : 15 Marks |
| Project based learning | : 15 Marks |
| Internal test | : 10 Marks |

**Semester End Assessment:**

- Semester end examination is for 60 marks (180 min) conducted and assessed by both external and internal examiners.
- Semester End Examination shall include assessment of the student on Final drawings like modeling, assembly and drafting.
- Student is expected to execute one exercise.

- Final drawings like modeling, assembly and drafting hard copies shall be evaluated by both internal and external examiners

### iii) Design and Drawing Courses

**Evaluation Procedure:**

The course will have 5 units and assessed for 100 marks, of which, 40 marks for internal assessment and 60 marks for semester end external examination.

| **Internal Assessment:** | **40 Marks** |
|---|---|
| Subjective Test | - 20 Marks |
| Assignments | - 10 Marks |
| Design and Drawing reports | - 10 Marks |

- Two subjective tests shall be conducted.
- Each subjective test shall be conducted for 90 Minutes and have 3 questions each for 7 marks (No choice) and the same shall be scaled down to 20 Marks.
- Average of two subjective tests shall be considered.
- Assignments shall be assessed for 10 marks.
- Design and drawing reports shall be assessed for 10 marks.

**External Assessment:**

The end examination question paper consists of Part A and Part B.

Part A consists of two questions regarding Design and Drawing (from two clusters clearly mentioned in the syllabus). Each question carries 20 marks. The student shall answer any 1 question.

Part B consists of four questions (from the remaining four clusters) with internal choice and all four are to be answered. Each question carries 10 marks.

### iv) Estimation and Costing Courses

The course will have 5 units and assessed for 100 marks, of which, 40 marks for internal assessment and 60 marks for semester end external examination.

| **Internal Assessment:** | **40 Marks** |
|---|---|
| Subjective Test | - 20 Marks |
| Assignments | - 10 Marks |
| Bar bending schedules, | - 10 Marks |
| Estimation and cost analysis reports | |

Two subjective tests shall be conducted.

- Each subjective test shall be conducted for 90 Minutes and have 3 questions each

for 7 marks (No choice) and the same shall be scaled down to 20 Marks.

- Average of two subjective tests shall be considered.
- Assignments shall be assessed for 10 marks.
- Bar bending schedules, Estimation and cost analysis reports shall be assessed for 10 marks.

**External Assessment:**

External examination is for 60 Marks. The question paper consists of 2 questions. Each question carries 60 Marks. The student shall answer 1 question.

In each question, the section, plan and reinforcement drawings of various members of a building will be given and the following items are to be calculated.

- Quantities of all the items (20 Marks).
- Reinforcement tonnage and Bar bending schedule (10 Marks).
- Specifications (10 Marks).
- Rates of all the items as per Standard Schedule of Rates (20 Marks).

**Integrated Course (Theory + Lab):**

**Theory and Lab shall be assessed for 200 Marks (Each 100 marks)**

- For Integrated course, the theory shall be assessed for 100 marks, of which 40 marks for internal assessment and 60 marks for semester end external examination.
- The Lab shall be assessed for 100 marks , of which, 40 marks for internal assessment and 60 marks for semester end external examination

**Socially Relevant Project:**

- A student shall identify and provide a solution to the problem relevant to society/Profession/Industry.
- A student shall engage at least 15 hours on socially relevant project. Socially relevant project shall be evaluated internally for 50 marks by Project Review Committee (PRC). PRC comprising of HoD, department Academic Coordinator, R&D member of the department, one senior faculty and guide shall review the progress.

**Mini Project:**

- A student shall undergo internship for a period of 4 weeks/provide solution to the problem relevant to Industry/ Modern tool during the vacation after VI semester and submit comprehensive report.

- Mini project shall be evaluated internally for 50 marks by Project Review Committee (PRC).
- PRC shall prepare rubrics for assessment.

**Project Evaluation**:

Project is divided into 2 phases – Phase I & Phase II

- Evaluation shall comprise of internal and external assessment.
  Internal: 110 (Phase I 50 marks, Phase II 60 Marks)
  External: 90
- A project Review committee (PRC) comprising of HoD, department Academic Coordinator, R&D member of the department, one senior faculty and guide shall review the progress once in four weeks.

**Project Phase I:**

- Project Phase I shall be evaluated internally by PRC for 50 Marks.
- A student shall undertake project phase I during the VII semester.
- A student shall report to the guide/external supervisor and work under his supervision at least 2 hours per week.
- Assessment shall be on
  - Literature review
  - Identification and statement of the Problem

**Project Phase II:**

- A student shall undertake project phase II during the VIII semester.
- A student shall report to the guide/external supervisor and work under his supervision at least 8 hours per week.
- Internal evaluation shall be done by HoD, department Academic Coordinator, R&D member of the department, one senior faculty and guide for 60 marks.
- External evaluation shall be done by HoD, Guide/Internal Examiner and External Examiner for 90 marks.
- Assessment shall be on
  a) Review on fundamental knowledge involved
  b) Inter disciplinary aspect
  c) Experimental/methodology design
  d) Result analysis and interpretations
  e) Report writing

f) Team work
g) Presentation
h) Viva-voce

**B.Tech. (Lateral Entry):**

The rules and regulations for candidates admitted under lateral entry category for $2^{nd}$, $3^{rd}$ and $4^{th}$ years of study shall be same as applicable to regular B.Tech students.

## 7. ATTENDANCE REGULATIONS:

**B.Tech.:**

I. A student shall be eligible to appear for end semester examinations, if he or she acquires a minimum of 75% of attendance in aggregate of all the subjects (Theory & Lab.) for the semester.
II. Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted by the college academic committee.
III. Shortage of attendance below 65% in aggregate of all the subjects (Theory & Lab) for the semester shall not be Condoned.
IV. Detained student shall seek re- admission for that semester when offered within 4 weeks from the date of commencement of class work.

**PROMOTION RULE (Based on attendance):**

- A Student shall be promoted to the next semester on fulfillment of minimum attendance requirement (75%) of current semester.

**PROMOTION RULE (Based on credits):**

- A student shall be promoted from IV semester to V semester if he fulfills the minimum attendance requirement (75%) and academic requirement of 40% of credits up to IV semester from the following examinations irrespective of whether the candidate takes the examination or not.
    - Two regular and Two supplementary examinations of I semester
    - Two regular and One supplementary examinations of II semester
    - One regular examination and One supplementary examination of III semester
    - One regular examination of IV semester.

- A student shall be promoted from VI semester to VII semester if he fulfills the minimum attendance requirement (75%) and academic requirement of 40% of credits up to VI semester from the following examinations irrespective of whether the candidate takes the examination or not.
    - Three regular and Three supplementary examinations of I semester
    - Three regular and Two supplementary examinations of II semester
    - Two regular and Two supplementary examinations of III semester
    - Two regular and One supplementary examinations of IV semester
    - One regular and One supplementary examination of V semester
    - One regular examination of VI semester.

**B.TECH (Lateral Entry):**

**PROMOTION RULE (Based on attendance):**

A Student shall be promoted to the next semester on fulfillment of minimum attendance requirement of current semester.

**PROMOTION RULE (Based on credits):**

A student shall be promoted from VI semester to VII semester if he fulfills the minimum attendance requirement (75%) and academic requirement of 40% of credits up to VI semester from the following examinations irrespective of whether the candidate takes the examination or not.

- Two regular and Two supplementary examinations of III semester
- Two regular and one supplementary examinations of IV semester
- One regular and One supplementary examinations of V semester
- One regular examination of VI semester.

## B.Tech. (Lateral Entry):

The rules and regulations for candidates admitted under lateral entry category for 2nd, 3rd and 4th years of study shall be same as applicable to regular B.Tech students.

## 8. MINIMUM ACADEMIC REQUIREMENTS:

**B.Tech.: (Theory/Lab)**

i. A student is deemed to have satisfied the minimum academic requirements for a course on securing at least 24 marks out of 60 marks at semester end examination and overall minimum of 40 marks out of 100 marks including internal assessment.

ii. **Integrated Course (Theory + Lab):**

- The student shall secure minimum 24 marks out of 60 marks at semester end examination and overall 40 marks out of 100 marks for Theory and Laboratory courses independently. In case of failure in either theory or Laboratory course, the student should re-appear for both theory and laboratory.
- The assessment shall be done independently for both theory and laboratory courses and final marks shall be calculated on weighted average method for converting marks into grade points.

**Sample calculation:**

Integrated course-5 credits. Theory is for 3 credits and laboratory is for 2 credits.

Total Marks obtained in theory: 70 out of 100 (3 Credits)

Total Marks obtained in Lab : 90 out of 100 (2 Credits)

Final marks of the integrated course is

(70X3 + 90X2) / 5 = 78 Marks

**B.Tech. (Lateral Entry):**

The rules and regulations for candidates admitted under lateral entry category for 2nd, 3rd and 4th years of study shall be same as applicable to regular B.Tech students.

**9. GRADING SYSTEM:**

**B.Tech. / B.Tech. (Lateral Entry)**

Semester Grade Point Average (SGPA) for the current semester which is calculated on the basis of grade points obtained in all courses, except audit courses and courses in which satisfactory or course continuation has been awarded,

SGPA= Σ (course credits earned x Grade points) /
Σ (Total course credits in the semester.

**CGPA= Σ (course credits earned x Grade points) up to successfully completed semesters ) / Σ (Total course credits up to successfully completed)**

The UGC recommends a 10-point grading system with the following letter grades as given below:

| | | |
|---|---|---|
| O | (Outstanding) | 10 |
| A+ | (Excellent) | 9 |
| A | (Very Good) | 8 |
| B+ | (Good) | 7 |
| B | (Above Average) | 6 |
| C | (Average) | 5 |
| P | (Pass) | 4 |
| F | (Fail) | 0 |
| Ab | (Absent) | 0 |

- iii. A student obtaining Grade F shall be considered failed and will be required to reappear in the examination.

**Illustration of Computation of SGPA and CGPA and Format for Transcripts**

Computation of SGPA and CGPA

**Illustration for SGPA**

| Course | Credit | Grade Letter | Grade point | Credit Point (Credit x Grade) |
|---|---|---|---|---|
| Course 1 | 3 | A | 8 | 3 X 8 = 24 |
| Course 2 | 4 | B+ | 7 | 4 X 7 = 28 |
| Course 3 | 3 | B | 6 | 3 X 6 = 18 |
| Course 4 | 3 | O | 10 | 3 X10 = 30 |
| Course 5 | 3 | C | 5 | 3 X 5 = 15 |
| Course 6 | 4 | B | 6 | 4 X 6 = 24 |
| | **20** | | | **139** |

Thus, **SGPA** =139/20 = 6.95

**Illustration for CGPA**

| **Semester 1** | **Semester 2** | **Semester 3** | **Semester 4** | **Semester 5** | **Semester 6** |
|---|---|---|---|---|---|
| Credits: 16 | Credits: 18 | Credits: 25 | Credits: 21 | Credits: 23 | Credits: 22 |
| SGPA: 7.9 | SGPA: 7.8 | SGPA: 7.6 | SGPA: 8.0 | SGPA: 8.3 | SGPA: 8.6 |

| **Semester 7** | **Semester 8** |
|---|---|
| Credits: 21 | Credits:14 |
| SGPA: 8.2 | SGPA: 8.5 |

Thus,

**CGPA**= 16x7.9 + 18x7.8 + 25x7.6 + 21x8.0 + 23x8.3 + 22x8.6 + 21x8.2 + 14x8.5 = **8.1**

## 10. ELIGIBILITY FOR AWARD OF DEGREE:

**B.Tech:**

A student shall be eligible for award of the degree if he/she fulfills the following conditions:

1) Successfully completes all the courses prescribed for the Program.
2) CGPA greater than or equal to 4.5(Minimum requirement for Pass),

## 11. AWARD OF CLASS:

**B.Tech:**

Eligible Candidates for the award of B.Tech., Degree shall be placed in one of the following Classes based on CGPA.

| Class | CGPA |
|---|---|
| Distinction | $\geq 7.5$ |
| First Class | $\geq 6.5$ |
| Second Class | $\geq 5.5$ |
| Pass class | $\geq 4.5$ |

## 12. INSTRUCTION DAYS:

A semester shall have a minimum of 90 clear instruction days (including internal examinations).

## 13. Transfers from other Institutions shall not be permitted.

## 14. SUPPLEMENTARY EXAMINATIONS:

Supplementary examinations shall be conducted within 4 weeks from the date of announcement of results of regular examinations.

**15. WITHHOLDING OF RESULTS:** The result of a student shall be withheld

- If the student has not paid the dues, if any, to the institution
- If any case of pending disciplinary action ,
- Involvement in any sort of malpractices etc.
- Involvement in ragging.

## 16. TRANSITORY REGULATIONS:

a) Detained candidates are eligible for re-admission as and when next offered.

b) The re-admitted candidate will be governed by the rules and regulations under which the candidate has been admitted.

c) In case of transferred students from other Universities, credits shall be transferred to JNTUK as per the academic regulations and course structure of JNTUK.

d) The students seeking transfer to colleges affiliated to JNTUK from various other Universities/ Institutions have to obtain the credits of any equivalent subjects as prescribed by JNTUK. The transferred candidates have to write the backlogs/failed subjects, if any, in the same Institution where he/she was admitted.

## 17. AMENDMENTS TO REGULATIONS:

The Academic Council of MVGR College of Engineering (Autonomous) reserves the right to revise, amend, change or nullify the Regulations, Schemes of Examinations, and/ or Syllabi or any other such matter relating to the requirements of the program which are compatible to the contemporary/emerging trends effectively meeting the needs of society/industry/stake holding groups.

## 18. Regulations for MALPRACTICES during the conduct of examinations

| | Nature of Malpractices/Improper conduct | Punishment |
|---|---|---|
| 1 (a) | If the candidate possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination) | Expulsion from the examination hall and cancellation of the performance in that subject only. * |
| (b) | If the candidate gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter. | Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him. * |

| | | |
|---|---|---|
| 2 | If the candidate has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing. | Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year.<br>The Hall Ticket of the candidate is to be cancelled.<br>* |
| 3 | If the candidate impersonates any other candidate in connection with the examination. | The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate, who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider/candidate not on rolls, he will be handed over to the police and a case is registered against him.<br>* |
| 4 | If the candidate mishandles the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.<br>Also if the answer script is mutilated / damaged disturbing the shape, of the script, answers, the bar code intentionally. | Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester. He shall be debarred from class work and all examinations and be allowed to reregistered for the next subsequent odd or even semester only. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.* |

| | | |
|---|---|---|
| 5. | Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks. | The same should be brought to the notice of CE who in turn in consultation with malpractice committee makes decision for cancellation of the performance in that subject.<br>* |
| 6. | Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination. | In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.<br>* |
| 7. | Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall. | Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. * |
| 8. | Possess any lethal weapon or firearm in the examination hall. | Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. * |

| | | |
|---|---|---|
| 9. | If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8. | Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester. The candidate is also debarred and forfeits the seat.<br>Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them. * |
| 10 | Comes in a drunken condition to the examination hall. | Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester. * |
| 11 | Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny. | Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.* |

*

**19. General :**

- Wherever the words “he”, “him”, “his”, occur in the regulations, they include “she”, “her”, “hers”.
- The academic regulation should be read as a whole for the purpose of any interpretation.
- In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor is final.
- The University may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the University.

* * *

# Ragging

## Prohibition of ragging in educational institutions Act 26 of 1997

### Salient Features

- **Ragging within or outside any educational institution is prohibited.**
- **Ragging means doing an act which causes or is likely to cause Insult or Annoyance of Fear or Apprehension or Threat or Intimidation or outrage of modesty or Injury to a student**

| | Imprisonment upto | | Fine Upto |
|---|---|---|---|
| Teasing, Embarrassing and Humiliation | 6 Months | + | Rs. 1,000/- |
| Assaulting or Using Criminal force or Criminal intimidation |  1 Year | + | Rs. 2,000/- |
| Wrongfully restraining or confining or causing hurt |  2 Years | + | Rs. 5,000/- |
| Causing grievous hurt, kidnapping or Abducts or rape or committing unnatural offence |  5 Years | + | Rs. 10,000/- |
| Causing death or abetting suicide |  10 Months | + | Rs. 50,000/- |

**In Case of Emergency CALL TOLL FREE NO. : 1800 - 425 - 1288**

**LET US MAKE MVGR A RAGGING FREE CAMPUS**

# Ragging

ABSOLUTELY NO TO RAGGING

1. **Ragging is prohibited as per Act 26 of A.P. Legislative Assembly, 1997.**
2. **Ragging entails heavy fines and/or imprisonment.**
3. **Ragging invokes suspension and dismissal from the College.**
4. **Outsiders are prohibited from entering the College and Hostel without permission.**
5. **Girl students must be in their hostel rooms by 7.00 p.m.**
6. **All the students must carry their Identity Cards and show them when demanded**
7. **The Principal and the Wardens may visit the Hostels and inspect the rooms any time.**

## PROGRAM STRUCTURE

## B. TECH – CIVIL ENGINEERING

## (A2 Regulation)

| SEMESTER-I | | | | | | |
|---|---|---|---|---|---|---|
| **Sl. No** | **Course Code** | **Course Title** | **L** | **T** | **P** | **Credits** |
| 1 | A2MAT101 | Mathematics-I | 3 | - | - | 3 |
| 2 | A2CYI101 | Engineering Chemistry (Integrated Course) | 3 | - | 3 | 5 |
| 3 | A2EEI201 | Basic Electrical Engineering (Integrated Course) | 3 | - | 3 | 5 |
| 4 | A2CEW201 | Workshop | - | - | 3 | 2 |
| 5 | A2EHA701 | Constitution of India | 2 | - | - | 0 |
| **Total number of Credits:** | | | | | | **15** |

| SEMESTER-II | | | | | | |
|---|---|---|---|---|---|---|
| **Sl. No** | **Course Code** | **Course Title** | **L** | **T** | **P** | **Credits** |
| 1 | A2MAT102 | Mathematics-II | 3 | - | - | 3 |
| 2 | A2PYI101 | Engineering Physics (Integrated Course) | 3 | - | 3 | 5 |
| 3 | A2CII201 | Programming for Problem Solving (Integrated Course) | 3 | - | 3 | 5 |
| 4 | A2MED201 | Computer Aided Engineering Graphics | 1 | - | 4 | 3 |
| 5 | A2EHL001 | Essential Communication in English | 1 | - | 3 | 3 |
| **Total number of Credits:** | | | | | | **19** |

| SEMESTER-III | | | | | | |
|---|---|---|---|---|---|---|
| **Sl. No** | **Course Code** | **Course Title** | **L** | **T** | **P** | **Credits** |
| 1 | A2EHT001 | Effective Technical Communication | 2 | - | 2 | 3 |
| 2 | A2MAT106 | Mathematics-III | 3 | - | - | 3 |
| 3 | A2CET201 | Internet of Things | 2 | - | 2 | 3 |
| 4 | A2CET301 | Engineering Mechanics | 3 | - | - | 3 |
| 5 | A2CET302 | Surveying and Geomatics | 2 | - | 2 | 3 |
| 6 | A2CEI201 | AI Tools, Techniques and Applications (Integrated Course) | 3 | - | 3 | 5 |
| 7 | A2CEI301 | Fluid Mechanics and Hydraulic Machines (Integrated Course) | 3 | - | 3 | 5 |
| 8 | A2CHA701 | Environmental Science | 2 | - | - | 0 |
| **Total number of Credits:** | | | | | | **25** |

| SEMESTER-IV | | | | | | |
|---|---|---|---|---|---|---|
| **Sl. No** | **Course Code** | **Course Title** | **L** | **T** | **P** | **Credits** |
| 1 | A2CHT101 | Biology for Engineers | 3 | - | - | 3 |
| 2 | A2MAT110 | Mathematics-IV | 3 | - | - | 3 |
| 3 | A2CET202 | Design Thinking and Product Innovation | 3 | - | - | 3 |
| 4 | A2CET303 | Building Planning and Project Management | 2 | - | 2 | 3 |
| 5 | A2CEI302 | Strength of Materials (Integrated Course) | 3 | - | 3 | 4.5 |
| 6 | A2CEI303 | Materials, Testing and Evaluation (Integrated Course) | 3 | - | 3 | 4.5 |
| 7 | A2EHA702 | Essence of Indian Traditional Knowledge | 2 | - | - | 0 |
| **Total number of Credits:** | | | | | | **21** |

| SEMESTER-V | | | | | | |
|---|---|---|---|---|---|---|
| **Sl. No** | **Course Code** | **Course Title** | **L** | **T** | **P** | **Credits** |
| 1 | A2CET304 | Basic Reinforced Concrete Design | 3 | - | - | 3 |
| 2 (PE-1) | A2CET401 | Advanced Concrete Technology | 3 | - | - | 3 |
| | A2CET402 | Engineering Geology | | | | |
| | A2CET403 | Road Safety Engineering | | | | |
| | A2CET404 | MOOCs | | | | |
| 3 | A2CEI304 | Structural Analysis (Including STAAD. Pro.) (Integrated Course) | 3 | - | 2 | 4 |
| 4 | A2CEI305 | Soil Mechanics (Integrated Course) | 3 | - | 3 | 4.5 |
| 5 (OE-1) | A2MST002 | OE-I: Human Resources Development and Organizational Behavior | 3 | - | - | 3 |
| 6 (OE-2) | A2xxxxx | | 3 | - | - | 3 |
| 7 | A2CEP602 | Mini Project | - | - | - | 2 |
| **Total number of Credits:** | | | | | | **22.5** |

| SEMESTER-VI | | | | | | |
|---|---|---|---|---|---|---|
| **Sl. No** | **Course Code** | **Course Title** | **L** | **T** | **P** | **Credits** |
| 1 | A2MST001 | Managerial Economics and Financial Analysis | 3 | - | - | 3 |
| 2 | A2CET305 | Design of Steel Structures | 3 | - | - | 3 |
| 3 | A2CET306 | Highway Engineering | 3 | - | - | 3 |
| 4 | A2CET307 | Water Resources Engineering | 3 | - | - | 3 |
| 5 (PE-2) | A2CET405 | Advanced Fluid Mechanics | 3 | - | - | 3 |
| | A2CET406 | Railways, Airports and Harbors | | | | |
| | A2CET407 | Repair and Rehabilitation of Structures | | | | |
| | A2CET408 | MOOCs | | | | |
| 6 (PE-3) | A2CET409 | Advanced Structural Analysis | 3 | - | - | 3 |
| | A2CET410 | Ground Improvement Techniques | | | | |
| | A2CET411 | Open Channel Hydraulics | | | | |
| | A2CET412 | MOOCs | | | | |
| 7 | A2CEI306 | Environmental Engineering (Integrated Course) | 3 | - | 3 | 4.5 |
| **Total number of Credits:** | | | | | | **22.5** |

| SEMESTER-VII | | | | | | |
|---|---|---|---|---|---|---|
| **Sl. No** | **Course Code** | **Course Title** | **L** | **T** | **P** | **Credits** |
| 1 | A2EHT002 | Professional Ethics and Human Values | 3 | - | - | 3 |
| 2 | A2CET308 | Estimation and Costing | 3 | - | - | 3 |
| 3 | A2CET309 | Foundation Engineering | 3 | - | - | 3 |
| 4 (PE-4) | A2CET413 | Building Construction and Services | 3 | - | - | 3 |
| | A2CET414 | Irrigation Engineering and Hydraulic Structures | | | | |
| | A2CET415 | Reinforced Soil Structures | | | | |
| | A2CET416 | MOOCs | | | | |
| 5 (PE-5) | A2CET417 | Air Pollution Engineering | 3 | - | - | 3 |
| | A2CET418 | Disaster Management | | | | |
| | A2CET419 | Traffic Engineering and Transport Planning | | | | |
| | A2CET420 | MOOCs | | | | |
| 6 (PE-6) | A2CET421 | Water Supply and Sanitary Engineering | 3 | - | - | 3 |
| | A2CET422 | Advanced Reinforced Concrete Design | | | | |
| | A2CET423 | Remote Sensing and GIS | | | | |
| | A2CET424 | MOOCs | | | | |
| 7 | A2CEP601 | Socially Relevant Project | - | - | 2 | 1 |
| 8 | A2CEP603 | Project (Phase–I) | - | - | 4 | 2 |
| **Total number of Credits:** | | | | | | **21** |

| SEMESTER - VIII | | | | | | |
|---|---|---|---|---|---|---|
| **Sl. No** | **Course Code** | **Course Title** | **L** | **T** | **P** | **Credits** |
| 1 | A2CET5xx | Open Elective – III | 3 | - | - | 3 |
| 2 | A2CET5xx | Open Elective – IV | 3 | - | - | 3 |
| 3 | A2CEP604 | Project Phase – II | - | - | 16 | 8 |
| **Total number of Credits** | | | **14** | | | |

**Note:** Each department is offering 4 open elective courses. One elective course is from Humanities (Human Resources Development and Organizational Behavior) which is common to all Engineering departments. 2nd Open elective course should be opted from the other departments (List of Open elective courses offered by various departments are given below). 3rd and 4th Open elective courses (Emerging subjects) should be discipline centric.

## OPEN ELECTIVES

| OPEN ELECTIVE COURSES OFFERED BY THE DEPARTMENT OF CIVIL ENGINEERING | | | | | | |
|---|---|---|---|---|---|---|
| **Sl. No** | **Course Code** | **Course Title** | **L** | **T** | **P** | **Credits** |
| 1 | A2CET501 | Remote Sensing and GIS | 3 | - | - | 3 |
| 2 | A2CET502 | Project Planning and Management | 3 | - | - | 3 |
| 3 | A2CET503 | Road Safety Engineering | 3 | - | - | 3 |
| 4 | A2CET504 | Geomatics | 3 | - | - | 3 |
| 5 | A2CET505 | Building Services | 3 | - | - | 3 |
| 6 | A2CET506 | Water Power Engineering | 3 | - | - | 3 |
| **OPEN ELECTIVE COURSES OFFERED BY THE DEPARTMENT OF EEE** | | | | | | |
| **Sl. No** | **Course Code** | **Course Title** | **L** | **T** | **P** | **Credits** |
| 1 | A2EET501 | Basic Control Systems | | | | |
| 2 | A2EET502 | Applied Electrical Engineering | | | | |
| 3 | A2EET503 | Electrical Safety | | | | |
| 4 | A2EET504 | Concepts of Electrical Wiring | | | | |
| 5 | A2EET505 | Basic Automation Course | | | | |
| 6 | A2EET506 | Illumination Engineering | | | | |
| **OPEN ELECTIVE COURSES OFFERED BY THE DEPARTMENT OF MECHANICAL ENGINEERING** | | | | | | |
| **Sl. No** | **Course Code** | **Course Title** | **L** | **T** | **P** | **Credits** |
| 1 | A2MET501 | Introduction to Robotics | 3 | - | - | 3 |
| 2 | A2MET502 | Solar and Wind Energy | 3 | - | - | 3 |
| 3 | A2MET503 | Production and Operations Management | 3 | - | - | 3 |
| 4 | A2MET504 | Micro Electromechanical Systems | 3 | - | - | 3 |
| 5 | A2MET505 | Product Lifecycle Management | 3 | - | - | 3 |
| 6 | A2MET506 | Foundation of Computational Fluid Dynamics | 3 | - | - | 3 |
| | | | | | | |
| **OPEN ELECTIVE COURSES OFFERED BY THE DEPARTMENT OF ECE** | | | | | | |
| **Sl. No** | **Course Code** | **Course Title** | **L** | **T** | **P** | **Credits** |
| 1 | A2ECT501 | Principles of Communication Engineering | 3 | - | - | 3 |
| 2 | A2ECT502 | Electronic Instrumentation | 3 | - | - | 3 |
| 3 | A2ECT503 | Biomedical Engineering | 3 | - | - | 3 |
| 4 | A2ECT504 | Modern Communication Systems | 3 | - | - | 3 |
| 5 | A2ECT505 | Transducers and Sensors | 3 | - | - | 3 |
| 6 | A2ECT506 | Principles of Mobile Communications | 3 | - | - | 3 |

| OPEN ELECTIVE COURSES OFFERED BY THE DEPARTMENT OF CSE & IT | | | | | | |
|---|---|---|---|---|---|---|
| **Sl. No** | **Course Code** | **Course Title** | **L** | **T** | **P** | **Credits** |
| 1 | A2CIT501 | Fundamentals of Data Structures | 3 | - | - | 3 |
| 2 | A2CIT502 | Object Oriented Programming with JAVA | 3 | - | - | 3 |
| 3 | A2CIT503 | Web Design and Development | 3 | - | - | 3 |
| 4 | A2CIT504 | Python Programming | 3 | - | - | 3 |
| 5 | A2CIT505 | NoSQL Databases | 3 | - | - | 3 |
| 6 | A2CIT506 | Data Analytics | 3 | - | - | 3 |
| **OPEN ELECTIVE COURSES OFFERED BY THE DEPARTMENT OF CHEMICAL ENGINEERING** | | | | | | |
| **Sl. No** | **Course Code** | **Course Title** | **L** | **T** | **P** | **Credits** |
| 1 | A2CHT501 | Computational Fluid Dynamics | 3 | - | - | 3 |
| 2 | A2CHT502 | Non-Conventional Sources of Energy | 3 | - | - | 3 |
| 3 | A2CHT503 | Design & Analysis of Experiments | 3 | - | - | 3 |
| 4 | A2CHT504 | Industrial Waste Water Engineering | 3 | - | - | 3 |
| 5 | A2CHT505 | Green Chemistry & Technology | 3 | - | - | 3 |
| 6 | A2CHT506 | Air Pollution Control and Design of Equipment | 3 | - | - | 3 |

| A2MAT101 | SEMESTER - I | L | T | P | C |
|---|---|---|---|---|---|
| | MATHEMATICS-I (common to ALL branches) | 3 | 0 | - | 3 |
| | Total Contact Hours – 48 | | | | |

## SYLLABUS

### UNIT-I: LINEAR ALGEBRA-1

Rank of a matrix: Elementary row and column transformations, equivalent matrices, Echelon form of a matrix, calculation of rank by reducing the matrix to Echelon form. System of equations: Linear system of equations, homogeneous and non-homogeneous system of equations, consistency criteria, trivial and non-trivial solutions, solving system of equations by Rank method; Eigenvalues and Eigenvectors: Finding Eigenvalues and Eigenvectors, properties of Eigenvalues and Eigenvectors (statements) including spectral mapping theorem.

### UNIT- II: LINEAR ALGEBRA-2

Cayley-Hamilton Theorem: Statement of the theorem and its verification. Applications: Finding higher powers of a matrix, finding matrix polynomials, finding inverse of matrix. Diagonal form of a matrix: Reduction to diagonal form, spectral and modal matrices, finding higher powers of a matrix using diagonalisation, Quadratic forms: Matrix form of quadratic forms, orthogonal transformation, canonical form, reduction of quadratic form to canonical form by orthogonal transformation method, rank, index, signature and nature (definiteness) of a quadratic form.

### UNIT-III: FIRST ORDER DIFFERENTIAL EQUATIONS & APPLICATIONS

Outlines: Differential Equations(DEs), Order and degree of a DE, Formation of DEs, general solutions of a DE; Solving first order and first degree DEs: linear DEs, Bernoulli's DEs (reducible to linear), exact DEs, integrating factors, non-exact DEs (reducible to exact).

Applications to real world problems: Newton's law of cooling, laws of growth and decay, family of curves, orthogonality of families curves, orthogonal trajectories (Cartesian and polar curves).

### UNIT-IV: HIGHER ORDER DIFFERENTIAL EQUATIONS

Differential equations of higher order: Linear differential equations of higher order, its operator form. Solution concepts: General (complete) solution, particular solution. Solution of linear differential equations of higher order: Auxiliary equations, rules for finding complementary functions, rules for finding particular integrals (general and special methods).

### UNIT-V: LAPLACE TRANSFORMS

Laplace transformation: Laplace transformation of elementary functions, Properties: Linearity, change of scale, first shifting properties, finding Laplace transformations using properties, Advanced properties: Laplace transformations of derivatives and integrals, multiplication by $t^n$, division by t (statements), finding Laplace transformations using advanced properties; Inverse Laplace transformations: Finding inverse Laplace transformations using partial fractions, statement of Convolution theorem, finding inverse Laplace transformations by Convolution theorem; Applications: Solving Initial Value Problems by using Laplace transformations.

**TEXT BOOKS:**

1. B.S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017
2. T.K.V. Iyengar et al, Engineering Mathematics, S. Chand Publishers, Revised edition

**REFERENCE BOOKS:**

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011
2. B.V. Ramana, Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010
3. T. Veerarajan, Higher Engineering Mathematics, Tata McGraw-Hill, 2008

**COURSE OUTCOMES:** Learners at the end of this course will be able to

| | |
|---|---|
| CO 1 | Recall the concepts of Linear algebra |
| CO 2 | Recall the solution methods and applicability of first order differential equations |
| CO 3 | Recall the solution methods of higher order differential equations and the concepts of Laplace transforms |
| CO 4 | Use and interpret the concepts of linear algebra |
| CO 5 | Use and interpret solution methods and applicability of first order differential equations |
| CO 6 | Use and interpret solution methods of higher order differential equations and the concepts of Laplace transforms |
| CO 7 | Apply the concepts of linear algebra, differential equations and Laplace transformation to model and solve real world problems |

CO/PO Mapping

| Course Title: | | | | Mathematics-I (Common to ALL Branches) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Code: | | | | A2MAT101 | | | | | | | | | | |
| Course Designed by | | | | Dept. of Mathematics | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 3 | 3 | | 2 | | | | | | | 2 | | | |
| CO2 | 3 | 3 | | 2 | | | | | | | 2 | | | |
| CO3 | 3 | 3 | | 2 | | | | | | | 2 | | | |
| CO4 | 3 | 3 | | 2 | | | | | | | 2 | | | |
| CO5 | 3 | 3 | | 2 | | | | | | | 2 | | | |
| CO6 | 3 | 3 | | 2 | | | | | | | 2 | | | |
| CO7 | 3 | 3 | | 2 | | | | | | | 2 | | | |

| | |
|---|---|
| Course designed by | DEPARTMENT OF MATHEMATICS |
| Approval | Approved by: Meeting of Board of Studies held on 06.07.2019 |
| | Ratified by: 5th Meeting of Academic Council, 13-07-2019. |

| A2CYI101 | SEMESTER - I | L | T | P | C |
|---|---|---|---|---|---|
| | ENGINEERING CHEMISTRY (Common to all branches) | 3 | -- | 3 | 5 |
| | Total Contact Hours – 48 | | | | |

## SYLLABUS

### UNIT 1: WATER TECHNOLOGY

Introduction –Soft Water and hardness of water, Estimation of hardness by EDTA Method - Boiler troubles - Industrial water treatment – specifications for drinking water, Bureau of Indian Standards(BIS) and World health organization(WHO) standards, zeolite and ion-exchange processes - desalination of brackish water, reverse osmosis (RO) and electro dialysis.

### UNIT 2: POLYMERS

Introduction to polymers, functionality of monomers, addition and condensation polymerization, copolymerization, stereospecific polymerization with specific examples. Thermoplastics and Thermo-sets – their differences.

Elastomers – applications with specific examples- Preparation, properties and uses of PVC, Bakelite, Teflon and Nylon-6, 6, Buna-S and Thiokol rubber- Fibre reinforced plastics – carbon fibre, glass fibre and aramids.

### UNIT 3: ELECTROCHEMISTRY AND APPLICATIONS

Electrodes – concepts, electrochemical cell, Nernst equation, cell potential calculations.
Primary cells –dry cell- Secondary cells – lead acid, nickel-cadmium and lithium ion batteries- working of the batteries including cell reactions- Fuel cells, hydrogen-oxygen, and methanol fuel cells – working of the cells.
Corrosion: Introduction to corrosion, mechanism of dry and wet corrosion, Pilling Bedworth ratios and uses, Types of corrosion – Differential aeration corrosion, galvanic corrosion, pitting corrosion, waterline corrosion and stress corrosion, Factors affecting the rate of corrosion – metal based factors and environmental based factors, protection techniques – metal coatings – galvanization and tinning, cathodic protection, inhibitors – cathodic and anodic, organic coatings – paints – constituents and their functions.

### UNIT-4: CHEMISTRY OF ADVANCED MATERIALS

**NANOMATERIALS:** introduction- synthesis of Nano material by sol gel method- CVD- engineering applications of Nano materials
**CEMENT**: Introduction to ordinary Portland cement- manufacturing of OPC- setting and hardening of cement- decay of cement.
**FUELS**: Introduction- classification- liquid fuels- cracking- knocking- octane number and cetane number; Lubricants- definition- mechanism and properties of lubricants

### UNIT 5: INSTRUMENTAL METHODS AND APPLICATIONS

Electromagnetic spectrum. Absorption of radiation: Beer-Lambert's law. Principle, instrumentation (Block diagram and working), applications of UV, IR and NMR spectroscopic methods. Chromatography- introduction- Ion exchange chromatography- applications

**Text books:**

1. Jain and Jain, Engineering Chemistry, 16/e, Dhanpat Rai, 2013.
2. Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007.

**Reference books:**

1. H.F.W. Taylor, Cement Chemistry, 2/e, Thomas Telford Publications, 1997.
2. H.Kaur, Instrumental Methods of chemical analysis, Pragathi Prakashan, 2012.
3. Chemistry for Engineers, Teh Fu Yen, Imperial college press, London

**COURSE OUTCOMES:**

| | |
|---|---|
| **CO1** | The student will have the ability to describe softening methods and desalination processes. He/ She will be able to explain various types of polymers; preparation, properties and engineering applications of thermoplastic, thermosetting plastics, rubbers and FRP's. |
| **CO2** | The student will have the ability to describe electrochemical reactions, principles of batteries, fuel cell and corrosion. |
| **CO3** | The student will have the ability to outline electromagnetic spectrum and explain the working principles of IR, UV, NMR and chromatographic techniques. The student describes the synthesis, properties and applications of nanomaterials, cement. HE/ She Outlines the cracking methods, knocking of fuels. |
| **CO4** | The student will have the ability to differentiate between hard and soft water, demineralization and deionization processes and thermosetting – thermoplastic materials. |
| **CO5** | The students will have the ability to give examples on primary and secondary batteries, various types of corrosion, methods of corrosion prevention. |
| **CO6** | The student will have the ability to draw inferences on the principles and applications of various instrumental methods and also can compare and contrast between cracking methods. |
| **CO7** | The student will have the ability to analyze water samples and validate the results obtained and apply their knowledge on polymers, batteries, materials and instrumentation. |

CO/PO Mapping

| Course Title: | | | | Engineering Chemistry | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Code: | | | | A2CYI101 | | | | | | | | | | |
| Course Designed by | | | | Dept. of Chemistry | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 3 | | | | | | | | 2 | | | 1 | | |
| CO2 | 3 | | | | | | | | 2 | | | 1 | | |
| CO3 | 3 | | | | | | | | 2 | | | 1 | | |
| CO4 | 3 | | | | | | | | 2 | | | 1 | | |
| CO5 | 3 | | | | | | | | 2 | | | 1 | | |
| CO6 | 3 | | | | | | | | 2 | | | 1 | | |
| CO7 | 3 | | | | | | | | 2 | | | 1 | | |

| | |
|---|---|
| Course designed by | DEPARTMENT OF CHEMISTRY |
| Approval | Approved by: Meeting of Board of Studies held on 29.06.2019 |
| | Ratified by: 5th Meeting of Academic Council, 13-07-2019. |

# Engineering Chemistry - Laboratory

**List of Experiments:**

1. Determination of HCl using sodium carbonate
2. Determination of Hardness of a groundwater sample.
3. pH metric titration of strong acid vs. strong base
4. Condcutometric titration of Strong acid VS Strong base
5. Condcutometric titration of Weak acid VS strong base
6. Potentiometric titration of Fe(II) with potassium dichromate
7. Determination of Strength of an acid in Pb-Acid battery
8. Preparation of a polymer
9. Determination of viscosity of polymer solution using survismeter
10. Determination of percentage of Iron in Cement sample by colorimetry
11. Estimation of Calcium oxide in port land Cement
12. Preparation of Nanomaterials (ex: Fe/ Zn/ Ferrite)
13. Adsorption of acetic acid by charcoal
14. Determination of acid value and saponification value of a given lubricant
15. Project based learning (Mandatory for all students)

**Course Outcomes:**

| | |
|---|---|
| **CO1** | The student will be able to determine total hardness, strength of acid in a lead acid battery, calcium in Portland cement using volumetric analysis |
| **CO2** | The student will be able to explain condcutometric, potentiometric, pH metric titrations and colorimetric determination |
| **CO3** | The student will be able to explain the synthesis of a polymer, nanomaterials |

CO/PO Mapping

| Course Title: | | | | Engineering Chemistry | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Code: | | | | A2CYI101 | | | | | | | | | | |
| Course Designed by | | | | Dept. of Chemistry | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 3 | | 1 | | | 1 | | | | 1 | 1 | 2 | | |
| CO2 | 3 | | 1 | | | 1 | | | | 1 | 1 | 1 | | |
| CO3 | 3 | | 1 | | | | | | | 1 | 1 | 1 | | |

| | |
|---|---|
| Course designed by | DEPARTMENT OF CHEMISTRY |
| Approval | Approved by: Meeting of Board of Studies held on 29.06.2019 |
| | Ratified by: 5th Meeting of Academic Council, 13-07-2019. |

| A2EEI201 | SEMESTER – I | L | T | P | C |
|---|---|---|---|---|---|
| | Basic Electrical Engineering (Common to all branches) | 3 | - | 3 | 5 |
| | Total Contact Hours – 50 | | | | |

## SYLLABUS

**UNIT 1: D.C. CIRCUITS**

Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff's current and voltage laws, Analysis of simple circuits with DC excitation, Superposition, Thevenin's and Norton's Theorems, Time-domain analysis of first-order RL and RC circuits.

**UNIT 2: A.C. CIRCUITS**

Representation of sinusoidal waveforms, Average and RMS values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase AC circuits (Series & Parallel), Resonance, Three-phase balanced circuits, voltage and current relations in star and delta configurations.

**UNIT 3: DC & AC MACHINES [ELEMENTARY TREATMENT ONLY]**

Principle and operation of DC Generator - EMF equation – open circuit characteristic of DC shunt generator – principle and operation of DC Motor – Types of DC Motors – Performance Characteristics of DC Motor - Speed control of DC Motor – Principle and operation of single-phase Transformer - OC and SC tests on transformer - principle and operation of single phase & Three phase Induction Motors, construction and working of synchronous motors

**UNIT 4: BASICS OF POWER SYSTEMS:**

Layout & operation of Hydro, Thermal, Nuclear Stations - Solar & wind generating stations – Typical AC Power Supply scheme – Elements of Transmission line – Types of Distribution systems: Primary & Secondary distribution systems.

**UNIT 5: ELECTRICAL INSTALLATIONS**

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing, Types of Batteries, Characteristics of Batteries. Elementary calculations for energy consumption, power factor improvement, battery backup.

**TEXT BOOK/ REFERENCES:**


1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010
2. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
3. Vincent Del Toro, "Electrical Engineering Fundamentals", Pearson, 2015.

**COURSE OUTCOMES:**

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

| | |
|---|---|
| **CO1** | To recall fundamental concepts of electrical circuits such as charge, voltage, current and power. |
| **CO2** | Describe the principle of operation of D.C. & A.C. machines. |
| **CO3** | Outline the working operation of various generating stations. |
| **CO4** | Explain the procedure for solving circuits with A.C and D.C. Excitation |
| **CO5** | Summarize the performance characteristics of different machines |
| **CO6** | Explain about different equipment used in power industry |
| **CO7** | Apply the fundamental laws, associated with Basic Electrical Engineering to solve real world problems in the field of Engineering |

CO/PO Mapping

| CO / PO mapping | Program Outcomes | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | PSO 1 | PSO 2 |
| **CO1** | 3 | 3 | 1 | 1 | | | 3 | | | 1 | | | 1 | 1 |
| **CO2** | 3 | 2 | 2 | 2 | 2 | | | | | 1 | | | 1 | 1 |
| **CO3** | 3 | 3 | 3 | 1 | 1 | | 1 | | | 1 | | | 1 | 1 |
| **CO4** | 3 | 3 | 2 | 1 | 1 | | 2 | | | 1 | | | 1 | 1 |
| **CO5** | 3 | 3 | 2 | 1 | 1 | 3 | 1 | | | 1 | | | 1 | 1 |
| **CO6** | 3 | 3 | 2 | 1 | | 2 | 2 | | | 1 | | 1 | 3 | 2 |
| **CO7** | 3 | 3 | 3 | 3 | 3 | 2 | 2 | | | 2 | | 3 | 3 | 3 |

| | |
|---|---|
| Course designed by | Department of Electrical & Electronics Engineering |
| Approval | Approved by: Meeting of Board of Studies held on 29.06.19 |
| | Ratified by: 5th Meeting of Academic Council, 13-07-2019. |

## Basic Electrical Engineering Laboratory

LIST OF EXPERIMENTS

Basic safety precautions, Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope, resistors, capacitors and inductors.

1. Verification of Kirchhoff laws.
2. Verification of Network Theorems.
3. Magnetization characteristics of a DC Shunt Generator.
4. Speed control of DC Shunt Motor.
5. Predetermination of performance parameters of 1 – Phase Transformer.
6. I – V Characteristics of Solar PV cell
7. Brake test on DC Shunt Motor.
8. Measurement of earth resistance.
9. Measurement of reactive power in three phase balanced circuit.
10. Measurement of Choke coil parameters
11. Brake test on 3 - Phase Induction Motor.
12. Determination of AC quantities using CRO/DSO.
13. I – V characteristics of battery.

**COURSE OUTCOMES:**

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

| | |
|---|---|
| **CO1** | Identify common electrical equipment used in laboratory.(L1) |
| **CO2** | Estimate the ratings of different equipment used to perform an experiment. (L2) |
| **CO3** | Demonstrate the usage of various electrical measuring instruments.(L3) |
| **CO4** | Analyze the characteristics of rotating & stationery electrical machines (L4). |
| **CO5** | Interpret the characteristics of PV cell and Battery.(L5) |

CO/PO Mapping

| CO / PO Mapping | Program Outcomes | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | PSO 1 | PSO 2 |
| **CO1** | 3 | | 1 | 1 | 3 | 1 | | | 3 | 2 | 2 | 2 | 2 | 1 |
| **CO2** | 3 | 2 | 3 | 3 | 3 | 2 | 1 | | 3 | 3 | 2 | 2 | 2 | 3 |
| **CO3** | 2 | 2 | 2 | 2 | 3 | 1 | | | 3 | 3 | 1 | 2 | 2 | 1 |
| **CO4** | 3 | 3 | 3 | 3 | 2 | | | | 3 | 3 | | 2 | 3 | 2 |
| **CO5** | 3 | 3 | 3 | 3 | 3 | | 1 | | 3 | 3 | 2 | 2 | 3 | 3 |

| | |
|---|---|
| Course designed by | Department of Electrical & Electronics Engineering |
| Approval | Approved by: Meeting of Board of Studies held on 29.06.19 |
| | Ratified by: 5th Meeting of Academic Council, 13-07-2019. |

| A2CEW201 | SEMESTER - I | L | T | P | C |
|---|---|---|---|---|---|
| | WORKSHOP | 0 | 0 | 4 | 2 |
| | Total Contact Hours – 48 | | | | |

## SYLLABUS

### LIST OF EXPERIMENTS

1. Ranging – offsets - chainage
2. To find the area of an irregular polygon using chain by using horizontal measurements
3. Determination of bearings and included angles with prismatic compass.
4. Estimation of quantity of bricks, concrete, wood, paint for the given single room building
5. Masonry work: Hands on practice work for different types of bonds in brick masonry
6. Setting out of building : The student is required to set out a building (Single room only) as per the given building plan using tape and cross staff
7. Identification of rock / ore forming minerals
8. Identification of Rocks – Igneous, Sedimentary, Metamorphic rocks
9. Finding the discharge velocity in a water pipe line and find density of water
10. Computation of centre of gravity and moment of inertial of (i) I-sectionand (ii) Channel section.

### FOR DEMONSTRATION

11. Demonstration on usage of chain
12. Demonstration on various Building materials used in construction
13. Identification of quality of cement through physical tests
14. Identification of quality of brick through physical tests
15. Identification of soil based on their physical properties
16. Demonstration on Installation of simple sanitary fittings and fixtures like Tap, T-joint, Elbow, bend, threading etc.
17. Demonstration on Automatic weather station for measuring different climatic parameters like Temperature, humidity, rainfall, evaporation etc.,
18. Welding (arc welding and gas welding)
19. Carpentry
20. Indentify deferent types of roads in the campus and write the physical characteristics of layers
21. Demonstration on making of cement mortar/concrete for the given nominal mix
22. Study of a given Toposheet

**REFERENCE BOOKS**

1. Laboratory manual for Basic civil Engineering workshop compiled by Department of Civil Engineering MVGR College of Engineering (A)

**COURSE OUTCOMES:**

**Learners at the end of this Laboratory course will be able to**

| | |
|---|---|
| **CO1** | Identify various components of a building and give lump-sum estimate. |
| **CO2** | Determine distances and irregular areas using conventional survey instruments like chain, tape, cross-staff and compass |
| **CO3** | Identify different soils, minerals and rocks. |
| **CO4** | Know various traffic signs & signals |
| **CO5** | Determine centre of gravity and moment of inertia of channel and I-sections. |
| **CO6** | Set out a signal room building as per given plan |
| **CO7** | Know to observe various climatic parameters using AWS |
| **CO8** | Install simple sanitary filling and find discharge / velocity in a water pipe line as density of water |
| **CO9** | Know to the process of making cement mortar / concrete for nominal mix |

| **A2CEW201- WORKSHOP** | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO/ PO** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **PSO-1** | **PSO-2** |
| COs | | | | √ | | | | | √ | | | √ | √ | √ |

| **A2CEW201 WORKSHOP** | |
|---|---|
| Course Designed by | Department of Civil Engineering |
| Approval | Approved by: Meeting of Board of Studies held on 09.07.2019 |
| | Ratified by: Meeting of Academic Council, held on |

| A2EHA701 | SEMESTER - I | L | T | P | C |
|---|---|---|---|---|---|
| | CONSTITUTION OF INDIA | 2 | - | - | 0 |
| | Total Contact Hours – 30 | | | | |

## SYLLABUS

**UNIT – I: HISTORY OF MAKING OF THE INDIAN CONSTITUTION**
History - Drafting Committee, (Composition & Working)

**UNIT – II: PHILOSOPHY OF THE INDIAN CONSTITUTION:** Preamble - Salient Features

**UNIT-III: CONTOURS OF CONSTITUTIONAL RIGHTS & DUTIES:** Fundamental Rights -Right to Equality -Right to Freedom -Right against Exploitation -Right to Freedom of Religion -Cultural and Educational Rights -Right to Constitutional Remedies ; Directive Principles of State Policy ; Fundamental Duties.

**UNIT-IV: ORGANS OF GOVERNANCE:** Parliament -Composition - Qualifications and Disqualifications - Powers and Functions - Executive - President - Governor - Council of Ministers; Judiciary, Appointment and Transfer of Judges, Qualifications.

**UNIT – V: LOCAL ADMINISTRATION:** District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Panchayati raj: Introduction, PRI: Zila Panchayat. Elected officials and their roles, CEO Zila Panchayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy

**TEXT BOOK:**
Reference Source compilation

**REFERENCES:**
**1.** The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.

**COURSE OUTCOMES:**

| | |
|---|---|
| CO1 | Students will be able to discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics. |
| CO2 | Students will be able discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India. |
| CO3 | Students will be able to discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP]under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution. |
| CO4 | Students will be able to discuss the passage of the Hindu Code Bill of 1956. |
| CO5 | Students will be able to discuss the powers of Executive, Judiciary and Legislature. |

CO/PO Mapping

| Course Title: | | | | Constitution of India (Common to ALL Branches) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Code: | | | | A2EHA701 | | | | | | | | | | |
| Course Designed by | | | | Dept. of English & Humanities | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | | | | | | 2 | | | | | | | | |
| CO2 | | | | | | 2 | | | | | | | | |
| CO3 | | | | | | 2 | | | | | | | | |
| CO4 | | | | | | 2 | | | | | | | | |
| CO5 | | | | | | 2 | | | | | | | | |

| | |
|---|---|
| Course designed by | DEPARTMENT OF ENGLISH & HUMANITIES |
| Approval | Approved by: Meeting of Board of Studies held on 23.06.15 |
| | Ratified by: 5th Meeting of Academic Council, 13-07-2019. |

*** * ***

| A2MAT102 | SEMESTER - II | L | T | P | C |
|---|---|---|---|---|---|
| | MATHEMATICS-II (MEC,ECE,EEE,CHE & CIV) | 3 | 0 | - | 3 |
| | Total Contact Hours – 48 | | | | |

## SYLLABUS

### UNIT-I: NUMERICAL METHODS-1

Solving Algebraic and Transcendental Equations: Intermediate value theorem (statement), solution concepts, error in solution, measure of accuracy, approximate and exact solutions, Solution methods: Bisection method, Regula-Falsi method and Newton-Raphson Iterative method; Finite differences: Forward, backward and shift operators, relations among operators, Interpolation: Interpolation and extrapolation, data of equal and unequal intervals, Newton's forward and backward Interpolation formulae, Lagrange's interpolation formula, Fitting polynomials to the data by using Newton's and Lagrange's formulae, Inverse Interpolation by Lagrange's formula.

### UNIT- II: NUMERICAL METHODS-2

Numerical Integration: Simpson's and Trapezoidal rules, Weddle's and Boole's rules of integrations; Numerical solutions of ordinary differential equations: Concepts of Initial Value Problem, Taylor's series method, Euler's method, Runge - Kutta method of fourth order; Predictor-corrector method: Milne's method to solve initial value problems.

### UNIT-III: MULTIVARIABLE CALCULUS

Overview: Functions of two variables, limit and continuity, partial derivative and its geometrical meaning; Functions of several variables: Partial differential coefficients of higher order, total derivatives, Chain rules for partial differentiation, partial differentiation of Implicit functions; Jacobians: Jacobian and properties, chain rule, functional dependence, Jacobian of implicit functions

Maxima and Minima: Maxima and minima of a function of two variables, constrained maxima and minima, Lagrange's method of undetermined multipliers.

### UNIT-IV: PARTIAL DIFFERENTIAL EQUATIONS -FIRST ORDER

Formation of PDEs: Elimination of arbitrary constants, Elimination of arbitrary functions; Solution concepts of PDEs: Complete solution / integral, particular integral, general integral and singular integral, PDEs solvable by direct integration; Linear PDEs of first order (Lagrange's linear equation): Method of grouping and method of multipliers; Nonlinear PDEs of first order: Solution methods of solving PDEs in standard forms I, II, III & IV (as is specified in Text Book 1).

### UNIT-V: PARTIAL DIFFERENTIAL EQUATIONS -HIGHER ORDER

Homogeneous Linear Partial Differential Equations of second and higher order with constant coefficients: Symbolic form, Rules for finding complementary function, Rules for finding particular integral, working procedure to get complete solution; Solving nonhomogeneous linear PDEs of second and higher order with constant coefficients; Method of separation of variables: concept of boundary value problem, solving boundary value problems by separating variables.

**TEXT BOOKS:**

1. B.S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017
2. T.K.V. Iyengar et al, Engineering Mathematics, S. Chand Publishers, Revised edition

**REFERENCE BOOKS:**

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011
2. B.V. Ramana, Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010
3. T. Veerarajan, Higher Engineering Mathematics, Tata McGraw-Hill, 2008

**COURSE OUTCOMES:** At the end of course, students shall be able to

| | |
|---|---|
| **CO1** | Recall the concepts of numerical methods |
| **CO2** | Recall the concepts of multivariable calculus. |
| **CO3** | Recall solution methods of PDEs |
| **CO4** | Use the concepts of numerical methods to solve equations, do interpolation & numerical integration and also to solve ODEs numerically. |
| **CO5** | Use the concepts of multivariable calculus to find maxima & minima of a multivariable function. |
| **CO6** | Use solution methods of PDEs to solve BVPs. |
| **CO7** | Apply the concepts of numerical methods, multivariable calculus and PDEs to solve real world problems including BVPs. |

CO/PO Mapping

| Course Title: | | | | MATHEMATICS-II (MEC,ECE,EEE,CHE & CIV) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Code: | | | | A2MAT102 | | | | | | | | | | |
| Course Designed by | | | | Dept. of Mathematics | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 3 | 3 | | 2 | | | | | | | 2 | | | |
| CO2 | 3 | 3 | | 2 | | | | | | | 2 | | | |
| CO3 | 3 | 3 | | 2 | | | | | | | 2 | | | |
| CO4 | 3 | 3 | | 2 | | | | | | | 2 | | | |
| CO5 | 3 | 3 | | 2 | | | | | | | 2 | | | |
| CO6 | 3 | 3 | | 2 | | | | | | | 2 | | | |
| CO7 | 3 | 3 | | 2 | | | | | | | 2 | | | |

| | |
|---|---|
| Course designed by | DEPARTMENT OF MATHEMATICS |
| Approval | Approved by: Meeting of Board of Studies held on 06.07.2019 |
| | Ratified by: 5th Meeting of Academic Council, 13-07-2019. |

| | SEMESTER – II | L | T | P | C |
|---|---|---|---|---|---|
| A2PYI101 | ENGINEERING PHYSICS (COMMON TO CE , ME & CHEM) | 3 | - | - | 3 |
| | Total Contact Hours – 48 | | | | |

## SYLLABUS

### UNIT – I: CRYSTALLOGRAPHY

Introduction- Crystal systems- Bravais lattices- Packing fractions of simple, body centered, face centered cubic structures - Directions and Planes in crystals- Miller indices- Inter planar spacing- Bragg's Law of X-Ray diffraction- Powder X-Ray diffraction method.

### UNIT –II: LASER & FIBER OPTICS

**LASER:** Introduction- Absorption, Spontaneous and stimulated emission of radiation- Einstein coefficients- Population inversion- Basic components of laser- Nd YAG Laser – $CO_2$ Laser- Applications of LASER.

**FIBER OPTICS:** Introduction- Principle of optical fiber- Numerical Aperture- Acceptance angle- Classification of optic fibers- Applications of fibers.

### UNIT-III: ULTRASONICS & ACOUSTICS

**Ultrasonics**-Introduction- Properties of ultrasonic sounds- Generation of Ultrasonic sounds- Magnetostriction- Piezoelectric effect- Detection- Kunts tube- Converse piezoelectric method- Ultrasonic Nondestructive testing technique (pulse-echo technique under reflection mode)- Applications.

**ACOUSTICS-** Introduction– Reverberation- Reverberation time- Sabines formula for reverberation time- Absorption coefficient and its measurement- Factors effecting acoustic design of hall.

### UNIT – IV: THERMODYNAMICS

Introduction- First Law- Isothermal process- Adiabatic process- Work done- Second Law- Carnot's heat engine- Efficiency- Entropy- Physical significance- Entropy and second law- Temperature entropy diagram- Third Law of Thermodynamics- Applications of thermodynamics.

### UNIT – V: PRINCIPLES OF MECHANICS

Introduction- System of forces- Resultant of coplanar forces- Method of resolution- Parallel forces- Moment of force- Varignon theorem- Force system in space- Friction- Limiting friction & Impending motion- Coulomb's laws of dry friction- Coefficient of friction- Cone of friction- Types of friction (qualitative).

### TEXTBOOKS

1. Engineering Physics by R.K. Gaur and S.L. Gupta, Dhanpat Rai Publications.

### REFERENCES

1. RESNICK, HALLIDAY and WALKER, Principles of Physics, Wiley Publishers
2. A.NELSON, Engineering Mechanics: Statics & Dynamics by, Tata Mc Graw Hill Publishers.
3. P.K. NAG, Engineering Thermodynamics, Mc. Graw Hill Publishers

**COURSE OUTCOMES:**

| | |
|---|---|
| CO1 | The student will be able to recognize the underlying principles of crystalline solids, LASER production and Optical fibers |
| CO1 | The student will be able to gain knowledge on the fundamentals of acoustics and production & detection of ultrasonics |
| CO3 | The student will be able to describe the essentials of thermodynamics, force systems and friction. |
| CO4 | The student will be able to understand crystal structures and X-ray diffraction as a tool for crystal structure analysis. |
| CO5 | The student will be able to understand the importance of industrially relevant LASERS, applications of optical fibers and the prominence of ultrasonics in nondestructive testing. |
| CO6 | The student will be able to understand basic processes involved in thermo-dynamical systems and force systems |
| C07 | The student will have the ability to apply the conceptual knowledge of forces and its related physical quantities in solving engineering problems. |

**CO/PO MAPPING**:

| Course Title: | Engineering Physics |
|---|---|
| Course Code: | A2PYI101 |
| Course Designed by | Dept. of Physics |

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | | | | | | 1 | | | | 1 | | |
| CO2 | 3 | 3 | | | | | | 1 | | | | 1 | | |
| CO3 | 3 | 3 | | | | | | 1 | | | | 1 | | |
| CO4 | 3 | 3 | | | | | | 1 | | | | 1 | | |
| CO5 | 3 | 3 | | | | | | 1 | | | | 1 | | |
| CO6 | 3 | 3 | | | | | | 1 | | | | 1 | | |
| CO7 | 3 | 3 | | | | | | 1 | | | | 1 | | |

| | |
|---|---|
| Course designed by | DEPARTMENT OF PHYSICS |
| Approval | Approved by: Meeting of Board of Studies held on 29.06.2019 |
| | Ratified by: 5th Meeting of Academic Council, 13-07-2019. |

| A2PYI101 | SEMESTER – II | L | T | P | C |
|---|---|---|---|---|---|
| | ENGINEERING PHYSICS LAB | - | - | 3 | 2 |
| | Total Contact Hours – 42 | | | | |

## LIST OF EXPERIMENTS

1. Determination of size of the micro dimensional system by Laser diffraction.
2. Determination of numerical aperture and acceptance angle of the optic fiber.
3. Determination of lattice constants of the crystal systems.
4. Verification of laws of transverse vibrations in stretched strings by using Sonometer.
5. Determination of velocity of ultrasonic sounds in liquids by acoustic grating method
6. Determination of thermal conductivity coefficient of the disc shaped material.
7. Determination of specific heat of the given liquid by Newton's law of cooling principle.
8. Determination of temperature coefficient resistance for the thermistor.
9. Determination of the static friction coefficient.
10. Determination of rigidity modulus of the wire shaped material by using Torsional pendulum.

**TEXTBOOKS:**

1. BALASUBRAMANIAN.S, SRINIVASAN.M..N, A Text book of Practical Physics, S Chand Publishers, 2017

**REFERENCES:**

1. https://vlab.amrita.edu.

**COURSE OUTCOMES:**

| | |
|---|---|
| CO1 | . Design experiments to determine the size of the micro-dimensional system and the parameters impelling communication through optic fibre. |
| CO2. | Investigate the powder X-Ray diffraction patterns for crystal structure analysis. |
| CO3. | Design experiments for demonstration of mechanical resonance and determine the velocity of ultrasonic sounds in liquid media. |
| CO4. | Design experiments to determine physiognomies of materials like the thermal conductivity coefficient ($K$), specific heat (s) and temperature coefficient of resistance ($\alpha$). |
| CO5 | Design experiments to determine the mechanical properties like the rigidity modulus ($\eta$) and the static friction coefficient ($\mu_s$). |

**CO/PO MAPPING**:

| Course Title: | | | | Engineering Physics Lab | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Code: | | | | A2PYI101 | | | | | | | | | | |
| Course Designed by | | | | Dept. of Physics | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 3 | 3 | | | | | | 1 | 2 | 1 | | 1 | | |
| CO2 | 3 | 3 | | | | | | 1 | 2 | 1 | | 1 | | |
| CO3 | 3 | 3 | | | | | | 1 | 2 | 1 | | 1 | | |
| CO4 | 3 | 3 | | | | | | 1 | 2 | 1 | | 1 | | |
| CO5 | 3 | 3 | | | | | | 1 | 2 | 1 | | 1 | | |

| Course designed by | DEPARTMENT OF PHYSICS |
|---|---|
| Approval | Approved by: Meeting of Board of Studies held on 29.06.2019 |
| | Ratified by: 5th Meeting of Academic Council, 13-07-2019. |

| A2CII201 | SEMESTER – II | L | T | P | C |
|---|---|---|---|---|---|
| | PROGRAMMING FOR PROBLEM SOLVING | 3 | 0 | 3 | 5 |
| | Total Contact Hours : 54 | | | | |
| | Prerequisites: Mathematics | | | | |

## SYLLABUS

**UNIT – I:**

**INTRODUCTION:** Introduction to Programming, Computer System, Hardware and Software concepts.

**PROBLEM SOLVING:** Algorithm, Pseudo-code, flow-chart, program development steps, high-level, Assembly and machine languages.

**BASICS OF C PROGRAMMING:** Structure of C program, identifier, basic data types and sizes, constants, variables, arithmetic operators, relational operators, logical operators, increment and decrement operators, assignment operator, conditional operator, scanf and printf built-in functions, Creating and running programs.

**UNIT – II:**

**BIT-WISE OPERATORS:** logical, shift, rotation, masks.

**EXPRESSIONS:** expressions, type conversions, conditional expressions, precedence and order of evaluation.

**SELECTION:** Two-way selection: if-else, nested if, examples, multi-way selection: switch, else-if, examples.

**ITERATIVE:** loops - while, do-while and for statements, break continue, event and counter controlled loops.

**UNIT – III:**

**Part – I:**

**ARRAYS:** Arrays (1-D, 2-D), Character arrays and Strings, Searching (Linear Search and Binary Search).

**Part – II: [9 HOURS]**

**BASIC ALGORITHMS:** Basic Sorting Algorithms (Bubble, Insertion and Selection), comparing algorithms for complexity.

**FUNCTIONS:** Functions, Scope and Extent of Variables, Function Parameters, parameter passing using call-by-value, sub-routines, Storage Classes,#define,#ifdef, #ifndef pre-processor directives.

**UNIT – IV:**

**RECURSION:** Definition of Recursion, example programs using recursion like finding Factorial, Fibonacci series, Quick sort, puzzle solving using recursive functions (towers of hanoi, ackerman function).

**POINTERS:** Definition of Pointers, Pointer Type, Pointer Arithmetic, Function parameter passing using call-by-reference.

**MEMORY ALLOCATION:** Difference between static and dynamic memory allocation, dynamic memory allocation using built-in functions, dangling pointer, unreferenced memory problem.

**UNIT – V:**

**ENUMERATED, STRUCTURE AND UNION TYPES:** Derived types- structures-declaration, definition and initialization of structures, accessing structures, nested structures,

arrays of structures, structures and functions, pointers to structures, self-referential structures, unions, typedef, bit-fields, concept of linked list, program applications.
**FILE-HANDLING:** Input and output- concept of a file, text files and binary files, Formatted I/O, File I/O operations, command line arguments.

**Text Books**


1. Programming For Problem Solving, Behrouz A.Forouzan & Richard F.Gilberg, Cengage Publishers, 3rd Edition
2. Programming In C:A Practical Approach, Ajay Mittal, Pearson Education


**Reference Books**


1. Brian W. Kernighan And Dennis M. Ritchie, The C Programming Language, Prentice Hall Of India
2. Introduction To C Programming, Reema Thareja, Oxford University Press
3. E. Balaguruswamy, Programming In Ansi C, Tata Mcgraw-Hill


**COURSE OUTCOMES**

The student will

| | |
|---|---|
| **CO1** | Have the ability to **describe** a formal algorithmic solution for the given problem, **list** the features of C including scalar & vector data types, operators, **Outline** expressions, expression evaluation, operator precedence, sequential, conditional & iterative constructs. |
| **CO2** | Have the ability to **describe** one and two-dimensional arrays, **outline** loops and arrays for searching and **describe** various sorting techniques. |
| **CO3** | Have the ability to **outline** the purpose of functions, pointers, command line arguments, dynamic memory allocation. **Define** storage classes. **Describe** command like arguments, structures, unions, and enumeration. Have knowledge of handling files. |
| **CO4** | Have the ability to **solve** complex expressions, **design** algorithms and **develop** programs in C language using the basic constructs, data types, operators, control & iterative statements, and arrays. |
| **CO5** | Have the ability to **apply** arrays to solve complex matrix related problems and strings. **Compare and contrast** various searching and sorting techniques for complexity. |
| **CO6** | Have the ability to **distinguish between** function call types. **Draw inferences on** command line arguments, storage classes, and pre-processor directives. **Use** pointers with functions, arrays, strings, to **solve** complex problems. **Give example** and **solve** classical recursion problems**. Compare and contrast** static and dynamic memory allocation, and **apply** them. **Use** structures and unions to implement and **solve** real-time problems. **Apply** file related functions to process files. |
| **CO7** | Have the ability to **Fullyappreciate** the art of procedural programming in C and develop programs **optimally** using the full feature set of C language. |

| Course Title: | Programming for problem solving (Common to ALL Branches) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Code: | A2CII201 | | | | | | | | | | | | | | |
| Course Designed by | Dept. of Computer Science and Engineering | | | | | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSOM | PSON | PSOO |
| CO1 | 3 | 3 | | | | | | 3 | 2 | 1 | | 2 | 1 | 1 | 1 |
| CO2 | 3 | 3 | | | | | | 3 | 2 | 1 | | 2 | 1 | 1 | 1 |
| CO3 | 3 | 3 | | | | | | 3 | 2 | 1 | | 2 | 1 | 1 | 1 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 1 | 1 | 2 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 1 | 1 | 2 | 3 | 3 | 3 |
| CO6 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 1 | 1 | 2 | 3 | 3 | 3 |
| CO7 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 1 | 1 | 3 | 3 | 3 | 3 |

**Levels of Correlation: High-3, Medium-2, Low-1**

# PROGRAMMING FOR PROBLEM SOLVING PRACTICE

## SYLLABUS

**UNIT – I**

**WEEK 1:**

**Objective:** Getting familiar with the programming environment on the computer and writing the first program.

**Suggested Experiments/Activities:**

**Tutorial 1:** Problem-solving using computers

**Lab1:** Familiarization with programming environment

i) Exposure to Turbo C, gcc, Code Blocks IDE
ii) Writing simple programs using printf(), scanf()

**WEEK 2:**

**Objective:** Getting familiar with how to formally describe a solution to a problem in a series of finite steps both using textual notation and graphic notation.

**Suggested Experiments/Activities:**

**Tutorial 2:** Problem-solving using Algorithms and Flow charts

**Lab1:** Converting algorithms/flowcharts into C Source code

Developing the algorithms/flowcharts for the following sample programs

i. Sum and average of 3 numbers
ii. Conversion of Fahrenheit to Celsius and vice versa
iii. Simple interest calculation

**WEEK 3:**

**Objective:** Learn how to define variables with the desired data-type, initialize them with appropriate values and how arithmetic operators can be used with variables and constants.

**Suggested Experiments/Activities:**

**Tutorial 3:** Variable types and type conversions:

**Lab 3:** Simple computational problems using arithmetic expressions

i) Finding the square root of a given number
ii) Finding compound interest
iii) Area of a triangle using heron's formulae
iv) Distance travelled by an object

**UNIT – II**

**WEEK 4:**

**Objective:** Explore the full scope of expressions, type-compatibility of variables & constants and operators used in the expression and how operator precedence works.

**Suggested Experiments/Activities:**

**Tutorial 4:** Operators and their precedence and associativity:

**Lab 4:** Simple computational problems using the operator's precedence and associativity

i) Evaluate the following expressions
   a. A+B*C+(D*E)+F*G
   b. A/B*C-B+A*D/3
ii) a. A+++B---A
   b. J=(i++)+(++i)
iii) Find the maximum of three numbers using conditional operator
iv) Take marks of 5 subjects in integers, and find the total, average in float

**WEEK 5:**

**Objective:** Explore the full scope of different variants of "if construct" namely if-else, null-else, if-else if*-else, switch and nested-if including in what scenario each one of them can be used and how to use them. Explore all relational and logical operators while writing conditionals for "if construct".

**Suggested Experiments/Activities:**

**Tutorial 5:** Branching and logical expressions:

**Lab 5**: Problems involving if-then-else structures

i) Write a C program to find the max and min of four numbers using if-else
ii) Write a C program to generate electricity bill
iii) Find the roots of the quadratic equation
iv) Write a C program to simulate a calculator using switch case
v) Write a C program to find the given year is a leap year or not

**WEEK 6:**

**Objective:** Explore the full scope of iterative constructs namely while loop, do-while loop and for loop in addition to structured jump constructs like break and continue including when each of these statements is more appropriate to use.

**Suggested Experiments/Activities:**

**Tutorial 6:** Loops, while and for loops:

**Lab 6:** Iterative problems e.g., the sum of series

i) Find the factorial of given number using any loop
ii) Find the given number is a prime or not
iii) Compute sine and cos series
iv) Checking a number palindrome
v) Construct a pyramid of numbers

**UNIT – III**

**WEEK 7:**

**Objective:** Explore the full scope of Arrays construct namely defining and initializing 1-D and 2-D and more generically n-D arrays and referencing individual array elements from the defined array. Using integer 1-D arrays, explore search solution linear search.

**Suggested Experiments/Activities:**
**Tutorial 7:** 1D Arrays: searching
**Lab 7:** 1D Array manipulation, linear search

i) Find the min and max of a 1-D integer array
ii) Perform linear search on1D array
iii) The reverse of a 1D integer array
iv) Find 2's complement of the given binary number
v) Eliminate duplicate elements in an array

**WEEK 8:**
**Objective:** Explore the difference between other arrays and character arrays that can be used as Strings by using null character and get comfortable with string by doing experiments that will reverse a string and concatenate two strings. Explore sorting solution bubble sort using integer arrays.
**Suggested Experiments/Activities:**
**Tutorial 8:** 2D arrays, Sorting and Strings
**Lab 8:** Matrix problems, String operations, Bubble sort

i) Addition of two matrices
ii) Multiplication two matrices
iii) Sort array elements using bubble sort
iv) Concatenate two strings without built-in functions
v) Reverse a string using built-in and without built-in string functions

**UNIT-IV**
**WEEK 9:**
**Objective:** Explore the Functions, sub-routines, scope and extent of variables, doing some experiments by parameter passing using call by value. Basic methods of numerical integration
**Suggested Experiments/Activities:**
**Tutorial 9:** Functions, call by value, scope and extent,
**Lab 9:** Simple functions using call by value, Solving differential equations using Eulers theorem

i) Write a C function to calculate NCR value
ii) Write a C function to find the length of a string
iii) Write a C function to transpose of a matrix
**iv)** Write a C function to demonstrate numerical integration of differential equations using Euler's method

**WEEK 10:**

**Objective:** Explore how recursive solutions can be programmed by writing recursive functions that can be invoked from the main by programming at-least five distinct problems that have naturally recursive solutions.

**Suggested Experiments/Activities:**

**Tutorial 10:** Recursion, the structure of recursive calls

**Lab 10:** Recursive functions

i) Write a recursive function to generate Fibonacci series
ii) Write a recursive function to find the lcm of two numbers
iii) Write a recursive function to find the factorial of a number
iv) Write a C Program to implement Ackermann function using recursion
v) Write a recursive function to find the sum of series.

**WEEK 11:**

**Objective:** Explore the basic difference between normal and pointer variables, Arithmetic operations using pointers and passing variables to functions using pointers

**Suggested Experiments/Activities:**

**Tutorial 11:** Call by reference, dangling pointers

**Lab 11:** Simple functions using Call by reference, Dangling pointers

i) Write a C program to swap two numbers using call by reference
ii) Demonstrate Dangling pointer problem using a C program
iii) Write a C program to copy one string into another using pointer
iv) Write a C program to find no of lowercase, uppercase, digits and other characters using pointers.

**UNIT – V**

**WEEK 12:**

**Objective:** Explore pointers to manage a dynamic array of integers, including memory allocation & value initialization, resizing changing and reordering the contents of an array and memory de-allocation using malloc(), calloc(), realloc() and free() functions. Gain experience processing command-line arguments received by C

**Suggested Experiments/Activities:**

**Tutorial 12:** Pointers, structures and dynamic memory allocation

**Lab 12:** Pointers and structures, memory dereference

i) Write a C program to find the sum of a 1D array using malloc()
ii) Write a C program to find the total, average of n students using structures
iii) Enter n students data using calloc() and display failed students list
iv) Read student name and marks from the command line and display the student details along with the total.

v) Write a C program to implement realloc()

**WEEK 13:**

**Objective:** Experiment with C Structures, Unions, bit fields and self-referential structures (Singly-linked lists) and nested structures

**Suggested Experiments/Activities:**

**Tutorial 12:** Bitfields**,** Self-Referential Structures, Linked lists

**Lab 12:** Bitfields, linked lists

i) Read and print a date using dd/mm/yyyy format using bit-fields and differentiate the same without using bit-fields
ii) Create and display a singly linked list using self-referential structure
iii) Demonstrate the differences between structures and unions using a C program
iv) Write a C program to shift/rotate using bitfields
v) Write a C program to copy one structure variable to another structure of the same type.

**WEEK 14:**

**Objective:** To understand data files and file handling with various file I/O functions. Explore the differences between text and binary files.

**Suggested Experiments/Activities:**

**Tutorial 14:** File handling:

**Lab 14:** File operations

i) Write a C program to write and read text into a file
ii) Write a C program to write and read text into a binary file using fread() and fwrite()
iii) Copy the contents of one file to another file
iv) Write a C program to merge two files into the third file using command-line arguments
v) Find no. of lines, words and characters in a file
vi) Write a C program to print last n characters of a given file.

**TEXTBOOKS:**

1. Ajay Mittal, Programming in C: A practical approach, Pearson.
2. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill

**REFERENCES:**

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice-Hall of India
2. C Programming, A Problem Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE

**COURSE OUTCOMES**

| | |
|---|---|
| CO1. | **Demonstrate** the ability to write a formal algorithmic solution for the given problem, **name & explain** the features of C like types including scalar & vector types, operators, expressions, expression evaluation, operator precedence, sequential, conditional & iterative constructs. |
| CO2. | **Implement** one and two-dimensional arrays to solve simple mathematical and matrix related problems. **Make use of** loops and arrays for searching and **Compare** various sorting techniques. |
| CO3. | **Identify** the purpose of functions, pointers, command line arguments, dynamic memory allocation. **Define** storage classes. **Understand** command like arguments, structures and unions. Have **knowledge** of handling files. |
| CO4. | **Design** algorithms and **develop** programs in C language using the basic constructs, data types, operators, control statements, and arrays. |
| CO5 | **Apply** pointers, functions, derived data types, and dynamic memory allocation, **design** solutions to challenging problems. |
| CO6 | **Illustrate** the art of procedural programming in C and **develop** programs optimally using the full feature set of C language. |

| Course Title: | Programming for problem solving lab |
|---|---|
| Course Code: | A2CII201 |
| Course Designed by | Dept. of CSE & IT |

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 1 | 2 | 3 | 1 | 1 | 1 | 2 | 2 | | | 2 | 2 | 2 |
| CO2 | 3 | 3 | 1 | 2 | 3 | 1 | 1 | 1 | 2 | 2 | | | 2 | 2 | 2 |
| CO3 | 3 | 3 | 2 | 3 | 3 | 2 | 1 | 1 | 2 | 2 | | | 3 | 3 | 3 |
| CO4 | 3 | 3 | 2 | 3 | 3 | 3 | 1 | 1 | 2 | 2 | | | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 | 3 | 1 | 1 | 2 | 2 | | | 3 | 3 | 3 |
| CO6 | 3 | 3 | 3 | 3 | 3 | 3 | 1 | 1 | 3 | 3 | 3 | | 3 | 3 | 3 |

Levels of Correlation: High-3, Medium-2, Low-1

| | |
|---|---|
| Course designed by | DEPARTMENTS OF CSE & IT |
| Approval | Approved by: Meeting of Board of Studies held on 29-06-2019 |
| | Ratified by: 5th Meeting of Academic Council, 13-07-2019 |

| A2EHL001 | SEMESTER - II | L | T | P | C |
|---|---|---|---|---|---|
| | Essential Communication in English | 1 | - | 3 | 3 |
| | Total Contact Hours – 60 | | | | |

## SYLLABUS

**UNIT – I: BASIC LANGUAGE SKILLS – A REFRESHER**

**Organs of Speech:** Consonant Sounds &Vowel Sounds; Phonemic Transcription; Using a Dictionary to know the Pronunciation of a word

**Presenting Oneself**: Introducing oneself -Using different expressions in Formal&Informal Contexts.

**Reading a News Article**: Identifying the key words and their usage; summarizing the information

**Word Study & Mind Mapping:** Root words–Derivatives; Homonyms, Homographs, Homophones; Synonyms & Antonyms

**UNIT – II: RUDIMENTS OF FUNDAMENTAL COMMUNICATION**

**The World:** Listening & watching Documentaries on World famous Places.

**Describing People, Places and Life experiences:** Physical Description- Describing someone's qualities – Usage of Jargon to present topography.

**Short Story Corner:** Reading a short story – Understanding the mood and essence – Sharing different perspectives.

**Sentence Patterns:** Concord – Rules – Common errors in day-day usage

**UNIT-III: COMMUNICATION AT PRACTICE**

**Oratory Skills:** Listening to World's Famous Speeches

**JAM (Just a Minute) Talk:** Format & Delivery Techniques

**Nuances of Language:** Company Description –Position Description (Formal) – processes like Chocolate Making( Informal)**.**

**Types of Sentences** – Declarative, Interrogative, Assertive etc.

**UNIT-IV: COMMUNICATION THROUGH CONCEPTUAL LEARNING**

**BBC English:** Watching interviews of Famous people.

**Dialogue Practice:** Situational Dialogues; Structuring a Role Play

**New Inventions:** Reading about latest technology pertaining to different fields (Source : Science Journals)

**Transformation of sentences:** Active Voice-Passive Voice**,** Direct & Indirect Speech**,** Degrees of Comparison**,** Simple Compound & Complex Sentences.

**UNIT – V: COMMUNICATION THROUGH LIFE SKILLS**

**Watching Movies for Language Enrichment & Writing Reviews.**

**Skits:** Enacting a Skit on a Social Issue

**Reflections:** Reading News Paper Editorial columns, Literacy Reviews, Poetry

**Presenting an autobiography:** Exploring different styles of writing autobiographies and evolving an own style**.**

**TEXT BOOK:**
Reference Source Compilation by the Department

**REFERENCES:**

1. **Fundamentals of Technical Communication** by Meenakshi Raman,OUP.
2. **Living English Structure** by W.Stannard Allen, Pearson Publications.
3. **English Made Easy** by Mary Margaret Hosler, Mc Graw Hill.
4.. **English and Communication Skills for Students of Science and Engineering**, by Dhanavel, S.P. Orient Blackswan Ltd.
5. **The Oxford Guide to Writing and Speaking** by John Seely , OUP


**COURSE OUTCOMES:**

| | |
|---|---|
| CO1 | Student will be able to come to terms with the basic language Skills required to cater to the requirement of the programme undertaken. |
| CO2 | Student will be able to comprehend and analyze the core concepts well. |
| CO3 | Student will be able to gain proficiency in all four skills of Language – Listening, Reading, Speaking and Writing. |
| CO4 | Student will be able to understand the Syntactical and Grammatical Components of English Language and their correct use. |
| CO5 | Student will be able to present his/her ideas confidently in a Professional manner. |

CO/PO Mapping

| Course Title: | | | | **Essential Communication in English** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Code: | | | | A2EHL001 | | | | | | | | | | |
| Course Designed by | | | | Dept. of English & Humanities | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | | | | | | 2 | | 2 | 3 | 3 | | 3 | | |
| CO2 | | | | | | 2 | | 2 | 3 | 3 | | 3 | | |
| CO3 | | | | | | 2 | | 2 | 3 | 3 | | 3 | | |
| CO4 | | | | | | 2 | | 2 | 3 | 3 | | 3 | | |
| CO5 | | | | | | 2 | | 2 | 3 | 3 | | 3 | | |

| | |
|---|---|
| Course designed by | DEPARTMENT OF ENGLISH & HUMANITIES |
| Approval | Approved by: Meeting of Board of Studies held on 29.06.19 |
| | Ratified by: 5th Meeting of Academic Council, 13-07-2019. |

| | | | | | |
|---|---|---|---|---|---|
| **A2MED201** | **SEMESTER - II** | **L** | **T** | **P** | **C** |
| | **COMPUTER AIDED ENGINEERING GRAPHICS** | **1** | **-** | **3** | **3** |
| | **Total Contact Hours – 60** | | | | |

## SYLLABUS

**UNIT-I**

**Overview of Computer Graphics:**

Computer technologies that impact on graphical communication, Demonstrating knowledge of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line, The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.
Set up of the drawing page and the printer, Scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing.
Applying dimensions to objects, applying annotations to drawings;

**UNIT-II**

**Layers:** Setting up and use of Layers, layers to create drawings, create, edit and use customized layers, concept of view ports.
**Introduction to Orthographic Projections**: Projections of Points; Projections of Straight Lines parallel to both planes; Projections of Straight Lines-Parallel to one and inclined to other plane.

**UNIT-III**

**Projections of Straight Lines and Planes:** Lines inclined to both planes, determination of true lengths, angle of inclinations and traces, Projections of Planes

**UNIT-IV**

**Projections and sections of solids:** Projections of simple solids- Sections of solids

**UNIT -V**

**Development of surfaces, Isometric Projection and Conversion of Isometric Views to Orthographic Views:** Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa

**TEXT BOOKS**

1. DM Kulkarni, AP Rastogi, AK Sarkar "Engineering graphics with Auto CAD" PHI Publishers
2. Bhatt N.D., Panchal V.M. & Ingle P.R "Engineering Drawing" Charotar Publishing House.

**REFERENCE BOOKS**

1. Shah, M.B. & Rana B.C "Engineering Drawing and Computer Graphics", Pearson Education.
2. Agrawal B. & Agrawal C. M "Engineering Graphics", TMH Publication.
3. Narayana, K.L. & P Kannaiah "Engineering Drawing", SciTech Publishers.
4. CAD Software Theory and User Manuals.

**COURSE OUTCOMES**

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

| | |
|---|---|
| CO1 | Prepare two dimensional drawings using draw and modify commands in Auto CAD software and represent dimensions to the drawings |
| CO2 | Clearly differentiate different types of projections and get solutions to projections of points in Auto CAD by applying the layers concept |
| CO3 | Solve problems related to projections of straight lines and planes |
| CO4 | Prepare simple solids in CAD software and obtain solutions to projections and sections of solids |
| CO5 | Develop the surfaces of simple solids, prepare Isometric drawings and convert isometric drawings into orthographic views |

CO/PO Mapping

| Course Title: | | | | Computer Aided Engineering Graphics | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Code: | | | | A2MED201 | | | | | | | | | | |
| Course Designed by | | | | Dept. of Mechanical Engineering | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 3 | 2 | 2 | | 3 | 1 | | 1 | 2 | 3 | 2 | 2 | 3 | 2 |
| CO2 | 3 | 2 | 2 | | 3 | 1 | | 1 | 2 | 3 | | | 2 | 1 |
| CO3 | 3 | 2 | 2 | | 3 | 1 | | 1 | 2 | 3 | | | 2 | 1 |
| CO4 | 3 | 2 | 3 | | 3 | 1 | | 1 | 2 | 3 | 2 | 2 | 3 | 1 |
| CO5 | 3 | 2 | 3 | | 3 | 1 | | 1 | 2 | 3 | 2 | 2 | 3 | 1 |

| | |
|---|---|
| Course designed by | DEPARTMENT OF MECHANICAL ENGINEERING |
| Approval | Approved by: Meeting of Board of Studies held on 29-06-2019 |
| | Ratified by: 5th Meeting of Academic Council, 13-07-2019. |

* * *

| | SEMESTER - III | L | T | P | C |
|---|---|---|---|---|---|
| **A2EHT001** | **EFFECTIVE TECHNICAL COMMUNICATION (Skill Oriented Course)** | **2** | **-** | **2** | **3** |
| | **Total Contact Hours – 48** | | | | |

## SYLLABUS

### UNIT – I: PROFICIENCY SKILLS IN COMMUNICATION

**Listening Comprehension (Basic Level)**:

- *Working memory – attention –Vocabulary – Inference- comprehension monitoring.*

**Elocution**:

- *Composition of words in phrases and clauses – Collocation of words – patterns of sentences – proper use of conjunctions.*

**Reading Comprehension Practice – I:**

- *Reading Passages for Enrichment of Vocabulary and Sentence Improvement.*

**Sentence Completion:**

- *Concepts &Rules*

### UNIT – II: COMMUNICATION FOR COMPETITIVE WORLD

**Listening Comprehension- (Advanced)**:

- *TOEFL – GRE - IELTS Orientation, Mock Tests.*

**Group Discussion**:

- *Purpose – Planning –Participation. Etiquette – reaching consensus in group work*

**Reading Comprehension Practice – II:**

- *Skimming & Scanning Techniques*

**Idiomatic expressions & Foreign Expressions and their usage**

### UNIT-III: COMMUNICATION FOR PROFESSIONAL OUTREACH

**Interview Skills:**

- *Watching Mock Interviews, Interview Training Sessions,*

**Mock Interviews :**

- *Facing Interviews, Prerequisites and practice*

**Cloze Passages :**

- *Reading &Understanding the sequence of sentences in passages*

**Syllogisms**:

- *Major Premise – Minor premise – Conclusion*

**Analogies**:

- *Types of Analogies*

**UNIT-IV: CAREER PLANNING & GUIDANCE**

**Video Profile:**

- *Preparation – Planning - Execution*

**Presentation Skills:**

- *Making an oral Presentation -Structuring ideas – Power Point Presentation etiquette –Practice*

**Reading Comprehension – III (Practice)**

- *(Passages culled from model papers of competitive and qualifying examinations)*

**Resume Writing & Cover Letter writing**

**UNIT – V: ENGLISH & PROFESSIONAL ETIQUETTE**

**Learning through Visuals:**

- *Body Language Gestures & Postures.*

**Debating Skills:**

- *Making an opening statement – rebuttals – Closing statement, Debate etiquette*

**Logic based English Language Tests – Practice**

**Report Writing:**

- *Types of Reports – Writing a Technical Report*

**TEXT BOOK:**

Open Source Compilation

**REFERENCES:**


1. Basic Communication Skills for Technology by Andrea J.Rutherfoord, Pearson Publications.
2. Business Communication Today Courtland L. Bovee,John V.Thill Abha Chatterjee, Pearson Publications.
3. How to Do Well in GDs and Interviews by Pearson Publications.

**COURSE OUTCOMES:**

| | |
|---|---|
| CO1 | Student will be able to develop proficiency in Communication in English. |
| CO2 | Student understands the structure and pattern of various competitive and qualifying examinations for higher studies and employment. |
| CO3 | Student will be able to express professionally his/her views to the context. |
| CO4 | Student will be able to understand the need and concept of professional etiquette as a prerequisite for written and spoken communication. |
| CO5 | Student shall be able to hone his/her analytical thinking skills. |
| CO6 | Student will be able to acquire the employability skills needed. |

CO/PO Mapping

| Course Title: | **Effective Technical Communication** | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Code: | A2EHT001 | | | | | | | | | | | | | |
| Course Designed by | Dept. of English & Humanities | | | | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | | | | | | 2 | | 2 | 3 | 3 | | 3 | | |
| CO2 | | | | | | 2 | | 2 | 3 | 3 | | 3 | | |
| CO3 | | | | | | 2 | | 2 | 3 | 3 | | 3 | | |
| CO4 | | | | | | 2 | | 2 | 3 | 3 | | 3 | | |
| CO5 | | | | | | 2 | | 2 | 3 | 3 | | 3 | | |
| C06 | | | | | | 2 | | 2 | 3 | 3 | | 3 | | |

| | |
|---|---|
| Course designed by | DEPARTMENT OF EHGLISH & HUMANITIES |
| Approval | Approved by: Meeting of Board of Studies held on 29.06.19 |
| | Ratified by: 5th Meeting of Academic Council, 13-07-2019. |

| A2MAT106 | SEMESTER - III | L | T | P | C |
|---|---|---|---|---|---|
| | MATHEMATICS-III (common to CIV & MEC) | 3 | 0 | - | 3 |
| | Total Contact Hours – 48 | | | | |

## SYLLABUS

**Unit-I: Random Variables & Probability Distributions**

Random Variables: Discrete and continuous random variables, properties of mass and density functions. Mathematical Expectation: Properties (statements), Moment Generating Function; Outlines: of Binomial and Poission distributions; Normal Distribution: Probability density function, Normal approximation to Binomial Distribution, Parameters of Normal Distribution(statements), Characteristics of normal distribution, Area under normal curve, Standard normal distribution.

**Unit-II: Statistical Methods**

Curve fitting by least squares method: Bi-variate data, scatter diagram, method of least squares, normal equations, fitting of straight line, second degree curve (parabola), exponential and power curves; Correlation: types of correlation, measures of correlation, Karl Pearson coefficient of correlation and its properties; Regression Analysis: Regression Coefficients and its Properties, Regression lines.

**Unit-III: Multiple Integrals**

**Double Integral**: Concept of double integration, properties, evaluation procedures, change of order of integration, double integrals in polar coordinates; Change of variables: Jacobian of transformations, Change of Cartesian coordinates to polar coordinates in double integrals, Applications of double integrals: Calculation of areas enclosed by plane curves (Cartesian and polar coordinates);

**Triple Integrals**: Evaluation procedures of triple integrals; Change of variables: Jacobian of transformations, Change of rectangular coordinates to Cylindrical and Spherical polar coordinates in triple integrals; Applications of triple integrals: Volumes of solids.

**Unit-IV: Differential Calculus of Vectors**

Gradient: Scalar and vector point functions, scalar and vector fields, vector operator ‘del’, Gradient of a scalar point function (GradΦ), geometrical interpretation of GradΦ, directional derivative, maximum directional derivative, evaluation of scalar potential of an irrotational field; Divergence: Divergence of a vector point function, physical interpretation of divergence, solenoidal vector function; Curl: Curl of a vector point function, physical interpretation of curl, Rotational and Irrotational fields.

**Unit-V: Integral Calculus of Vectors**

Line integral of a vector function: Line integral and its types, applying line integral to calculate ‘circulation’ of a fluid particle and total work done by a force; Surface integral of a vector function: Surfaces, types of surfaces, surface integral and its types, evaluation of surface integrals; Volume integral of a vector function: Evaluation of volume integrals; Integral theorems relating line, surface and volume integrals: Green's theorem in a plane, Stoke's theorem and Gauss divergence theorem (all statements), Verification of theorems.

**Text Books**:

1. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017
2. T.K.V. Iyengar et al, Engineering Mathematics, S. Chand Publications, Revised edition .

**Reference Books**:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.
2. B.V. Ramana, Higher Engineering Mathematics, Tata McGraw Hill New Delhi,11th Reprint, 2010.
3. Murugesan and Gurusamy, Probability, Statistics and Random Process, Anuradha Publicatons.

COURSE OUTCOMES

At the end of the course, students shall be able to:

| | |
|---|---|
| CO 1 | Recall the concepts of Random Variables, Probability Distributions, Curve Fitting and Correlation, Regression |
| CO 2 | Recall the concepts of Multiple Integrals |
| CO 3 | Recall the concepts of Vector Calculus |
| CO 4 | Use and Interpret the concepts of Random Variables, Probability Distributions, Curve Fitting and Correlation, Regression |
| CO 5 | Use and interpret the concepts of Multiple Integrals |
| CO 6 | Use and interpret the concepts of Vector Calculus |
| CO 7 | Apply the concepts of Probability Distributions, Statistical Methods, Multiple Integrals and Vector Calculus to model and solve real world problems. |

CO/PO Mapping

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Title: | | | | | Mathematics-III (CIV & MEC) | | | | | | | | | |
| Course Code: | | | | | A2MAT106 | | | | | | | | | |
| Course Designed by | | | | | Dept. of Mathematics | | | | | | | | | |
| CO | Program Outcome (PO) | | | | | | | | | | | | PSO | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 1 | 3 | 3 | | 2 | | | | | | | 2 | | | |
| 2 | 3 | 3 | | 2 | | | | | | | 2 | | | |
| 3 | 3 | 3 | | 2 | | | | | | | 2 | | | |
| 4 | 3 | 3 | | 2 | | | | | | | 2 | | | |
| 5 | 3 | 3 | | 2 | | | | | | | 2 | | | |
| 6 | 3 | 3 | | 2 | | | | | | | 2 | | | |
| 7 | 3 | 3 | | 2 | | | | | | | 2 | | | |

| | |
|---|---|
| Course Designed by | Dept. of Mathematics |
| Approval | Approved by Board of Studies (BoS) of Department of Mathematics in its 4th meeting held on 06.07.2019 |
| | Ratified by Academic Council in its 5th meeting held on 13.07.2019. |

| | | | | | |
|---|---|---|---|---|---|
| **A2CET201** | **SEMESTER - III** | **L** | **T** | **P** | **C** |
| | **Internet of Things** | **2** | **0** | **2** | **3** |
| | Total Contact Hours: 32 (L) + 32 (P) | | | | |
| | Pre-requisite: Programming for Problem Solving | | | | |

## SYLLABUS

### UNIT – I: INDUSTRY 4.0 AND INTRODUCTION TO IoT

**Industry 4.0**

Introduction to Industry 4.0, Globalization and Emerging Issues, The Fourth Revolution, Smart and Connected Factories

**Introduction to Internet of Things**

IoT Devices vs. Computers; Trends in the adoption of IoT, Societal benefits of IoT – Risks, Privacy and Security of IoT devices.

### UNIT-II: EMBEDDED SYSTEMS AND DESIGN PRINCIPLES OF IoT

**Embedded Systems**

Introduction – Generic structure of Embedded Systems – Components of Embedded Systems.

**Design principles of IoT**

Physical Design of IOT – Logical Design of IOT, IOT Enabling Technologies - IOT Levels and deployment templates; Need for networking, Definition and principles of Internet – Internet protocols, TCP/IP Application Layer, Transport layer protocols, Application Layer Protocols.

### UNIT-III: IoT and M2M, IoT HARDWARE

**IoT and Machine-to-Machine (M2M), IoT Systems Management, Design Methodology**

Machine-to-Machine (M2M) - Difference between IOT and M2M - Software Defined Networking (SDN); Need for IOT Systems Management - Simple Network Management Protocol (SNMP) - Limitations of SNMP; Network Configuration Protocol (NETCONF); IoT Design Methodology.

**IoT Hardware**

What is an IOT Device – Basic building blocks of an IoT Device; Raspberry Pi, Arduino, ESP8266, NodeMCU, ESP 32, BeagleBone Black, pcDuino, Cubieboard.

### UNIT-IV: IOT SOFTWARE AND SENSORS IN IoT

Linux on Raspberry Pi; Programing Arduino using IDE; Introduction to Sensors, commonly used sensors - Motion Sensor, Ultrasonic Sensor, Rain Drop Sensor, Moisture Sensor, Temperature Sensor, etc.; Interfacing of Sensors with Arduino and Programming; Demonstration of measurement of parameters using Arduino; Introduction to Cloud storage models – ThingSpeak, AWS IoT platform.

### UNIT-V: APPLICATIONS OF IOT

**Domain applications of IoT**

Case studies illustrating IoT – Cities – Smart Cities; Environment - Weather monitoring – Water quality monitoring; Agriculture – Smart irrigation system with IoT; Green Buildings and Home Automation; Logistics – Smart perishable tracking with IoT; Health – Elderly fall detection with IoT; Manufacturing industry.

## TEXT BOOKS

1. "Internet of Things - A hands-on approach", Vijay Madisetti, Arshdeep Bahga, Orient Blackswan Private Limited.
2. "Internet of Things", RMD Sundaram Shriram K Vasudevan, Abhishek S Nagarajan, Wiley
3. "Designing the Internet of Things", Adrian McEwen, Hakim Cassimally, Wiley

## REFERENCES

1. "Internet of Things", Jeeva Jose, Khanna Publishing.
2. "21 IoT Experiments", Yashavant Kanetkar, Shrirang Korde, BPB Publications.

## WEB REFERENCES

1. https://www.coursera.org/learn/iot - Introduction to the Internet of Things and Embedded Systems.
2. https://www.udemy.com/course/internet-of-things-iot-for-beginners-getting-started/
3. https://onlinecourses.nptel.ac.in/noc20_cs69/preview - Introduction to Industry 4.0 and Industrial Internet of Things
4. https://create.arduino.cc/projecthub - Arduino Project Hub
5. https://www.raspberrypi.org/ - Raspberry Pi Foundation

## List of Experiments – Internet of Things for Civil Engineers (Hands-on)

1. Introduction to various sensors and various actuators & its Application
   a) PIR Motion Sensor.
   b) Ultrasonic Sensor
   c) Rain Drop Sensor.
   d) Moisture Sensor.
   e) Temperature Sensor.
   f) Touch Sensor.
   g) Infrared Sensor.
   h) Light Dependent Resistor.
   i) Servo Motor
   j) Motor drivers
   k) DC relays
   l) 16×2 LCD display
2. Demonstration of IoT Board – Raspberry Pi, Arduino Uno
3. Perform Experiment using Arduino to measure the distance of any object using Ultrasonic Sensor.
4. Perform Experiment using Arduino to measure temperature and humidity using sensors.
5. Perform Experiment using Arduino to measure the soil moisture in agriculture field.
6. Demonstration of ThingSpeak platform.
7. Open ended problem: Students are required to submit a project applying the learnt fundamental principles using an IoT Device such as Arduino.

## COURSE OUTCOMES

Learners at the end of this course will be able to

| | |
|---|---|
| **CO1** | Describe Industry 4.0, and fundamental principles of Embedded systems and Internet of Things |
| **CO2** | Describe IoT systems management and the fundamental operating principles of an IoT Hardware Device. |
| **CO3** | Explain programming using Arduino with sensors and describe the various domain applications of IoT. |
| **CO4** | Understand the relevance of Industry 4.0 and the design principles Internet of Things. |
| **CO5** | Distinguish between IoT and M2M and compare different IoT Hardware Devices. |
| **CO6** | Compare the various sensors available for IoT Devices and their corresponding applications and comprehend the applications of IoT in various domains. |
| **CO7** | Apply the learnt fundamental principles to design and develop an IoT device to perform real time measurements. |

## CO-PO-PSO MAPPING

| **CO/ PO-PSO** | **PO 1** | **PO 2** | **PO 3** | **PO 4** | **PO 5** | **PO 6** | **PO 7** | **PO 8** | **PO 9** | **PO 10** | **PO 11** | **PO 12** | **PSO 1** | **PSO 2** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 1 | | | | | | | | | | | 1 | | |
| **CO2** | 1 | | | | | | | | | | | 1 | | |
| **CO3** | 1 | 3 | 3 | | 3 | 2 | | | | | | 2 | | |
| **CO4** | 1 | | | | | | | | | | | 1 | | |
| **CO5** | 1 | | | | 3 | | | | | | | 1 | | |
| **CO6** | 1 | 3 | 3 | | 3 | 2 | | | | | | 2 | | |
| **CO7** | 1 | 3 | 3 | 3 | 3 | 2 | | | 3 | 2 | 1 | 3 | | |

***"1" - Low Correlation; "2" - Medium Correlation; "3" - Substantial Correlation***

| | |
|---|---|
| **Course Title** | Internet of Things |
| **Course Code** | A2CET201 |
| **Course Designed by** | Department of Civil Engineering |
| **Approval** | |

| | | | | | |
|---|---|---|---|---|---|
| **A2CET301** | **SEMESTER - III** | **L** | **T** | **P** | **C** |
| | **Engineering Mechanics** | **3** | **0** | **0** | **3** |
| | Total Contact Hours: 48 (L) | | | | |
| | Pre-requisite: Engineering Physics | | | | |

## SYLLABUS

### UNIT – I: FORCES & FRICTION

**Introduction to Engineering Mechanics**: Forces, Transfer of forces, Couple, Moment

**Resultant of force system:** Triangle law of forces, Polygon law of forces, Resultant of two dimensional concurrent and Non-concurrent force systems, Lamis' theorem. Free body diagrams, Equilibrium of forces, Equations of Equilibrium.

**Friction:** Introduction, Terminology, types and laws of friction, Sliding friction and Ladder friction

### UNIT – II: ANALYSIS OF PLANE TRUSSES

**Introduction:** Types of trusses, static indeterminacy of plane and space trusses,

**Analysis of plane truss:** Analysis of statically determinate plane trusses using method of joints and method of sections.

### UNIT-III: CENTROID AND MOMENT OF INERTIA

**Centroid:** Introduction, Centroid of regular and compound areas, Pappu's theorems

**Moment of Inertia:** Introduction, Parallel axis theorem, Perpendicular theorem, Moment of Inertia of regular and compound areas, product of inertia.

### UNIT-IV: KINEMATICS AND KINETICS

**Introduction:** Rectilinear motion, constant and variable acceleration, curvilinear motion, Projectiles, horizontal and inclined projection at same level, D-Alembert's principle, Concept of work energy equation, Concept of Impulse momentum equation.

### UNIT-V: SIMPLE STRESSES AND STRAINS

Types of stresses and strains, Hook's law, Stress-Strain variation of mild steel, working stress, factor of safety, lateral strain, Poisson's ratio, volumetric strain, Elastic moduli and the relationship between them.

Stresses in prismatic and homogeneous bars, Stresses in bars of varying section, Stresses in composite bars, Stresses due to temperature changes, strain energy: strain energy of prismatic bars under gradual, sudden and impact loading

### TEXT BOOKS


1. Engineering Mechanics, S.Timoshenko & D.H. Young, McGraw Hill publications
2. Engineering Mechanics, S.S. Bhavikatti, K.G. Rajashekharappa


### REFERENCES


1. Engineering Mechanics statics R C Hibbler, Pearson Publications
2. Engineering Mechanics, Basudeb Bhattacharyya, Oxford University Press

## COURSE OUTCOMES

Learners at the end of this course will be able to

| | |
|---|---|
| **CO1** | Have the ability to list/outline/describe/state different force systems, resultant of forces, equilibrium of forces, sliding and ladder friction |
| **CO2** | Have the ability to list/outline/describe/state concept of centroid, moment of inertia of plane areas |
| **CO3** | have the ability to list/outline/describe/state the concepts of kinematics and kinetics to find forces acting on system and also concepts of simple stresses and strains |
| **CO4** | Have the ability to Compare & Contrast/Distinguish between alternatives/Give examples for/Draw Inferences different force systems, resultant of forces, equilibrium of forces, sliding and ladder friction |
| **CO5** | Have the ability to Compare & Contrast/Distinguish between alternatives/Give examples for/Draw Inferences on centroid and moment of inertia of simple and compound areas. |
| **CO6** | Have the ability to Compare & Contrast/Distinguish between alternatives/Give examples for/Draw Inferences to find the resultant forces using the concepts of kinematics and kinetics and stresses and strains due to axial forces |
| **CO7** | Ability to calculate the resultant forces using the principles of statics, kinematics and kinetics on structural system and calculate the simple stresses and strains in axially loaded members |

## CO-PO-PSO MAPPING

| CO/ PO-PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 3 | | | | | | | | | | 3 | |
| **CO2** | 3 | 3 | | | | | | | | | | | 3 | |
| **CO3** | 3 | 3 | | | | | | | | | | | 3 | |
| **CO4** | 3 | 3 | 3 | | | | | | | | | | 3 | |
| **CO5** | 3 | 3 | | | | | | | | | | | 3 | |
| **CO6** | 3 | 3 | 3 | | | | | | | | | | 3 | 3 |
| **CO7** | 3 | 3 | 3 | | | | | | | | | | 3 | 3 |

***"3" - Low Correlation; "2" - Medium Correlation; "3" - Substantial Correlation***

| | |
|---|---|
| **Course Title** | Engineering Mechanics |
| **Course Code** | A2CET301 |
| **Course Designed by** | Department of Civil Engineering |
| **Approval** | |

| | | | | | |
|---|---|---|---|---|---|
| **A2CET302** | **SEMESTER - III** | **L** | **T** | **P** | **C** |
| | **Surveying and Geomatics** | **2** | **0** | **2** | **3** |
| | Total Contact Hours: 36 (L) + 36(P) | | | | |
| | Pre-requisite: Basic Engineering | | | | |

## SYLLABUS

### UNIT – I: INTRODUCTION TO SURVEYING

**Introduction:** Principles of surveying, Objectives, Classification of surveying, Plan and map, Scales, Errors due to use of wrong scale,

**Linear measurements:** Direct measurements, ranging, Errors in chaining, instruments, angular measurements-instruments, basic definitions, horizontal and vertical angles.

### UNIT – II: VERTICAL DISTANCES

**Introduction to leveling:** Methods, rise and fall method, height of instrument method, reciprocal leveling, introduction to contouring-Characteristics, uses, contour gradient

**Trigonometric leveling**: Introduction, cases – base of the object is accessible, Base of the object is inaccessible – instrument stations in the same vertical plane and not in the same vertical plane, instrument axis at very different levels, Errors in leveling.

### UNIT – III: TRAVERSING, TACHEOMETRY, CURVE SURVEY AND SETTING OUT WORKS

**Traversing:** Chain traversing, chain and compass traversing, locating details with transit and tape, plotting a traverse survey, co-ordinates calculations, closing error-Bowditch rule, Transit rule.

**Tacheometry:** Introduction, methods in tachemetry–Stadia method – staff held normal, held vertical, tangential method.

**Curves:** Introduction to curves – Simple circular curve, setting of simple circular curve, Compound curves-Setting of compound curves.

**Setting out works:** Introduction to setting out works, Control for setting out-Horizontal control, Vertical control; Setting out in vertical direction; Setting out in vertical direction; Setting out foundation trenches.

### UNIT – IV: AREA AND VOLUME CALCULATIONS

**Area calculations:** Methods-Area by geometric figures, Offset method- Regular intervals, irregular intervals.

V**olume Calculations :** Methods-Measurements from cross-sections, Trapezoidal rule, Prismoidal rule; Curvature corrections.

### UNIT – V: BASICS OF ADVANCED SURVEYING

**Advanced Surveying:** Electronic Distance Measurements, Types of EDM; Total Station-Missing line measurement, Remote Elevation measurement, Area Calculations using co-ordinate system; Basics of Remote Sensing; Basics of Global Positioning System; Basics of Geological Information System.

**Photogrammetric Survey:** Principle of photogrammetric survey; Scale of vertical photograph, Scale of tilted photograph, Displacements, Aerial photography survey procedure.

## TEXT BOOKS

1. "Surveying and Leveling" by R Subramanian, Tata McGraw Hill Education Pvt Ltd.
2. "Geomatics Engineering", by Manoj, K. Arora and Badjatia, Standard Nem Chand & Bros.

## REFERENCES

1. "Surveying Vol. I, II" by Punmia BC, Laxmi Publication
2. "Surveying" by Arora, K.R, Standard Book House

## WEB REFERENCES

**http://sl-iitr.vlabs.ac.in/sl-iitr/**

## SURVEYING FIELD WORK

### FIELD WORK-I

Traversing the given area

### FIELD WORK-II

Perform leveling survey

### FIELD WORK-III

Preparation of layout plan and stakeout

## COURSE OUTCOMES

Learners at the end of this course will be able to

| | |
|---|---|
| **CO1** | Have the ability to list/outline/describe/state principles of surveying, leveling and theodolite surveying, Setting out simple curves, Principle of tacheometry |
| **CO2** | Have the ability to list/outline/describe/state Principles and errors in advanced equipment's like EDM, Electronic theodolite, Total station and GPS |
| **CO3** | Have the ability to list/outline/describe/fundamentals of Aerial photogrammetry |
| **CO4** | Have the ability to Compare & Contrast/Distinguish between alternatives/Give examples for/Draw Inferences on leveling, Theodolite, Setting out curves and Tacheometry |
| **CO5** | Have the ability to Compare & Contrast/Distinguish between alternatives/Give examples for/Draw Inferences on Practical applications of GPS |
| **CO6** | Have the ability to Compare & Contrast/Distinguish between alternatives/Give examples for/Draw Inferences on practical applications of Aerial photogrammetry |
| **CO7** | Ability to apply the principles of Total station, GPS, DGPS and fundamentals of Aerial photogrammetry and Drone survey |

**CO-PO-PSO MAPPING**

| CO/ PO-PSO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 1 | 2 | | | 3 | | | | 1 | 3 | | | 3 | 1 |
| **CO2** | 1 | 2 | | | 1 | | | | 1 | 3 | | | 2 | 1 |
| **CO3** | 1 | 2 | | | 1 | | | | 1 | 3 | | | 2 | 1 |
| **CO4** | 1 | 1 | | | 2 | | | | 1 | 3 | | | 3 | 1 |
| **CO5** | 1 | 2 | | | 1 | | | | 1 | 3 | | | 1 | 1 |
| **CO6** | 1 | 2 | | | 1 | | | | 1 | 3 | | | 1 | 1 |
| **CO7** | 1 | 1 | | | 1 | | | | 1 | 3 | | | 1 | 1 |

***"1" - Low Correlation; "2" - Medium Correlation; "3" - Substantial Correlation***

| | |
|---|---|
| **Course Title** | Surveying and Geomatics |
| **Course Code** | A2CET302 |
| **Course Designed by** | Department of Civil Engineering |
| **Approval** | |

| A2CEI201 | SEMESTER - III | L | T | P | C |
|---|---|---|---|---|---|
| | **AI Tools, Techniques and Applications** | **3** | **0** | **3** | **5** |
| | Total Contact Hours: 36 (L) + 36 (P) | | | | |
| | Pre-requisite: - | | | | |

## SYLLABUS

### UNIT – I: INTRODUCTION TO PYTHON

Python as a programming language, IDE, The basic elements of python, array, input and print, strings, Control Structures, Loops.

### UNIT – II: HIGHER ORDER FUNCTION

Functions and scoping, Recursion, Global variables, Modules, Files, Structured Types, Tuples, Lists and Dictionaries. Data Visualization packages using matplotlib.

### UNIT – III: INTRODUCTION TO MACHINE LEARNING AND TRAINING

Basics of AI. Applications of AI. Conceptual introduction to Machine Learning, Types of Machine Learning Systems, Challenges in ML, Testing and validating the models. Supervised and Unsupervised Training

Dimensionality reduction-PCA, Kernel PCA, Linear Discriminant Analysis Training of models- linear regression, Gradient descent, polynomial regression, logistic regression

### UNIT – IV: DEEP LEARNING MODEL

Introduction to Neural Networks, Training Neural Networks, Multilayer Perceptron and Back Propagation. Support Vector Machines- Classification and Regression.

### UNIT – V: ADVANCED METHODS AND APPLICATIONS

Advanced Methods: Decision Trees, Ensemble and Random Forests, End to End Machine Learning Projects with case studies in Civil Engineering.

**LAB EXPERIMENTS**

1. Write a python function to collect data about students and store in a dictionary or structure.
   *This experiment will help the student to apply the concepts related to input/output, writing a function, using for iterative loops and dictionary or structure.*
2. Write a function to develop a relationship between given two sets of data.
   *Help in linear regression and other regression methods.*
3. Exercise using matplotlib.
   *This will help in data visualization and interpretation.*
4. Exercise related for supervised classification
   *Classification of data*
5. Exercise related to Neural Networks
   *Application of NN*
6. Exercise using SVM
7. Exercise using Random Forests and Decision Trees
8. Design Project- End to End ML project for any civil Engineering Application.

**TEXT BOOKS**


1. Kenneth A Lambert, Fundamentals of Python First Programs, Cengage Publishers (UNIT-I & II)
2. Aruelien Geron, Hands -on Machine Learning with Scikit Learn, Keras and TensorFlow, O'Reilly Publishers. (UNIT-III ,IV and V)


**REFERENCES**


1. Tom Mickiewicz & Josh Zheng, Getting started with Artificial Intelligence, Published by O'Reilly Media, 2017
2. Joshua Eckroth**,** Python Artificial Intelligence Projects for Beginners, Packt Publishing


**COURSE OUTCOMES**

Learners at the end of this course will be able to

| | |
|---|---|
| **CO1** | Have the ability to code in python environment and use basic packages |
| **CO2** | Have ability to write own functions using structures, classes and OOPS concept in python. |
| **CO3** | Have the ability to describe various machine learning systems and understand its applications |
| **CO4** | Have the ability to differentiate between supervised and unsupervised learning for machine learning application |
| **CO5** | Have ability to describe and apply the concepts of basic machine learning methods such as Neural Networks and Support Vector Machine |
| **CO6** | Have the ability to use the advanced machine learning method such as random forest regression and decision trees |
| **CO7** | Have the ability to develop an end to end machine learning projects for any civil engineering problems |

**CO-PO-PSO MAPPING**

| CO/ PO-PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | | | | 3 | | | | | | | | | |
| **CO2** | | | | 2 | | | | | | | | | | |
| **CO3** | | | | 2 | | | | | | | | | | |
| **CO4** | | | | | 3 | | | | | | | | | |
| **CO5** | | | | | 3 | | | | | | | | | |
| **CO6** | | | | | 3 | | | | | | | | | |
| **CO7** | | 3 | 3 | | | | | | 3 | | | | 3 | |

***"1" - Low Correlation; "2" - Medium Correlation; "3" - Substantial Correlation***

| | |
|---|---|
| **Course Title** | AI Tools, Techniques & Applications |
| **Course Code** | A2CEI201 |
| **Course Designed by** | Department of Civil Engineering |
| **Approval** | |

| | | | | | |
|---|---|---|---|---|---|
| **A2CEI301** | **SEMESTER - III** | **L** | **T** | **P** | **C** |
| | **Fluid Mechanics & Hydraulic Machines** | **3** | **0** | **3** | **5** |
| | Total Contact Hours: 54(L) + 48(P) | | | | |
| | Pre-requisite: Applied Mechanics | | | | |

## SYLLABUS

### UNIT – I: FLUID PROPERTIES AND MEASUREMENT OF PRESSURE

**Physical properties of fluids:** Units and dimensions-Distinction between fluid and solid -- fluid continuum- Properties of fluids- Specific gravity -Viscosity of fluids-Surface tension-Vapour pressure- influence on fluid motion.

**Measurement of Pressure:** Systems of pressures-relation between gauge and absolute pressures-Types of pressure measuring devices-Simple Manometers-Differential manometers-U-tube and inverted U tube -Pressure gauges

### UNIT – II: FLUID STATICS AND FLUID KINEMATICS

**Hydrostatic forces:** Force on plane surface-horizontal, vertical and inclined -Centre of pressure-Force on Curved surfaces-Archimedes principle-Stability of submerged and floating bodies.

**Description of fluid flow and flow-net:** Streamlines, stream tube, streak lines and path lines-Classification of fluid flow-1D,2D and 3D Continuity equation-Acceleration of fluid flow-tangential and convective-Circulation and Vorticity

Velocity potential-Stream function-Relation between Velocity potential and Stream function-Concept of flow net-Methods of construction of flow net

### UNIT-III: FLUID DYNAMICS AND LOSSES IN PIPES

**Equations of fluid flow:** Forces acting on fluids-Basic equations of fluid motion-Eulers's equation of motion-Bernoulli's equation of motion-Momentum Principle

**Practical Applications:** Venturimeter, Orifice-meter, Orifice and Mouthpiece -Force on pipe bend

**Flow through Tubes:**Reynold's experiment -Characteristics of Laminar flow and turbulent flow -Steady laminar flow through a long horizontal circular tube (Hazen Poisuelli's equation)- TEL and HGL

**Losses in pipes and compound pipes:**Laws of fluid friction - Major losses-variation of friction factor with Reynold's number-Minor losses- Pipes in parallel-Pipes in series

### UNIT-IV: HYDRAULIC SIMILITUDE AND IMPACT OF JET ON VANES

**Hydraulic Similitude:** Dimensional analysis-Rayleigh's method and Buckingham's pi theorem-study of Hydraulic models – Geometric, kinematic and dynamic similarities-dimensionless numbers – model and prototype relations.

**Impact of Free Jet:**Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes, jet striking centrally and at tip, velocity triangles at inlet and outlet, expressions for work done and efficiency.

### UNIT-V: HYDRAULIC MACHINES

**Hydraulic Turbines:** Angular momentum principle-classification of turbines- Pelton wheel - Francis turbine - Kaplan turbine – unit quantities and specific speed of turbines- performance characteristics-cavitation – Governing.

**Pumps:** Classification of pumps –centrifugal pumps – heads and efficiencies- specific speed-multistage pumps-characteristic curves- NPSH- Cavitation.
Reciprocating pumps-Classification - main components and working of reciprocating pump

**TEXT BOOKS:**

1. "Fluid Mechanics including Fluid machines" , Dr.A.K.Jain, Khanna Publishers.
2. "Hydraulics and Fluid Mechanics including hydraulic machines", Modi and Seth, Standard book house Publisher.

**REFERENCES:**

1. "Introduction to Fluid Mechanics and Machines". S.K. Som & G. Biswas, Tata McGraw Hill Pvt. Ltd.
2. "Fluid Mechanics and Hydraulic Machines", K Subramanya, Tata McGraw Hill Pvt. Ltd

**List of Experiments - Fluid Mechanics and Hydraulic Machines Laboratory (Hands-on)**

**a) Experiments having concepts in line with theory**

1) Verification of Bernoulli's theorem
2) Calibration of Venturi-meter
3) Calibration of Orifice-meter
4) Determination of Coefficient of discharge for a small orifice
5) Determination of Coefficient of discharge for an external mouth piece
6) Determination of loss coefficient of sudden contraction, sudden expansion, bend and elbow in a pipe
7) Determination of friction factor for different pipes
8) Impact of jet on vanes
9) Performance test on Pelton wheel
10) Performance test on Francis turbine
11) Performance test on Kaplan Turbine
12) Performance test on multi stage centrifugal pump
13) Performance test on reciprocating pump

**b) Experiments not having concepts in line with theory**

1) Calibration of contracted Rectangular Notch and /or Triangular Notch
2) Study of Hydraulic jump
3) Calibration of venturi flume
4) Calibration of submerged weir

**c) Projects Based learning**

1) Determination of equivalent pipe diameter when pipes are connected in parallel experimentally. (Develop a working model consists of 2 tanks with 2 or more similar pipes connected in parallel)
2) Determination of equivalent pipe diameter when pipes are connected in series by developing a working model consists of 2 tanks and three different diameter pipes.
3) Determination of Metacentric height of a ship model experimentally.
4) Determination of Major and Minor losses in real site pipe network

5) Influence of notch located on upstream of another notch on flow conditions in an open channel.
6) Determination of coefficient of discharge in totally submerged external mouthpiece and compare the results with normal mouthpiece. (Develop the physical model with two tanks and should conduct experiment on it)
7) Determine the type of flow for different types of flow conditions by conducting Reynold's experiment in Tilting flume.
8) A study on effect of broad crested weir on fluid flow under different slope conditions. (Using tilting flume apparatus)
9) A comparative study of flow behavior between submerged or drowned broad crested weir and free flow broad crested weir. (Using tilting flume apparatus)
10) Determination of kinetic energy dissipation by simulating steep slope followed by mild slope to form hydraulic jump. (Using tilting flume apparatus)
11) Determination of kinetic energy dissipation by forming a hydraulic jump at spillway. Describe how this helps in avoiding erosion of channel bed at downstream. (Using tilting flume apparatus)
12) Determine the influence of hump height on the upstream flow properties. (Using tilting flume apparatus)
13) Develop the iso-efficiency curve for Francis turbine.
14) Develop the iso-efficiency curve for Kaplan turbine.
15) Develop the complete turbine design tool for different input parameters.
16) An experimental study on simulation of gradually varied flow profile (GVF Profile) and calculation of flow properties under different discharges. (Using tilting flume apparatus)

Note to students for Project Based Learning: -

1) Each batch should have 3 to 5 members.
2) Interested students can form batches by themselves and submit their batch details (student names, roll numbers, question number) to Lab incahrge.
3) At the end of the lab , the students are required to submit a report.

## COURSE OUTCOMES

Learners at the end of this course will be able to

| | |
|---|---|
| **CO1** | List/outline/describe/state Fluid Properties, measurement of pressure, hydrostatic forces and fluid flow and flow net |
| **CO2** | Describe Equations of fluid flow and their practical applications, flow through pipes and parallel plates and Losses in pipes and compound pipes |
| **CO3** | Describe Hydraulic Similitude, impact of free jet, turbines and pumps. |
| **CO4** | Compare & Contrast , Give examples for and Draw Inferences on Fluid Properties, measurement of pressure, hydrostatic forces and fluid flow and flow net |
| **CO5** | Compare & Contrast and Give examples for Equations of fluid flow and their practical applications, flow through pipes and parallel plates and Losses in pipes and compound pipes. |
| **CO6** | Compare and Give examples on Hydraulic Similitude, impact of free jet, hydraulic turbines and pumps. |
| **CO7** | Apply the principles of continuity, Bernoulli's and momentum to solve the realistic problems in fluid mechanics & machines. |

**CO-PO-PSO MAPPING**

| CO/ PO-PSO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 1 | 2 | | | | | | | | | | 3 | 1 | 3 |
| **CO2** | 1 | 2 | | | | | | | | | | 3 | 1 | 3 |
| **CO3** | 1 | 2 | | | | | | | | | | 3 | 1 | 3 |
| **CO4** | 1 | 2 | | | | | | | | | | 3 | 1 | 3 |
| **CO5** | 1 | 2 | | | | | | | | | | 3 | 1 | 3 |
| **CO6** | 1 | 2 | | | | | | | | | | 3 | 1 | 3 |
| **CO7** | 1 | 2 | | | | | | | | | | 3 | 1 | 3 |

***"1" - Low Correlation; "2" - Medium Correlation; "3" - Substantial Correlation***

| | |
|---|---|
| **Course Title** | Fluid Mechanics & Hydraulic Machines |
| **Course Code** | A2CEI301 |
| **Course Designed by** | Department of Civil Engineering |
| **Approval** | |

| A2CHA701 | SEMESTER - III | L | T | P | C |
|---|---|---|---|---|---|
| | ENVIRONMENTAL SCIENCE | 2 | 0 | 0 | 0 |
| | Total Contact Hours – 30 | | | | |

## SYLLABUS

**UNIT – I:**

**MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES:** Definition, Scope and Importance of Multidisciplinary nature of Environmental Studies, Climate change: Global warming, Acid rains, Ozone layer depletion

**UNIT – II:**

**NATURAL RESOURCES:** Forest resources, deforestation, case studies –Water resources – Use and over utilization of surface and ground water –Floods, drought, conflicts over water, dams – benefits and problems, Mineral resources: Use and exploitation, environmental effects of mining, case studies. Food resources- World food problems, effects of modern agriculture, Land resources- land degradation, soil erosion and desertification, Energy resources: Growing energy needs, renewable and non-renewable energy sources.

**UNIT – III:**

**Part A:**

**Ecosystem:** Concept of an ecosystem**,** Classification, Structure of an Ecosystem: Producers, consumers and decomposers, different functions of an ecosystem.

**Part B:**

**Biodiversity:** Definition and types: genetic, species and ecosystem diversity, Values of biodiversity, Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

**UNIT – IV:**

**ENVIRONNEMENTAL POLLUTION** Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Nuclear hazards. Role of an individual in prevention of pollution.

**UNIT – V: SOCIAL ISSUES AND THE ENVIRONMENT**

Sustainability, urban and energy related problems

Solid waste Management: Causes, effects and control measures of urban and industrial wastes,

**Text Books:**


1. Environmental Studies by Anubha Kaushik, 4th Edition
2. A Textbook of Environmental Studies by Shaashi Chawla, TMH, New Delhi
3. Environmental Studies by P.N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani; Pearson Education, Chennai


**References:**


1. Text Book of Environmental Studies by Deeshita Dave & P. Udaya Bhaskar, Cengage Learning.
2. Environmental Studies by K.V.S.G. Murali Krishna, VGS Publishers, Vijayawada
3. Environmental Studies by Benny Joseph, Tata McGraw Hill Co, New Delhi

**COURSE OUTCOMES:**

Students will be able to:

| | |
|---|---|
| CO1 | Understand the scope and importance of multidisciplinary nature of environmental science. |
| CO2 | Understand the natural resources and their importance for the sustenance of life and the need to conserve natural resources. |
| CO3 | Understand ecosystem and its function in the environment, |
| CO4 | Understand the importance of biodiversity, the threats to biodiversity and conservation practices to protect the biodiversity. |
| CO5 | Understand the various types of pollution, its impact and measures to control pollution. |
| CO6 | Understand solid waste management technologies. |
| CO7 | Understand the sustainability nature of environment. |

**CO-PO-PSO MAPPING**

| CO / PO mapping | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | | | | | 1 | | | | | | | | |
| CO2 | 1 | | | | | 2 | 2 | | | | | | | |
| CO3 | 2 | | | | | 2 | 1 | | | | | | 1 | |
| CO4 | 1 | | | | | 1 | | | | | | | | |
| CO5 | 1 | 1 | | | | | 1 | | | | | | 1 | |
| CO6 | 1 | | | | | 2 | 1 | | | | | | 1 | |
| CO7 | 1 | 1 | | | | | | | | | | | 1 | |

| **A2CHA701 ENVIRONMENTAL SCIENCE** | |
|---|---|
| Course designed by | Department of Chemical Engineering |
| Approval | Approved by: Meeting of Board of Studies held on 29th Jun, 2019 |
| | Ratified by: 2nd Meeting of Academic Council, 13th AUG, 2020 |

| | | | | | |
|---|---|---|---|---|---|
| **A2CHT101** | **SEMESTER – IV** | **L** | **T** | **P** | **C** |
| | **Biology for Engineers** | **3** | **0** | **0** | **3** |
| | Total Contact Hours – 48 | | | | |

## SYLLABUS

**UNIT-I:**

**Introduction**: Biology and its applications, Biological classification, Living Organisms: Cells and Cell theory, Cell structure and function.

**UNIT-II:**

**Biochemistry and molecular analysis:** Chemical composition of living forms, analysis of Chemical composition, Carbohydrates, Amino acid and proteins, protein synthesis, Nucleic acids, lipids, nature of bonding and qualitative tests.

**Unit-IIIA**:

**Genetics:** Transfer of genetic information, Mendelian Law, Mendel's law of inheritance, Gene interaction, multiple allens, chromosome theory of inheritance., linkage, Recombination, Chromosome mapping, Genetic disorders, Nucleic acids, replication of DNA, types of RNA, Transcription, Genetic code, translation and steps in translation.

**Unit-IIIB**:

**Metabolism:** Thermodynamics as applied to biological systems. Exothermic and endothermic reactions. Concept of Keq and its relation to standard free energy, Spontaneity. ATP as an energy currency. The breakdown of glucose to$CO_2 + H_2O$ (Glycolysis and Krebs cycle) and synthesis of glucose from $CO_2$ and $H_2O$ (Photosynthesis). Energy yielding and energy consuming reactions, Concept of Energy charge.

**UNIT-IV**:

**Enzymes and industrial applications**: Mode of action of enzymes, properties of enzymes, chemical reactions, factors affecting enzyme activity, Co-factors, importance of enzymes, industrial application of enzymes.

**UNIT-V:**

**Microbiology and Industrial applications:** Microorganism, Growth kinetics, culture media, sterilization, Microscopy, application of microbiology, immunology and immunity, Cancer Biology, stem cells.

**Text books:**


1. Biology for Engineers by Wiley (ISBN: 9781121439931), 1st edition TMH, New Delhi (2019)
2. Suraish kumar G K, Biology for Engineers, Oxford University Press, New Delhi (2019)


**References:**


1. Campbell, NA and Reece JB, Biology, International edition, 7th edition or later, Benjamin Cummings, New York (2007 or later)
2. Karp, G, Cell and Molecular Biology: Concepts and Experiments, 7th edition, Wiley, New York (2013)

**Course Outcomes:**

Students will be able to:

| | |
|---|---|
| CO1 | Explain the importance of biology in engineering. |
| CO2 | Identify the importance of chemicals like lipids, sugars, polysaccharides, amino acids and proteins |
| CO3 | Know the importance of DNA and RNA |
| CO4 | Describe the process metabolism |
| CO5 | Know the various applications of industrial enzymes |
| CO6 | Know the importance of industrial microbiology in the current scenario. |
| CO7 | Explain importance of the microbes and its applications. |

**Mapping of POs & COs**

| CO / PO mapping | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | 2 | | | 2 | | | | 2 | 2 | | 2 | 2 | 2 | |
| CO-2 | 2 | | | | | | | | | | | | 2 | |
| CO-3 | 2 | | | | | | | | | | | | 2 | |
| CO-4 | 2 | | | | | | | | | | | | 2 | |
| CO-5 | 2 | | | | | | | | | | | | 2 | |
| CO-6 | 2 | | | 2 | | | | 2 | 2 | | 2 | 2 | 2 | |
| CO-7 | 2 | | | | | | | | | | | | 2 | |

| **A2CHT101 Biology for Engineers** | |
|---|---|
| Course designed by | Department of Chemical Engineering |
| Approval | Approved by: Meeting of Board of Studies held on 29th Jun, 2019 |
| | Ratified by: 2nd Meeting of Academic Council, 13th AUG, 2020 |

| A2MAT110 | SEMESTER - IV | L | T | P | C |
|---|---|---|---|---|---|
| | MATHEMATICS-IV (common to CIV, MEC & CHE) | 3 | 0 | - | 3 |
| | Total Contact Hours – 48 | | | | |

## SYLLABUS

### UNIT-I:FOURIER SERIES

Outlines: Periodic function, even and odd functions, generalized rule of integration by parts, special wave forms like square wave, half wave rectifier, full wave rectifier, saw-toothed wave, triangular wave; Fourier Series expansions: Euler's formulae for Fourier series, Dirichlet's conditions, Fourier series expansions for functions of period $2\pi$, functions having points of discontinuity, Change of interval, Fourier series expansions for functions of period 2L, Fourier series of odd and even functions; Half range Fourier Series: Half range sine and cosine series.

### UNIT-II: FOURIER TRANSFORMATIONS

Fourier Integral: Fourier integral theorem and its complex, sine and cosine forms (statements only); Fourier Transformations (FTs): Concepts of integral transforms and its Kernels, Complex Fourier transformation, Fourier sine transformation & Fourier cosine transformations and their inverse transforms, Properties of Fourier transforms, Computation of Fourier, Fourier sine and Fourier cosine transformations using properties, evaluation of integrals, deductions of identities, Applications of FTs to solve integral equations.

### UNIT-III: APPLICATIONS OF PDES

Transverse vibrations of a stretched string (One dimensional wave equation): Solution by separation of variables method, boundary conditions, formation of physical problems of stretched string in to a boundary value problem (BVP), Solving BVPs for their particular solutions;

One dimensional heat flow equation: Solution by separation of variables method, modeling one dimensional heat flow phenomena as a BVP, solving BVPs for their particular solutions; Two dimensional heat flow equation (Laplace equation): Solution by separation of variables method, modeling two dimensional heat flow phenomena as a BVP, solving BVPs for their particular solutions.

### UNIT-IV: COMPLEX VARIABLES (DIFFERENTIATION)

Functions of complex variables: Neighborhood of a point in complex plane, Regions, limit and continuity of a complex function, derivative of a complex function, Cauchy-Riemann equations, analytic function, Entire function, Conjugate function, C-R equations in polar coordinates, Laplace equation, harmonic functions, harmonic conjugates; Construction of analytic functions: Milne-Thomson method; Applications to Electrical field and fluid flow problems: Complex potential, velocity potential, stream function in electrical field and fluid flow problems.

### UNIT-V: COMPLEX VARIABLES (INTEGRATION)

Line integral of a complex function: Concept of complex integration, simple closed curve and multiple curves, simply and multiply connected domains, line integral and its properties, evaluation of line integral, Cauchy's integral formula, Cauchy's integral theorem, Cauchy's integral formula for derivatives; Outlines: of Taylor's & Laurent's series; Cauchy's

residue theorem: Concepts of zeros, singularities and poles of an analytic function, residues, calculation of residues, Cauchy's residue theorem.

**Text Books**:

1. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017
2. T.K.V. Iyengar et al, Mathematical Methods, S.Chand Publishers

**Reference Books:**

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011
2. B.V. Ramana, Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
3. T. Veerarajan, Higher Engineering Mathematics, Tata McGraw-Hill, 2008

**Course Outcomes (COs):** At the end of course, students shall be able to:

| | |
|---|---|
| CO 1 | Recall the concepts of Fourier Series and Fourier Transformations |
| CO 2 | Recall the Applications of PDEs |
| CO 3 | Recall the concepts of Complex variables |
| CO 4 | Use and Interpret the concepts of Fourier Series and Fourier Transformations |
| CO 5 | Use and interpret the Applications of PDEs |
| CO 6 | Use and interpret the concepts of Complex variables |
| CO 7 | Apply the concepts of Fourier Series, Fourier Transformations, PDEs and complex variables to model and solve real world problems. |

**CO/PO Mapping**

| Course Title: | | | | Mathematics-IV (Common to MECH, CHEM & CIVIL) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Code: | | | | A2MAT110 | | | | | | | | | | |
| Course Designed by | | | | Dept. of Mathematics | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 3 | 3 | | 2 | | | | | | | 2 | | | |
| CO2 | 3 | 3 | | 2 | | | | | | | 2 | | | |
| CO3 | 3 | 3 | | 2 | | | | | | | 2 | | | |
| CO4 | 3 | 3 | | 2 | | | | | | | 2 | | | |
| CO5 | 3 | 3 | | 2 | | | | | | | 2 | | | |
| CO6 | 3 | 3 | | 2 | | | | | | | 2 | | | |
| CO7 | 3 | 3 | | 2 | | | | | | | 2 | | | |

| | |
|---|---|
| Course designed by | DEPARTMENT OF MATHEMATICS |
| Approval | Approved by: Meeting of Board of Studies held on 06.07.2019 |
| | Ratified by: 5th Meeting of Academic Council, 13-07-2019. |

| | | | | | |
|---|---|---|---|---|---|
| **A2CET202** | **SEMESTER-III** | **L** | **T** | **P** | **C** |
| | **Design Thinking and Product Innovation** | 3 | 0 | 0 | 3 |
| | **Total Contact Hours :** 48<br>(Total practice hours-24, Estimated theory hours ~ 24 Total (48 hours) | | | | |
| | **Prerequisites:** None | | | | |

## SYLLABUS

### UNIT 1: INTRODUCTION TO DESIGN THINKING

**Design Thinking in General:** The Concept of Design Thinking; Wicked Problems, The Principles and the mindset of Design Thinking, Generic Phases of Design Thinking process and activities involved in each of the phase, Design Thinking Frameworks.

**Design Thinking for New Product Development :** Role of Design Thinking in NPD, When to Apply Design Thinking and When Not to, StageGate Vs Lean Vs. Agile methodologies Vs Design Thinking, Design innovation.

### UNIT 2: PROBLEM IDENTIFICATION PROCESS IN DESIGN THINKING

**Empathize:** Empathize - Goals and methods, Usage of Tools (Design Briefs - Nine Criteria with example), Usage of Tools (Creation of Personas, Illustrative application of Personas), Student Activity on Empathize phase.

**Define:** Importance of Define Phase, activities, Usage of Tools (Experience Mapping process with example), Usage of Tools (Developing Insights using HMW Questions, question ladder), Student Activity on Define phase.

### UNIT 3: PROBLEM SOLVING PROCESS IN DESIGN THINKING, CASE STUDY DISCUSSION & IMPLEMENTATION

**Ideate:** Importance of Ideate Phase, 77 Design Heuristics, Diverge Ideas, Converge Ideas Student Activity on Ideate phase

**Prototype & Test*:*** "A Design Thinking Product Development Framework", What Is a Story? What Is a Prototype?, "Putting It Together—Combining Stories and Prototypes", Employing Stories and Prototypes in Your Process

**Case Study Implementation:** Case Study - 1 (Problem Identification Processes in Design Thinking), Case Study - 1 (Problem Solving Processes in Design Thinking), Case Study - 2 (Problem Identification Processes in Design Thinking), Case Study - 2 (Problem Solving Processes in Design Thinking)

**Student implementing phases of DT towards Problem Solving:** Problem Area Identification , Application of Empathize Phase , Application of Empathize Phase,
Case Study Evaluation Phase - 1

### UNIT 4: PRODUCT INNOVATION

**The Role of Design in Early-Stage Ventures:** Introduction: An Emerging Start-up Culture, The Process: Winding from idea to product, Discussion on Case Study, Troubleshooting Common Mistakes

**Optimal Design for Radically New Products:** Introduction- six ideas and their implementation, Communicate the Challenge Goal toward Radically New Products; Shift Time Frames to Future and Past, Promote an Emerging Technology Focus across the

Consumption Chain; Use of Analogical Thinking, Look for Novel Ways to Solve Simple Problems; Leverage More Ideators via Crowd sourcing

**UNIT 5: CASE STUDY IMPLEMENTATION**

**Student implementing phases of DT towards Problem Identification & Solving**

Application of Define Phase, Application of Define Phase, Case Study Evaluation Phase – 2, Application of Ideate Phase

**Student implementing phases of DT towards Problem Identification & Solving**

Application of Ideate Phase, Build Prototype, Test the solution, Case Study Evaluation Phase – 3

**Textbooks:**

1. Design think new product development essentials from the PDMA – Wiley edition
2. Product Design and Development Karl Ulrich (Author), Steven Eppinger –Fifth edition

**References:**


1. Design Thinking Getting Started Sidney eve Matrix, https://innovationbydesign.pressbooks.com/
2. https://en.wikipedia.org/wiki/Wicked_problem
3. https://web.mit.edu/jrankin/www/engin_as_lib_art/Design_thinking.pdf
4. https://www.interaction-design.org/literature/article/5-stages-in-the-design-thinking-process
5. https://www.interaction-design.org/literature/article/design-thinking-a-quick-overview
6. https://www.designorate.com/measuring-the-impact-of-design-thinking/
7. https://www.mindtheproduct.com/understanding-design-thinking-lean-agile-work-together/
8. https://www.sopheon.com/spiral-development-lean-vs-stage-gate/#:~:text=In%20practice%2C%20lean%20product%20development,is%20completed%20within%20each%20stage.
9. https://medium.com/codomo/what-is-design-innovation-why-you-need-to-know-it-b8d850503b3a
10. https://dschool-old.stanford.edu/groups/k12/wiki/3d994/empathy_map.html
11. https://www.designkit.org/methods/how-might-we
12. https://careerfoundry.com/en/blog/ux-design/what-is-ideation-in-design-thinking / https://www.interaction-design.org/literature/article/stage-3-in-the-design-thinking-process-ideate


**Course Outcomes:**

| | |
|---|---|
| CO1 | Have the ability to describe various phases of Design Thinking and various tools for Empathizing in Design Thinking. |
| CO2 | Have the ability to describe various tools for Ideation, Prototyping in Design Thinking |
| CO3 | Have the ability to outline the Design process for new Product development in startups and techniques to design Radically New Products. |
| CO4 | Have the ability to give examples for empathize and define phases in Design Thinkin |
| CO5 | Have the ability to give examples for Ideation, Prototyping in Design Thinking |
| CO6 | Have the ability to draw inferences on designing Radically New Products in |

| | |
|---|---|
| | emerging startups. |
| CO7 | Have the ability to apply Design Thinking principles, methodologies, phases and tools to design New/Radically new Process/Service/Product |

| | |
|---|---|
| Course Designed by | Department of CSE and IT |
| Approval | Approved by: Meeting of Board of Studies held on 29.08.2020 |
| | Ratified by: 6th meeting of academic council held on 21.11.2020 |

| | | | | | |
|---|---|---|---|---|---|
| **A2CET303** | **SEMESTER – IV** | **L** | **T** | **P** | **C** |
| | **Building Planning and Project Management** | **2** | **0** | **2** | **3** |
| | Total Contact Hours – 42(L) + 42(P) | | | | |
| | Pre-requisite: Computer aided Engineering Graphics | | | | |

## SYLLABUS

**UNIT – I: BUILDING BYELAWS & REGULATIONS**

**Building byelaws**: Objectives of building byelaws – Principles under lying building bye laws – Building Classification.

Regulations: Development Control Rules of buildings – General Building Requirements as per NBC – Open space, Lighting and ventilation requirements – Floor area ratio & Floor space index.

**UNIT – II: PLANNING OF RESIDENTIAL & PUBLIC BUILDINGS**

**Residential Buildings**: Minimum standards for various parts of buildings – Requirements of different rooms and their grouping – Types of residential buildings.

**Public Buildings:** Planning of Educational, Hospital, and Office buildings.

**UNIT – III: PROJECT PLANNING (NETWORKS)**

**Planning And Scheduling Methods:** Bar charts & Milestone Charts – Elements of network, Network diagram – Guidelines for the construction of the network diagram.

**Pert Network:** Development of PERT - Network – Numbering, Time estimates – Optimistic, Pessimistic and Most likely time estimates – Earliest Expected time and Latest Allowable Occurrence time.

**Critical Path:** Slack – Identification of Critical Path using Slack – Probability of Completion of projects.

**CPM Network:** Construction of network – Earliest Possible Occurrence time and Latest Possible Occurrence time – Start and Finish times of activities – Floats – Identification of Critical Path using floats.

**UNIT – IV: INTRODUCTION TO PROJECT MANAGEMENT**

**Project Management:** The role of Management in Project environment – Scope and Principles – Concept of Scientific Management – Qualities of a project manager.

**Management Information Systems:** Importance of Management Information Systems (MIS) – Logical Foundation of MIS – Classification of Information Systems – Introduction to MIS Software like MS project, PRIMEVERA etc.,

**UNIT – V: BUILDING DRAWING (using AUTOCAD)**

**Drawing of Residential Buildings:** Making line diagram – Site plan – Floor plan – Elevation – Section drawing.

**Drawing of Public Buildings:** Making line diagram – Site plan – Floor plan – Elevation – Section drawing.

**TEXTBOOKS**

1. "Project Planning and Control with PERT & CPM", B.C. Punmia & K.K. Khandelwal, Laxmi Publications(P) Ltd.
2. "Construction Project Management Theory and Practice", Kumar Neeraj Jha (2011), Pearson.
3. "Building Planning Designing and Scheduling", Gurucharan singh & Jagdish singh, Standard Publishers Distributors.

**REFERENCES**

1. "Construction Project Management - An Integrated Approach", Peter Fewings, Taylor and Francis.
2. "Construction Management Emerging Trends and Technologies", Trefor Williams, Cengage learning.
3. "Drawing and Design of Residential and commercial Building", Zaidi S. Kaleem A. Label Book Publisher: New Delhi Standard Pub.

**COURSE OUTCOMES**

Learners at the end of this course will be able to

| | |
|---|---|
| **CO1** | Have the ability to list/outline/describe/state Building byelaws, regulations and planning of residential and public buildings. |
| **CO2** | Have the ability to list/outline/describe/state Planning and scheduling methods, Critical path, PERT network and CPM networks. |
| **CO3** | Have the ability to list/outline/describe/state Drawing of residential buildings & RCC elements, Project management and Management information systems. |
| **CO4** | Have the ability to Compare & Contrast/Distinguish between alternatives/Give examples for/Draw Inferences on Building byelaws, regulations and planning of residential and public buildings. |
| **CO5** | Have the ability to Compare & Contrast/Distinguish between alternatives/Give examples for/Draw Inferences on Planning and scheduling methods, Critical path, PERT network and CPM networks. |
| **CO6** | Have the ability to Compare & Contrast/Distinguish between alternatives/Give examples for/Draw Inferences on Drawing of residential buildings & RCC elements, Project management and Management information systems. |
| **CO7** | Ability to apply the skills and principles of Building planning and Project management to solve the problems raises in ongoing projects and tends to complete it in estimated time and cost. |

## CO-PO-PSO MAPPING

| CO/ PO-PSO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | | | | 1 | 2 | | 1 | 1 | 2 | 1 | 2 | 2 | |
| **CO2** | 2 | | | | 1 | 2 | | 1 | 1 | 2 | 1 | 2 | 2 | |
| **CO3** | 2 | | | | 1 | 2 | | 1 | 1 | 2 | 1 | 2 | 2 | |
| **CO4** | 2 | | | | 1 | 2 | | 1 | 1 | 2 | 1 | 2 | 2 | |
| **CO5** | 2 | | | | 1 | 2 | | 1 | 1 | 2 | 1 | 2 | 2 | |
| **CO6** | 2 | | | | 1 | 2 | | 1 | 1 | 2 | 1 | 2 | 2 | |
| **CO7** | 2 | | | | 1 | 2 | | 1 | 1 | 2 | 1 | 2 | 2 | |

***"1" - Low Correlation; "2" - Medium Correlation; "3" - Substantial Correlation***

| | |
|---|---|
| **Course Title** | Building Planning and Project Management |
| **Course Code** | A2CET303 |
| **Course Designed by** | Department of Civil Engineering |
| **Approval** | |

| A2CEI302 | SEMESTER – IV | L | T | P | C |
|---|---|---|---|---|---|
| | **Strength of Materials** | **3** | **0** | **3** | **4.5** |
| | Total Contact Hours: 54 | | | | |
| | Pre-requisite: Engineering Mechanics, Mathematics | | | | |

## SYLLABUS

**UNIT- I: SHEAR FORCE AND BENDING MOMENT**

**Internal forces in Beams-1:** Types of Supports -Types of beams – Concept of shear force and bending moment – Relation between S.F., B.M and rate of loading at a section of a beam. S.F and B.M diagrams for cantilever for different load cases and simply supported beam under point loads.

**Internal forces in Beams-2:** S.F and B.M diagrams for simply supported beam and overhanging beams subjected to uniformly distributed loads, uniformly varying loads and combination of loads – Point of contraflexure, maximum bending moment.

**UNIT - II: BENDING STRESS AND SHEAR STRESS**

**Bending Stress:** Theory of simple bending – Assumptions – Derivation of pure bending equation- Neutral axis– Determination of bending stresses – Section modulus of rectangular, circular (Solid and Hollow), I, T, L, Triangle, Channel and built up sections of simple beams.

**Shear Stress:** Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T, angle sections, channel and built up beams.

**UNIT III: TORSION OF CIRCULAR SHAFTS**

**Torsion of Shaft:** Theory of pure torsion – Derivation of Torsion equations - Assumptions made in the theory of pure torsion – Torsional moment of resistance – Polar section modulus – Power transmitted by shafts.

**Principal Stresses and Strains:** Introduction – Stresses on an inclined section of a bar under axial loading – compound stresses – Normal and tangential stresses on an inclined plane for biaxial stresses – Two perpendicular normal stresses accompanied by a state of simple shear – Mohr's circle of stresses – Principal stresses and strains – Analytical and graphical solutions. Theories of failures.

**UNIT IV: COLUMNS AND STRUTS AND COMBINED DIRECT AND BENDING STRESSES**

**Columns and Struts:** Introduction – Types of columns– Axially loaded compression members – Crushing load – Euler's theorem for long columns- assumptions- Euler's critical load formulae for various end conditions – Equivalent length of a column – slenderness ratio – Euler's critical stress – Limitations of Euler's theory.

**Combined Direct and Bending Stresses:** Core of a section-Stresses under the combined action of direct loading and B.M.

**UNIT V: THIN CYLINDERS AND SPHERES**

**Thin Cylinders:** Derivation of formulae and calculations of hoop stress, longitudinal stress in a cylinder.

**Spheres:** Analysis of sphere subjected to internal pressures. Analysis of thin cylinder with hemispherical ends.

**TEXT BOOKS:**

1. "Mechanics of Structures: Vol: 1", H. J. Shah and S. B. Junnarkar, Charotar Publishing House, 2008
2. "Mechanics of Materials", J. M. Gere and S. Timoshenko, PWS Publishing Company, May 1997.

**REFERENCE BOOKS:**

1. "Mechanics of Materials", Ferdinand Beer, Jr. Johnston, E. Russell John DeWolf, and David Mazurek, McGraw-Hill Education.
2. "Strength of Materials", R. Subramanian, Oxford University Press.
3. "Fundamentals of Solid Mechanics", M. L. Gambhir, PHI Learning Pvt. Ltd., New Delhi.

## List of Experiments

1. Tension test on Mild steel bar
2. Compression test on Concrete
3. Hardness test on metal sample
4. Verification of Maxwell's Reciprocal theorem on beams
5. Impact test on Mild steel sample
6. Bending test on simply supported metal sample
7. Shear test on metal sample
8. Bending test on Cantilever metal sample
9. Spring test (open and close coiled)
10. Deflection test on continuous beam
11. Determination of Elastic Modulus of Concrete

## COURSE OUTCOMES

Learners at the end of this course will be able to

| | |
|---|---|
| **CO1** | Describe the concept of shear force and bending moment and the stresses developed. |
| **CO2** | Outline the concepts of torsion in circular shaft and principal stresses. |
| **CO3** | State the principles in analysis of columns, thin cylinder and spheres. |
| **CO4** | Draw SFD and BMD and determine the stresses developed in the beam |
| **CO5** | Analyze and design circular shaft for torsion and analyze the component subjected multi axial loading |
| **CO6** | Analyze the columns, thin cylinder and spheres and thereupon design them. |
| **CO7** | Apply the principles of statics to analyze and determine the strength of different structural elements. |

## CO-PO-PSO MAPPING

| CO/ PO-PSO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 1 | 2 | | 2 | | | | | | | | 1 | 2 | 1 |
| **CO2** | 1 | 2 | 2 | 2 | | | | | | | | 1 | 2 | 1 |
| **CO3** | 1 | 2 | 2 | 2 | | | | | | | | 1 | 2 | 1 |
| **CO4** | 1 | 2 | 2 | 2 | | | | | | | | 1 | 2 | 1 |
| **CO5** | 1 | 2 | 2 | 2 | | | | | | | | 1 | 2 | 1 |
| **CO6** | 1 | 2 | 2 | 2 | | | | | | | | 1 | 2 | 1 |
| **CO7** | 1 | 2 | 2 | 2 | | | | | | | | 1 | 2 | 1 |

***"1" - Low Correlation; "2" - Medium Correlation; "3" - Substantial Correlation***

| | |
|---|---|
| **Course Title** | Strength of Materials |
| **Course Code** | A2CEI303 |
| **Course Designed by** | Department of Civil Engineering |
| **Approval** | 28 August 2020, BoS Meeting |

| | | | | | |
|---|---|---|---|---|---|
| **A2CEI303** | **SEMESTER – IV** | **L** | **T** | **P** | **C** |
| | **MATERIALS, TESTING AND EVALUATION** | **3** | **0** | **3** | **4.5** |
| | **Pre-requisite:** | | | | |
| | **Total Contact Hours – 48 (L) + 48 (P)** | | | | |

## SYLLABUS

**UNIT – I: CEMENT AND ITS PROPERTIES**

**Composition and Manufacturing:** Types of cement, Manufacturing of cement, Chemical composition, Hydration of cement, Admixtures

**Tests on cement:** Field tests on cement, Fineness of cement, consistency of cement, strength and soundness test on cement, Heat of hydration and chemical composition tests

**UNIT – II: AGGREGATES FOR CONCRETE**

**Properties of aggregates:** Classification of aggregates, physical properties, mechanical properties, reactive aggregates, deleterious substances

**Tests on aggregates:** Specific gravity test on aggregates, Bulking of Fine Aggregates, sieve analysis of fine and coarse aggregates, zoning of fine aggregates and gradation of coarse aggregates

**UNIT – III: CONCRETE**

**Fresh Concrete**

**Workability of concrete**: Factors affecting workability, Measurements of workability, Segregation of concrete, bleeding of concrete, Setting of concrete

**Manufacturing of fresh concrete*:*** Batching, mixing, transporting and placing of concrete, RMC, Curing of concrete, shrinkage of concrete, shotcrete

**Hardened Concrete:**

**Factors effecting strength of concrete:** w/c ratio, Get/space ratio, maturity of concrete, effect of aggregates on strength of concrete, accelerated curing

**Properties of Hardened concrete:** Compressive strength, Tensile strength, Flexural strength, Modulus of elasticity, creep of concrete

**UNIT – IV: MIX DESIGN AND DURABILITY OF CONCRETE**

**Mix design of concrete:** Concept of mix design, factors affecting mix design, IS codal recommendations, Normal concrete mix design, fly ash replacement in concrete mix design

**Durability of concrete:** Factors affecting durability of concrete, freezing and thawing effect, sulphate effect, acid attack, chloride attack

**UNIT – V: BITUMEN & AGGREGATE FOR ROAD CONSTRUCTION**

**Bituminous materials:** Types of bituminous materials, desirable properties of bitumen for road construction (Grade of bitumen, softening point, ductility, specific gravity, flash and fire point and elastic recovery)

**Aggregates for road construction:** Desirable properties of aggregate for road construction (crushing strength, impact strength, abrasion, attrition, flakiness and elongation)

**TEXT BOOKS:**


1. Concrete Technology, M.S.Shetty – S. Chand & Co.: 2004
2. Highway Engineering, Khanna S.K., and Justo – Nem Chand Bros

**REFERENCES:**


1. Properties of concrete, A.M.Nevelli – PEARSON – 4th edition
2. Relevant IS codes for testing materials
3. MORTH Publications- Specifications for roads and bridges


**List of Experiments – Material Testing and Evaluation**
**(Hands On)**

1. Fineness of Cement and Normal Consistency of Cement
2. Initial and Final Setting Times of Cement
3. Specific Gravity of Cement and Soundness of Cement
4. Compression Strength of Cement
5. Bulking of Sand and Fineness Modulus of Fine Aggregate
6. Specific Gravity and Fineness modulus of Coarse Aggregate
7. Workability Tests on Fresh Concrete
    i. Slump Cone Test
    ii. V-Bee Consistometer Test
    iii. Compaction Factor Test
8. Test for Compressive Strength of Cement Concrete
9. Aggregate Crushing Test & Aggregate Impact Test
10. Elongation and Flakiness Index Test & Angularity Number Test
11. Los Angles Abrasion Test & Deval's Attrition test
12. Penetration Test & Softening Point Test
13. Ductility Test & Specific Gravity Test
14. Elastic recovery test & Flash & Fire Point Test

## COURSE OUTCOMES

Learners at the end of this course will be able to

| | |
|---|---|
| **CO1** | Describe composition, manufacturing and field tests on cement and properties of aggregates |
| **CO2** | Describe making, factors affecting, fresh and hardened properties of concrete |
| **CO3** | Describe the concepts of mix design and durability of concrete and materials for road construction |
| **CO4** | Draw inferences on composition, manufacturing and field tests on cement and properties of aggregates |
| **CO5** | Draw inferences on making, factors affecting, fresh and hardened properties of concrete |
| **CO6** | Draw inferences to the concepts of mix design and durability of concrete and materials for road construction |
| **CO7** | Ability to evaluate the relevant properties and suggest the suitability for the construction of various civil engineering structures. |

**CO-PO-PSO mapping**

| CO/ PO-PSO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 1 | 3 | | | | | | | | | | | | |
| **CO2** | 1 | 3 | | | | | | | | | | | | |
| **CO3** | 1 | 3 | | | | | | | | | | | | |
| **CO4** | 1 | 2 | | | | | | | | | | 2 | | |
| **CO5** | 1 | 2 | | | | | | | | | | | | |
| **CO6** | 1 | 2 | | | | | | | | | | 2 | | |
| **CO7** | 1 | 1 | | | | | | | | | | | 1 | |

***"1" - Low Correlation; "2" - Medium Correlation; "3" - Substantial Correlation***

| | |
|---|---|
| **Course Title** | Materials, Testing and Evaluation |
| **Course Code** | A2CEI303 |
| **Course Designed by** | Department of Civil Engineering |
| **Approval** | |

| | | | | | |
|---|---|---|---|---|---|
| **A2EHA702** | **SEMESTER – IV** | **L** | **T** | **P** | **C** |
| | **ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE** | **2** | **-** | **-** | **0** |
| | **Total Contact Hours – 30** | | | | |

## COURSE CONTENT

- Basic Structure of Indian Knowledge System

  i) Ashtadasa vidya
  ii) Veda
  iii) Upavedha
  iv) Ayurvedha
  v) Dhanurvedha
  vi) Ghaandravedha
  vii) Vedang
    a. Shiksha,Kalp
    b. Nirutha
    c. Vyakaran
    d. Jyotishya)
  viii) Shastra
    a. Meemamsha
    b. Purana
    c. Tarka Shasthra

- Modern Science and Indian Knowledge System

- Yoga and Holistic Health care

- Case Studies.

**Suggested Text/Reference Books**


1. V. Sivaramakrishna (Ed.), Cultural Heritage of India-Course Material, Bharatiya Vidya Bhavan, Mumbai, 5th Edition, 2014
2. Swami Jitatmanand, Modern Physics and Vedant, Bharatiya Vidya Bhavan
3. Fritzof Capra, Tao of Physics
4. Fritzof Capra, The wave of Life
5. V N Jha ( Eng. Trans,), Tarkasangraha of Annam Bhatta, Inernational Chinmay Foundation, Velliarnad, Amaku,am
6. Yoga Sutra of Patanjali, Ramakrishna Mission, Kolkatta
7. GN Jha ( Eng. Trans.) Ed. R N Jha, Yoga-darshanam with Vyasa Bhashya, Vidyanidhi Prakasham, Delhi, 2016
8. RN Jha, Science of Consciousness Psychotherapy and Yoga Practices, Vidyanidhi Prakasham, Delhi, 2016
9. P R Sharma ( English translation), Shodashang Hridayam

**COURSE OUTCOMES**

| | |
|---|---|
| CO1 | The students will be able to comprehend the concepts of Indian Traditional Knowledge. |
| CO2 | The Students will be able to connect themselves with Knowledge from the modern scientific perspective. |
| CO3 | The students will be able to connect the past with the present advancements in Technology. |
| CO4 | The students will be to come to terms with the holistic health care system. |
| CO5 | The students will be able to develop critical thinking skills. |
| CO6 | The students will be able to comprehend the principles enshrined in ancient Sanskrit Literature |

**CO/PO Mapping**

| Course Title: | ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | | | | | | 2 | | | | | | | | |
| CO2 | | | | | | 2 | | | | | | | | |
| CO3 | | | | | | 2 | | | | | | | | |
| CO4 | | | | | | 2 | | | | | | | | |
| CO5 | | | | | | 2 | | | | | | | | |
| C06 | | | | | | 2 | | | | | | | | |

| | |
|---|---|
| Course designed by | DEPARTMENT OF ENGLISH & HUMANITIES |
| Approval | Approved by: Meeting of Board of Studies held on 23.06.2019 |
| | Ratified by: 5th Meeting of Academic Council, 13-07-2019. |

| | | | | | |
|---|---|---|---|---|---|
| **A2CEI304** | **SEMESTER – V** | **L** | **T** | **P** | **C** |
| | **Structural Analysis (Including STAAD. Pro.)** | 3 | - | 2 | 4 |
| | Total Contact Hours – 54 | | | | |
| | Pre-requisite: Engineering Mathematics, Engineering Mechanics, Strength of materials | | | | |

**SYLLABUS**

**UNIT 1: INFLUENCE LINES, DEFLECTION AND SLOPE OF STATICALLY DETERMINATE BEAMS**

**Moving loads and Influence lines:** Introduction to moving loads – Concepts of influence lines, Influence lines for reactions, Shear Force and Bending moment at any section of a simply supported beam. Applications

**Slopes and Deflections of determinate beams:** Macaulay's method and Moment area method. Slope and deflection of a Simply supported and Cantilever beams subjected to Point Load, Uniformly Distributed Load, Uniformly Varying Loads and their combinations.

**UNIT 2: PROPPED CANTILEVERS AND FIXED BEAMS**

**Propped cantilevers:** Method of consistent deformation and Method of double integration. Propped cantilever subjected to

**Fixed beams:** Method of consistent deformation, Moment area equations and Method of double integration. Fixed beams subjected to Point load, Uniformly Distributed Load, Uniformly Varying Loads, couple, sinking of supports and their combination. Shear Force and Bending Moment diagrams.

**UNIT 3: ANALYSIS OF CONTINUOUS BEAMS**

**Moment distribution method:** Stiffness and carry over factors – Distribution and carryover of moments – Method of Analysis of continuous Beams, Shear Force and Bending Moment diagrams of 2 and 3 span continuous beams subjected to Point load, Uniformly Distributed Load, Uniformly Varying Loads, couple, sinking of supports and their combination with and without over hang. Analysis of non-sway portal frames.

**Slope deflection method:** Equilibrium conditions and Slope – deflection equations, Shear Force and Bending Moment Diagrams of 2 and 3 span continuous beams subjected to Point load, Uniformly Distributed Load, Uniformly Varying Loads and couple with and without overhang. Analysis of sway and non-sway portal frames. Elastic curve.

**UNIT 4: MATRIX METHODS OF STRUCTURAL ANALYSIS**

**Stiffness method for analysis of pin-jointed trusses:** Restrained structures, Introduction to Matrix methods, Stiffness and Flexibility methods, Equilibrium conditions, formation of Stiffness matrix in Local and global coordinate systems, Analysis of series and parallel system of springs, Analysis of trusses of static indeterminacy up to three.

**Stiffness method for analysis of beams :**Stiffness matrix for beam element in local coordinate system, Stiffness matrix for beam (plane frame) element in local coordinate system, Analysis of Propped cantilever, Fixed beams, Continuous beams, and portal frames.

**UNIT 5: APPROXIMATE METHODS OF MULTI-STOREY FRAMES**

**Substitute frame method:** Introduction to Approximate methods for gravity loads, Substitute frame method of analysis of multi-storey frames for gravity (vertical) loads, Approximate analysis of Multi-bay Multi-storey rigid jointed frame, Bending Moment Diagram of Multi-storey frames

**Portal and Cantilever methods:** Method of Analysis of multi-storey frames for lateral loads, Analysis of Multi-Bay Multi-storey rigid jointed frame. Approximate analysis of 3-dimensional Multi-Bay Multi-storey rigid jointed frames subjected to combination of vertical and lateral loads

## TEXT BOOKS

1. Structural Analysis, Hibler
2. Structural Analysis, Vazrani and Ratwani

## List of Experiments

## (STAAD. Pro Laboratory)

**(a) Experiments having concepts in line with theory**

1. Analysis of pin-jointed plane trusses
2. Analysis of simple beams subjected to static loads
3. Analysis of simple beams subjected to moving loads
4. Analysis of cantilever beams
5. Analysis of continuous beams without over hang
6. Analysis of continuous beams with over hang
7. Analysis and design of Portal frames
8. Analysis and design of two-dimensional Multi-storey frames

**(b) Experiments not having concepts in line with theory**

1. Analysis of pin-jointed space truss

**(c) Design Experiments**

1. Analysis and design of three-dimensional multi-storey frames subjected to dead and live load.

**(d) Projects Based learning**

1. Analysis and design of G+5 residential apartment complex in a given site area.

## COURSE OUTCOMES

Learners at the end of this course will be able to

| | |
|---|---|
| **CO1** | Describe Moving loads, Influence lines, determine Slopes, Deflections of determinate beams and obtain SFD and BMD for Propped cantilevers and Fixed beams |
| **CO2** | Describe Moment distribution method and Slope deflection method of continuous beams and portal frames. |
| **CO3** | Describe Stiffness method for analysis of pin-jointed trusses and beams, Approximate methods of Substitute frame method, Portal and Cantilever methods. |
| **CO4** | Draw Inferences from analysis of beams subjected to Moving loads using Influence lines, Slopes and Deflections of determinate beams, and analysis of indeterminate beams like Propped cantilevers and Fixed beams. |
| **CO5** | Compare & Contrast Moment distribution method and Slope deflection method for analysis of continuous beams and portal frames. |

| | |
|---|---|
| **CO6** | Distinguish between Stiffness method for analysis of pin-jointed trusses and beams and Approximate methods for transverse and lateral loads. |
| **CO7** | Apply the principles of Influence lines for analysis of determinate beams, Method of consistent deformation / double integration method / Moment area method to analyse Propped cantilevers and Fixed beams, Moment distribution and Slope deflection, Stiffness method and other approximate methods to analyse Indeterminate beams and frames. |

**CO-PO-PSO mapping**

| CO/ PO-PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 1 | 2 | | 2 | 2 | | | | | | | 1 | 1 | 2 |
| **CO2** | 1 | 2 | 2 | 2 | 2 | | | | | | | 1 | 1 | 2 |
| **CO3** | 1 | 2 | 2 | 2 | 2 | | | | | | | 1 | 1 | 2 |
| **CO4** | 1 | 2 | 2 | 2 | | | | | | | | 1 | 1 | 2 |
| **CO5** | 1 | 2 | 2 | 2 | | | | | | | | 1 | 1 | 2 |
| **CO6** | 1 | 2 | 2 | 2 | | | | | | | | 1 | 1 | 2 |
| **CO7** | 1 | 2 | 2 | 2 | 2 | | | | | | | 1 | 1 | 2 |

***"1" - Low Correlation; "2" - Medium Correlation; "3" - Substantial Correlation***

| | |
|---|---|
| **Course Title** | Structural Analysis (Including STAAD Pro.) |
| **Course Code** | A2CEI305 |
| **Course Designed by** | Department of Civil Engineering |
| **Approval** | |

| | | | | | |
|---|---|---|---|---|---|
| **A2CEI305** | **SEMESTER – V** | **L** | **T** | **P** | **C** |
| | **Soil Mechanics** | **3** | **0** | **3** | **4.5** |
| | Total Contact Hours: 48 | | | | |
| | Pre-requisite: Solid Mechanics | | | | |

# SYLLABUS

**UNIT- I: INTRODUCTION**

**Soil formation and Basic relationships**: Soil formation and Types of soils in India and World, Phase diagram, Volumetric relationships and Water content, Volume-Weight Relationships and Specific gravity, Important Relationships.

**Soil Structure and Clay Mineralogy:** Soil Structure, Inter-particle forces in soil mass, Basic structural units of clay minerals, types of clay minerals, Soil water.

**UNIT-II: SOIL CHARACTERIZATION**

**Index properties of soil:** Particle size distribution, Sedimentation analysis, Consistency of soil- limits and indices, Determination of Liquid limit and Plastic limit, Shrinkage limit.

**Soil Classification Systems**: Soil classification and its significance, Particle size classification, Unified Soil Classification System, Indian Standard Soil Classification System, Applications of soil classification.

**UNIT- III: PROPERTIES OF SOIL**

**Permeability of soil:** Basic concepts of fluid flow: Darcy's Law, Measurement of permeability in laboratory, In-situ measurement of permeability, Factors affecting coefficient of permeability, permeability through stratified soils.

**Effective stresses and Seepage:** Types of stresses and heads, Seepage through soils, Capillary phenomena, Flownet: characteristics and uses, Quicksand condition.

**Compaction of soil:** Soil compaction and its significance, Factors affecting compaction, Mechanical properties affected by compaction, Compaction in field, Field control and its specifications.

**Vertical stresses:** Geostatic stresses, Boussinesq's Equations, Vertical stress distribution, Westergaard's Equation, Newmark's Influence chart and Approximate stress distribution method.

**UNIT- IV: CONSOLIDATION OF SOIL**

**Theory of Consolidation:** Significance of Consolidation, Compressibility, Effect of stress history, Mechanism of Consolidation, Terzaghi's one dimensional consolidation theory,

**Consolidation Parameters:** Consolidation test, Void ratio- Effective stress relationship, Determination of Coefficient of consolidation, Settlement computation, Secondary Consolidation Settlement.

**UNIT- V: SHEAR STRENGTH**

**Shear Strength of soil:** Significance of shear strength, Mechanism of Shear strength, Mohr-Coulomb Failure theory, Drainage conditions, Shear Strength tests.

**Concept of stress–strain**: Stress-strain behavior of clay, Stress-strain behavior of sand, Pore pressure measurement, Dilatancy and critical void ratio, stress paths.

**TEXT BOOKS**

1. Basic and Applied Soil Mechanics by Gopal Ranjan, A.S.R. Rao, New Age International Publications.
2. Soil Mechanics & Foundation Engineering by K.R. Arora, Standard Publisher Distributors.

**REFERENCES**

1. Fundamentals of Soil Mechanics by D.W. Taylor, John Wiley & Sons publications.
2. Soil Mechanics by Lambe and Whitman, John Wiley & Sons publications.

## List of Experiments
## Soil Mechanics Laboratory

1. Determination of specific gravity
2. Determination of Atterberg limits:
    a. Liquid limit
    b. Plastic limit
    c. Shrinkage limit
3. Determination of field density by:
    a. Core Cutter method
    b. Sand replacement method
4. Grain size analysis by:
    a. Sieve analysis
    b. Hydrometer analysis
5. Determination of permeability of soil by:
    a. Constant head test
    b. Variable head test
6. IS Light weight compaction of soil
7. Unconfined compression (UCC) test
8. Direct shear test
9. Tri-axial test
10. Vane shear test
11. Determination of California Bearing Ratio (CBR) test
12. Differential free swell test
13. Determination of Relative density (Demonstration)
14. Consolidation test (Demonstration)
15. Swell pressure test (Demonstration)

## COURSE OUTCOMES

Learners at the end of this course will be able to

| | |
|---|---|
| **CO1** | Describe soil formation, phase diagram and related terminology, relationships, Soil structure, clay mineralogy and soil index properties |
| **CO2** | Describe permeability and seepage through soils, process of compaction and vertical stresses developed due to applied loads. |
| **CO3** | Illustrate the process of consolidation and describe shear strength of soil. |
| **CO4** | Distinguish soil based on index properties and other parameters. |
| **CO5** | Compute coefficient of permeability and seepage discharge through different types of soil, compaction parameters and vertical stresses using different equations available. |
| **CO6** | Determine degree of consolidation and shear strength parameters of soil using appropriate methods. |
| **CO7** | Recommend the suitable type of soil for various geotechnical applications based on index and engineering properties of soil. |

## CO-PO-PSO MAPPING

| CO/ PO-PSO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | | | | | | | | | | | | | |
| **CO2** | 2 | | | | | | | | | | | | | |
| **CO3** | 2 | | | | | | | | | | | | | |
| **CO4** | 1 | 1 | | 2 | | | | | | | | | | |
| **CO5** | 1 | 1 | | 2 | | | | | | | | | | |
| **CO6** | 1 | 1 | | 2 | | | | | | | | | | |
| **CO7** | | | | 2 | | 1 | | | | | | | 1 | 1 |

***"1" - Low Correlation; "2" - Medium Correlation; "3" - Substantial Correlation***

| | |
|---|---|
| **Course Title** | Soil Mechanics |
| **Course Code** | A2CEI305 |
| **Course Designed by** | Department of Civil Engineering |
| **Approval** | |

| A2CET304 | SEMESTER – V | L | T | P | C |
|---|---|---|---|---|---|
| | **Basic Reinforced Concrete Design** | **3** | **0** | **0** | **3** |
| | Total Contact Hours: 54 | | | | |
| | Pre-requisite: Structural Analysis, Strength of Materials | | | | |

# SYLLABUS

**UNIT- I INTRODUCTION TO REINFORCED CONCRETE DESIGN**

**Materials and Design Philosophy:** Materials for reinforced concrete, loading standards – Dead, live, wind and earthquake loads - Philosophy of working stress method, ultimate load method and limit state method.

**Concepts of Limit state Design:** Characteristic loads –Characteristic strength – Partial load and safety factors. Stress blocks of limit state method, neutral axis depth, moment of resistance, balanced, under-reinforced and over-reinforced sections (Theoretical concepts).

**UNIT-II LIMIT STATE DESIGN FOR FLEXURE**

**Analysis and Design of singly and doubly reinforced beams:** Basic concept of Limit state of Flexure - Analysis of Singly reinforced beams - Design of Singly reinforced beams- Analysis of Doubly reinforced beams- Design of Doubly reinforced beams.

**Analysis and Design of Flanged beams:** Fundamentals of Analysis of Flanged beams- Analysis of flanged beams - Design of flanged beams.

**UNIT- III LIMIT STATE DESIGN FOR SHEAR, TORSION, BOND & ANCHORAGE**

**Design for shear, Bond, Anchorage and Torsion:** Limit state analysis and design of section for shear and torsion- IS 456 code provisions. Design examples in simply supported beams. Concept of bond, anchorage and development length.

**Limit State Design of Slabs :**Classification of slabs, design and detailing of one way slabs, Serviceability aspects in design of slabs.

**UNIT- IV LIMIT STATE DESIGN OF COMPRESSION MEMBERS**

**Analysis and Design of Short column under axial load:** Effective length of a column-analysis, design and detailing of short under axial loads.

**Design of Short column subjected to axial load and Bending moment:** Analysis and design of short column subjected to axial load and bending moment using IS Code provisions and SP16 Charts**.**

**UNIT - V LIMIT STATE DESIGN OF FOOTING**

**Design of Footing for column subjected to axial loads:** Different types of footings – Design and Detailing of isolated footings – rectangular and square footings subjected to axial loads.

**Design of Footing for column subjected to axial loads and bending moment:** Design and Detailing of isolated footings – rectangular and square footings subjected to axial loads and uni-axial bending moments.

**TEXT BOOKS**

1. "Design of Reinforced Concrete Structures", N. Subramanian, Oxford University Press, New Delhi, 2013.

2. “Limit State Design of Reinforced Concrete”, P. C. Varghese, Prentice Hall of India, Pvt. Ltd., New Delhi, 2002.
3. “Reinforced Concrete: Limit State design”, A. K. Jain, Nem Chand & Brothers Publishers.

**REFERENCE BOOKS**

1. “Design of Concrete Structures”, Arthus H. Nilson, David Darwin, and Chorles W. Dolar, Tata McGraw-Hill, 3rd Edition, 2005.
2. “Reinforced Concrete Structures”, Robert Park and Thomas Paulay, John Wiley and Sons.
3. “Reinforced Concrete Design”, S. Unnikrishnan Pillai & Devdas Menon, Tata McGraw Hill, New Delhi.
4. IS 456-2000, SP 16-1978.

**COURSE OUTCOMES**

Learners at the end of this course will be able to

| | |
|---|---|
| **CO1** | Describe the principle of Limit state design for flexure |
| **CO2** | List the concepts of shear, torsion, anchorage and bond and design of slab |
| **CO3** | Describe the design concepts of columns and footings |
| **CO4** | Analyze and design Beams for flexure |
| **CO5** | Analyze and design and detail the beams for shear, torsion, anchorage and bond and design and detail the one way slab |
| **CO6** | Design and detail the columns and footings |
| **CO7** | Apply the limit state principles for analysis and design of structural elements |

**CO-PO-PSO MAPPING**

| CO/ PO-PSO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 1 | 2 | 1 | 2 | | | | | | | | 1 | 2 | 1 |
| **CO2** | 1 | 2 | 1 | 2 | | | | | | | | 1 | 2 | 1 |
| **CO3** | 1 | 2 | 1 | 2 | 1 | | | | | | | 1 | 2 | 1 |
| **CO4** | 1 | 2 | 1 | 2 | 1 | | | | | | | 1 | 2 | 1 |
| **CO5** | 1 | 2 | 1 | 2 | 1 | | | | | | | 1 | 2 | 1 |
| **CO6** | 1 | 2 | 1 | 2 | 1 | | | | | | | 1 | 2 | 1 |
| **CO7** | 1 | 2 | 1 | 2 | 1 | | | | | | | 1 | 2 | 1 |

***“1” - Low Correlation; “2” - Medium Correlation; “3” - Substantial Correlation***

| | |
|---|---|
| **Course Title** | Basic Reinforced Concrete Design |
| **Course Code** | A2CET304 |
| **Course Designed by** | Department of Civil Engineering |
| **Approval** | 28 August 2020, BoS Meeting |

| A2CET401 | SEMESTER – V | L | T | P | C |
|---|---|---|---|---|---|
| | **Advanced Concrete Technology (Professional Elective-I)** | **3** | **0** | **0** | **3** |
| | Total Contact Hours: 45<br>Pre-requisite: Concrete Technology | | | | |

# SYLLABUS

**UNIT-I: PROPERTIES OF CONCRETE**

**Fresh Concrete** – Workability: Factors Affecting Workability (Water Content, Mix Proportions, Size of Aggregate, Shape of Aggregate), Setting Time of Concrete, Manufacture of Concrete: Batching, Mixing, Compaction, Types of compaction, Curing, Types of curing.

**Hardened Concrete**– Strength of concrete, compressive and tensile strength of concrete, Elasticity : Relation between Modulus of Elasticity and Strength , Factors Affecting Modulus of Elasticity , Dynamic Modulus of Elasticity, Poison's Ratio, Creep: Factors Affecting Creep, Influence of Aggregate, Influence of Mix Proportions, Influence of Age, Effect of Creep, Shrinkage: Plastic Shrinkage, Drying Shrinkage, Factors Affecting Shrinkage, Moisture Movement, Autogenous Shrinkage, Carbonation Shrinkage, Tests on hardened concrete, Compression Test, Comparison between Cube and Cylinder Strength, Flexural Strength of Concrete, Determination of Tensile Strength, Tension Test Methods.

**UNIT-II: MICROSTRUCTURE AND DURABILITY OF CONCRETE**

**Microstructure Of Concrete**: Definition, Significance, Complexities, Microstructure of the Aggregate Phase, Microstructure of the Hydrated Cement Paste, Solids in the hydrated cement paste, Voids in the hydrated cement paste, Water in the hydrated cement paste, Microstructure-property relationships in the hydrated cement paste, Interfacial Transition Zone in Concrete, Significance of the interfacial transition zone, Microstructure, Strength, Influence of the interfacial transition zone on properties of concrete

**Durability Of Concrete**: Strength and Durability Relationship, Definition of Durability, Significance of Durability, Volume Change in Concrete, Factors effecting durability of concrete, Permeability : Permeability of hardened cement paste, aggregate, concrete, Frost Action, Frost action on hardened cement paste, aggregate, Factors controlling the frost resistance of concrete, Effect of Fire, Effect of high temperature on hydrated cement paste, Effect of high temperature on aggregate, Effect of high temperature on concrete, Sulfate Attack, Chemical reactions in sulfate attack, Delayed ettringite formation, Selected cases histories, Control of sulfate attack , Alkali-Aggregate Reaction , Corrosion of Embedded Steel in Concrete

## UNIT-III: ADVANCES IN CONCRETE MECHANICS AND PROPORTIONING OF CONCRETE MIXES

**Dimensional Stability:**

Types of Deformations, Elastic Behavior, Nonlinearity of the stress-strain relationship, Types of elastic moduli, Determination of the static elastic modulus, Poisson's ratio, Factors affecting modulus of elasticity; Drying Shrinkage, Creep and their Causes, Factors affecting drying shrinkage and creep; viscoelastic behavior, Reversibility, Thermal Shrinkage, Factors affecting thermal stresses, Thermal Properties of Concrete, Extensibility and Cracking.

**Viscoelasticity And Fracture Mechanics Of Concrete**:

Viscoelasticity: Basic rheological models, Generalized rheological models, Time-variable rheological models, Superposition principle and integral representation, Fracture Mechanics: Linear elastic fracture mechanics, Concrete fracture mechanics, Fracture process zone

**Proportioning Of Concrete Mixes**:

Factors influencing mix design, Mix design of concrete as per IS Code and ACI code, design specification of special concretes in IS and ACI codes.

## UNIT-IV: SPECIAL CONCRETES

**High Strength Concretes:** High-Strength Concrete : Development of HSC, Definition, Significance, Materials used for HSC, Mix proportioning, Microstructure, Properties of fresh and hardened concrete, HSC design example, Applications.

**High Performance Concretes:** Self-compacting concrete: Definition, Mix design, Applications; Fibre Reinforced Concrete : Fibres used, Factors Effecting Properties, Relative Fibre Matrix Stiffness, Volume of Fibres, Aspect Ratio of Fibres, Orientation of Fibres, Workability, Size of coarse Aggregate, Mixing, Application; Polymer Concrete: Type of Polymer Concrete, Polymer Impregnated Concrete, Polymer Cement Concrete, Polymer concrete, Partially Impregnated Concrete, Properties of Polymer Impregnated Concrete; Light-weight concrete : Light-weight Aggregate Concrete, Structural Light-weight Concrete, Design of Light-weight Aggregate Concrete, Proporties; No-fines Concrete, Application; High Density Concrete, Application ; Sulphur-Infiltrated Concrete, Application.

## UNIT-V: ADVANCED TESTING OF CONCRETE

**Non Destructive Testing:** Non-Destructive Testing Methods: Schmidt's Rebound Hammer, Limitations, Rebound number and strength of concrete; Pullout test; Dynamic or Vibration Method ;pulse velocity test, Factors affecting the measurement of pulse velocity, Smoothness of contact surface under test, Influence of path length on pulse velocity, Applications, Establishing uniformity of Concrete, Establishing acceptance criteria, Estimation of strength of concrete, Measurement of deterioration of concrete due to fire exposure, Relationship between Pulse Velocity and Static Young's Modulus of Elasticity; Combined Methods; Radioactivity Methods; Nuclear Methods; Magnetic Methods; Electrical Methods; Physical Method

**Latest Methods For Testing Cement And Concrete Properties:** SEM- Test procedure, interpretation of results, Applications, XRD- Test procedure, interpretation of results, Applications, Digital image correlation technique- Test procedure, interpretation of results,

Applications, Rapid chloride penetration test- Test procedure, interpretation of results, Applications, Shrinkage Tests- Test procedure, interpretation of results, Applications.

**TEXT BOOKS**

1. "Concrete Technology", by A M Nevelli , J J Brooks, Pearson Publishers
2. "Concrete microstructure properties and materials", by P K Mehta, Paulo J M Monteior, McGraw-Hill Publishers.

**REFERENCES**

1. "Concrete Technology Theory and Practice", by M.S.Shetty, Schand Company Pvt. Ltd.

**COURSE OUTCOMES**

Learners at the end of this course will be able to

| | |
|---|---|
| **CO1** | Have the ability to examine different properties and micro structure of concrete in fresh and hardened state. |
| **CO2** | Have the ability to describe the dimensional stability and fracture mechanics of concrete. |
| **CO3** | Have the ability to list different special concretes and their advanced testing methods. |
| **CO4** | Have the ability to explain engineering and rheological properties of concrete and their testing methods. |
| **CO5** | Have the ability to discuss mix design procedure concert as per different codes of practice and factors effecting dimensional stability, fracture mechanics of concrete. |
| **CO6** | Have the ability to discuss design procedure of special concretes and their advanced testing methods. |
| **CO7** | Ability to design any type of concrete mix and analyze micro structure |

**CO-PO-PSO MAPPING**

| CO/ PO-PSO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | - | - | - | - | - | - | - | - | - | - | 3 | 1 |
| **CO2** | 3 | 2 | - | - | - | - | - | - | - | - | - | - | 3 | 1 |
| **CO3** | 3 | - | - | 2 | 2 | - | - | - | 2 | - | - | - | 3 | 1 |
| **CO4** | 3 | - | - | - | - | - | - | - | - | - | - | - | 3 | 1 |
| **CO5** | 3 | - | 3 | 3 | - | - | - | - | - | - | - | - | 3 | 1 |
| **CO6** | 3 | - | 3 | - | - | - | - | - | - | - | - | - | 3 | 1 |
| **CO7** | 3 | - | 3 | 3 | - | - | - | - | - | - | - | - | 3 | 1 |

***"1" - Low Correlation; "2" - Medium Correlation; "3" - Substantial Correlation***

| | |
|---|---|
| **Course Title** | Advanced Concrete Technology |
| **Course Code** | A2CET401 |
| **Course Designed by** | Department of Civil Engineering |
| **Approval** | |

| A2CET409 | SEMESTER – V | L | T | P | C |
|---|---|---|---|---|---|
| | **Engineering Geology (Professional Elective-I)** | **3** | **0** | **0** | **3** |
| | Total Contact Hours – 54<br>Pre-requisite: Engineering Physics and Engineering Chemistry | | | | |

# SYLLABUS

**UNIT – I: IMPORTANCE OF GEOLOGY AND WEATHERING**

**Introduction to Geology:** Branches of Geology- Importance of Geology from Civil Engg point of view-Case studies on dams and other other structures

**Introduction to weathering:** Geological agents-Weathering process of rocks-River Process and its Development

**UNIT – II: MINERALOGY AND PETROLOGY**

**Importance of mineralogy:** Classification of Minerals-Methods of Identification-Physical Properties of Minerals-Common ore and rock forming minerals

**Importance of Petrology:** Classification of Rocks - Forms of rocks-Structure and texture of rocks -Megascopic study of rocks

**UNIT – III: STRUCTURAL GEOLOGY, EARTHQUAKES AND LAND SLIDES**

**Structural Geology:** Outcrop and attitude of Rocks- Study of folds, faults, joints and unconformities. Significance of study of structures -Importance of folds, faults, joints, unconformities in civil engineering.

**Earthquakes:** Basic Terminology-Classification-Shield areas and seismic belts-Seismic Waves-Precautions for building construction

**Land Slides:** Introduction –Classification – Causes-Effects-Preventive measures

**UNIT – IV: GEOPHYSICS**

**Importance :** Classification of Geophysical methods-principles of Gravity Method-Magnetic Method-Radiometric and Geothermal method.

**Electrical Resistivity method and Seismic methods:** Principle, methods, investigation and interpretation and Civil Engg., Applications.

**UNIT – V: GEOLOGY OF DAMS, RESERVOIRS AND TUNNELS 9 Hrs**

**Geology of Dams and Reservoirs:** Selection of dam site and type of dam Considerations for successful reservoirs and Life of reservoirs

**Geology of Tunnels:** Over break - Purposes and effects of tunneling, Lining of Tunnels and Influence of geology for Successful tunneling

**TEXT BOOKS**

1. "Engineering Geology", N Chenna Kesavulu, Trinity Press (An imprint of Laxmi Publications Pvt Ltd.)
2. "Engineering and General Geology", Parbin Singh published by Katson Educational Series.

**REFERENCES**

1. "Principles of Engineering Geology", K V G K Gokhale, BS Publications, Hyderabad
2. "A text book of Applied Engineering Geology", M T Maruthesha Reddy, Published by New Age International (P) Ltd

**COURSE OUTCOMES**

Learners at the end of this course will be able to

| | |
|---|---|
| **CO1** | Describe the importance of geology, weathering process, mineralogy and petrology |
| **CO2** | List and outline Structural Geology, Earthquakes and Land slides |
| **CO3** | List and describe geophysical methods, geology of dams, reservoirs and tunnels. |
| **CO4** | Give examples on the importance of geology, weathering process, mineralogy and petrology |
| **CO5** | Distinguish between Structural Geology, Earthquakes and Land slides |
| **CO6** | Give examples for Structural Geology, Earthquakes and Land slides |
| **CO7** | Apply the knowledge of engineering geology to identify minerals, rocks, secondary structures, explore groundwater and to locate a suitable site for dams, reservoirs and tunnels |

**CO-PO-PSO MAPPING**

| CO/ PO-PSO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | - | - | - | - | 3 | 2 | - | - | - | - | 2 | 2 | 2 |
| **CO2** | 2 | - | - | - | - | 3 | 2 | - | - | - | - | 2 | 2 | 2 |
| **CO3** | 2 | - | - | - | - | 3 | 2 | - | - | - | - | 2 | 2 | 2 |
| **CO4** | 2 | - | - | - | - | 3 | 2 | - | - | - | - | 2 | 2 | 2 |
| **CO5** | 2 | - | - | - | - | 3 | 2 | - | - | - | - | 2 | 2 | 2 |
| **CO6** | 2 | - | - | - | - | 3 | 2 | - | - | - | - | 2 | 2 | 2 |
| **CO7** | 2 | - | - | - | - | 3 | 2 | - | - | - | - | 2 | 2 | 2 |

***"1" - Low Correlation; "2" - Medium Correlation; "3" - Substantial Correlation***

| | |
|---|---|
| **Course Title** | Engineering Geology |
| **Course Code** | A2CET409 |
| **Course Designed by** | Department of Civil Engineering |
| **Approval** | |

| A2CET403 | Road Safety Engineering (Professional Elective-I) | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |
| | **Pre-requisite: NONE**<br>**Total Contact Hours – 48 (L)** | | | | |

## SYLLABUS

### UNIT – I: INTRODUCTION TO ROAD SAFETY

**Road Safety:** Stakeholders, Road safety responsibilities, definition of road accidents and accident causation, Efforts done towards road safety on national and international level, Vulnerable road users

**Traffic Studies:** Traffic Studies – Speed, Volume, Accident

### UNIT – II: ROAD SAFETY IN GEOMETRIC DESIGN

**Highway Geometric Elements:** Design controls and Criteria, Highway Cross Section Elements, Sight Distance Elements-SSD, OSD

**Highway Alignment:** Horizontal Alignment: Super elevation, Extra widening, Transition Curves, Vertical alignment, Gradients, Vertical curves.

### UNIT-III: TRAFFIC CONTROL

**Traffic Control Devices:** Traffic Control Devices: Signs, Markings and Signals, Level of service (LOS)

**Signal Design:** Design principles of a traffic signal: Phase design, cycle time determination, green splitting. Websters method, IRC method

**Road Safety Management:** Safety Management process, urban and rural road safety management, Pedestrian Safety, RTA authority roles and responsibilities

**Road Safety Education:** Introduction to Road Safety Education,5 P's of Road safety education: Pre-school road safety education , Importance of Practical education rather than theory education, Principles of own development as regards of road safety education, Presentations on road safety educationPlace for road safety education in curriculum

### UNIT-IV: ACCIDENT ANALYSIS

**Accident investigation:** Road accidents, causes, recorded cases, method of recording accident data, storing of accident data, the use of accident data, presentation of accident data, crash reduction measures

**Collision analysis:** Statistical analysis of accidents, difference between site and route analysis, Condition and collision diagrams, Accident reconstruction

### UNIT-V: ROAD SAFETY AUDIT

**Road Safety Audit:** Road safety Audit procedure, aims and objectives, roles and responsibilities, road safety audit tasks, various stages of safety audits; common identifiable problems.

**Audit Reports:** Structure of a road safety audit report, problems in audit reports, risk assessment & prioritization of audit reports,what to look for on-site visits

### TEXT BOOKS:

1. Khanna S.K., And Justo C.E.G - Highway Engineering – Nem Chand Bros., Roorkee.
2. Kadiyali LR, Principles of Highway Engineering; Khanna Publishers, New Delhi.

**REFERENCES:**

1. Indian Roads Congress, Highway Safety Code, IRC:SP-44:1996
2. Indian Roads Congress, Road Safety Audit Manual, IRC:SP-88:2010

**COURSE OUTCOMES:**

| | |
|---|---|
| CO1 | Have the ability to outline road safety importance emphasizing in geometric design |
| CO2 | Have the ability define traffic control devices and road safety management process |
| CO3 | Have the ability to state accident analysis and road safety audit |
| CO4 | Have the ability to illustrate effect of traffic studies and geometric design on road safety |
| CO5 | Have the ability to demonstrate types of traffic control devices and practical process of road safety education |
| CO6 | Have the ability to explain analysis of accident data and audit process |
| CO7 | Ability to apply crash management techniques ensuring road safety. |