Detailed Syllabus
for
First Year B. Tech program (All Branches)
## Dr. Babasaheb Ambedkar Technological Engineering

Teaching and Evaluation Scheme for First Year B. Tech. (All Branches)

### Group A

#### Semester I

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Teaching Scheme</th>
<th>Evaluation Scheme</th>
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<tbody>
<tr>
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**Total:** 14 2 8 330 100 420 850 18

#### Semester II

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<td>BTES211P</td>
<td>Field Training / Internship/Industrial Training (minimum of 4 weeks which can be completed partially in first semester and second Semester or in at one time).</td>
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**Total:** 12 3 12 430 80 440 950 19

27
## Dr. Babasaheb Ambedkar Technological Engineering

Teaching and Evaluation Scheme for First Year B. Tech. (All Branches)

### Group B

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<thead>
<tr>
<th>Semester I</th>
<th>Course Code</th>
<th>Course Title</th>
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| Credit                          | 18          | 25          | 19            |
Guide to Induction Program

When new students enter an institution, they come with diverse thoughts, backgrounds and preparations. It is important to help them adjust to the new environment and inculcate in them the ethos of the institution with a sense of larger purpose. Precious little is done by most of the institutions, except for an orientation program lasting a couple of days.

We propose a 3-week long induction program for the UG students entering the institution, right at the start. Normal classes start only after the induction program is over. Its purpose is to make the students feel comfortable in their new environment, open them up, set a healthy daily routine, create bonding in the batch as well as between faculty and students, develop awareness, sensitivity and understanding of the self, people around them, society at large, and nature.

The time during the Induction Program is also used to rectify some critical lacunas, for example, English background, for those students who have deficiency in it.

The following are the activities under the induction program in which the student would be fully engaged throughout the day for the entire duration of the program.

- **Physical Activity** This would involve a daily routine of physical activity with games and sports. It would start with all students coming to the field at 6 am for light physical exercise or yoga. There would also be games in the evening or at other suitable times according to the local climate. These would help develop team work. Each student should pick one game and learn it for three weeks. There could also be gardening or other suitably designed activity where labour yields fruits from nature.
- **Creative Arts** Every student would choose one skill related to the arts whether visual arts or performing arts. Examples are painting, sculpture, pottery, music, dance etc. The student would pursue it everyday for the duration of the program. These would allow for creative expression. It would develop a sense of aesthetics and also enhance creativity which would, hopefully, flow into engineering design later.
- **Universal Human Values:** It gets the student to explore oneself and allows one to experience the joy of learning, stand up to peer pressure, take decisions with courage, be aware of relationships with colleagues and supporting staff in the hostel and department, be sensitive to others, etc. Need for character building has been underlined earlier. A module in Universal Human Values provides the base. Methodology of teaching this content is extremely important. It must not be through do’s and don’ts, but get students to explore and think by engaging them in a dialogue. It is best taught through group discussions and real life activities rather than lecturing. The role of group discussions, however, with clarity of thought of the teachers cannot be over emphasized. It is essential for giving exposure, guiding thoughts, and realizing values. The teachers must come from all the departments rather than only one department like HSS or from outside of the Institute. Discussions would be conducted in small groups of about 20 students with a faculty mentor each. It is to open thinking towards the self. Universal Human Values discussions could even continue for rest of the semester as a normal course, and not stop with the induction program. Besides drawing the attention of the student to larger issues of life, it would build relationships between teachers and students which last for their entire 4-year stay and possibly beyond.
- **Literary** Literary activity would encompass reading, writing and possibly, debating, enacting a play etc.
- **Proficiency Modules:** This period can be used to overcome some critical lacunas that students might have, for example, English, computer familiarity etc. These should run like crash courses, so that when normal courses start after the induction program, the student has overcome the lacunas substantially. We hope that problems arising due to lack of English skills, wherein students start lagging behind or failing in several subjects, for no fault of theirs, would, hopefully, become a thing of the past.
- **Lectures by Eminent People** This period can be utilized for lectures by eminent people, say, once a week. It would give the students exposure to people who are socially active or in public life.
• **Visits to Local Area** A couple of visits to the landmarks of the city, or a hospital or orphanage could be organized. This would familiarize them with the area as well as expose them to the underprivileged.

• **Familiarization to Dept./Branch & Innovations**: The students should be told about different methods of study compared to coaching that is needed at IITs. They should be told about what getting into a branch or department means what role it plays in society, through its technology. They should also be shown the laboratories, workshops & other facilities.

### Schedule

The activities during the Induction Program would have an **Initial Phase**, a **Regular Phase** and a **Closing Phase**. The Initial and Closing Phases would be two days each.

#### Initial Phase

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
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</thead>
<tbody>
<tr>
<td><strong>Day 0</strong></td>
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</tr>
<tr>
<td>Whole day</td>
<td>Students arrive - Hostel allotment. (Preferably do preallotment)</td>
</tr>
<tr>
<td><strong>Day 1</strong></td>
<td></td>
</tr>
<tr>
<td>9.00 AM to 3.00 PM</td>
<td>Academic Registration</td>
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<tr>
<td>4.30 PM to 6.00 PM</td>
<td>Orientation</td>
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<tr>
<td><strong>Day 2</strong></td>
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<tr>
<td>9.00 AM to 10.00 AM</td>
<td>Diagnostic test (for English etc.)</td>
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<tr>
<td>10.15 AM to 12.25 PM</td>
<td>Visits to Respective Departments</td>
</tr>
<tr>
<td>12.30 to 2.00</td>
<td>Lunch time</td>
</tr>
<tr>
<td>2.00 PM to 3.00 PM</td>
<td>Director's Speech</td>
</tr>
<tr>
<td>3.00 PM to 4.00 PM</td>
<td>Interaction with Parents</td>
</tr>
<tr>
<td>4.00 PM to 5.30 PM</td>
<td>Mentor-Mentee groups- Introduction within group</td>
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</table>

#### Regular Phase

After two days is the start of the Regular Phase of induction. With this phase there would be regular program to be followed every day.

#### Daily Schedule

Some of the activities are on a daily basis, while some others are at specified periods within the Induction Program. We first show a typical daily timetable.

<table>
<thead>
<tr>
<th>Session</th>
<th>Time</th>
<th>Activity</th>
<th>Remark</th>
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<tbody>
<tr>
<td><strong>Day 3 Onwards</strong></td>
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<tr>
<td>I</td>
<td>9.00 AM to 11.00 AM</td>
<td>Creative Arts / Universal Human Values</td>
<td>Half the groups will do creative arts</td>
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<tr>
<td>II</td>
<td>11.00 AM to 1.00 PM</td>
<td>Universal Human Values/ Creative Arts</td>
<td>Complementary Alternate</td>
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**Lunch Time**

<table>
<thead>
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<th>Session</th>
<th>Time</th>
<th>Activity</th>
<th>Remark</th>
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</thead>
<tbody>
<tr>
<td>IV</td>
<td>2.00 PM to 4.00 PM</td>
<td>Afternoon Session</td>
<td>See below</td>
</tr>
<tr>
<td>V</td>
<td>4.00 PM to 5.00 PM</td>
<td>Afternoon Session</td>
<td>See below</td>
</tr>
</tbody>
</table>

Sundays are off. Saturdays have the same schedule as above or have outings.
**Afternoon Activities (Non-Daily)**: The following five activities are scheduled at different times of the Induction Program, and are not held daily for everyone:
1. Familiarization to Dept./Branch & Innovations
2. Visits to Local Area
3. Lectures by Eminent People
4. Literary
5. Proficiency Modules

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Last But one day</td>
<td></td>
</tr>
<tr>
<td>9.00 AM to 12.00 PM</td>
<td>Discussions and finalizations of presentations within each group</td>
</tr>
<tr>
<td>2.00 PM to 5.00 PM</td>
<td>Presentation by each group in front of 4 other groups besides their own (about 100 students)</td>
</tr>
<tr>
<td>Last Day</td>
<td></td>
</tr>
<tr>
<td>Whole day</td>
<td>Examinations if any</td>
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</table>

**Closing Phase**

A question comes up as to what would be the follow up program after the formal 3-week Induction Program is over? The groups which are formed should function as mentor- mentee network. A student should feel free to approach his faculty mentor or the student guide, when facing any kind of problem, whether academic or financial or psychological etc. (For every 10 undergraduate first year students, there would be a senior student as a student guide, and for every 20 students, there would be a faculty mentor.) Such a group should remain for the entire 4-5 year duration of the stay of the student. Therefore, it would be good to have groups with the students as well as teachers from the same department/discipline. Here we list some important suggestions which have come up and which have been experimented with.

- **Follow Up after Closure – Same Semester**: It is suggested that the groups meet with their faculty mentors once a month, within the semester after the 3-week Induction Program is over. This should be a scheduled meeting shown in the timetable. (The groups are of course free to meet together on their own more often, for the student groups to be invited to their faculty mentor’s home for dinner or tea, nature walk, etc.)
- **Follow Up – Subsequent Semesters**: It is extremely important that continuity be maintained in subsequent semesters. It is suggested that at the start of the subsequent semesters (upto fourth semester), three days be set aside for three full days of activities related to follow up to Induction Program. The students be shown inspiring films, do collective art work, and group discussions be conducted. Subsequently, the groups should meet at least once a month.

**Summary**

Engineering institutions were set up to generate well trained manpower in engineering with a feeling of responsibility towards oneself, one’s family, and society. The incoming undergraduate students are driven by their parents and society to join engineering without understanding their own interests and talents. As a result, most students fail to link up with the goals of their own institution. The graduating student must have values as a human being, and knowledge and meta-skills related to his/her profession as an engineer and as a citizen. Most students who get demotivated to study engineering or their branch, also lose interest in learning.

The Induction Program is designed to make the newly joined students feel comfortable, sensitize them towards exploring their academic interests and activities, reducing competition and making them work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and building of character.
The Universal Human Values component, which acts as an anchor, develops awareness and sensitivity, feeling of equality, compassion and oneness, draw attention to society and 4

We are aware that there are advantages in mixing the students from different depts. However, in mixing, it is our experience that the continuity of the group together with the faculty mentor breaks down soon after. Therefore, the groups be from the same dept. but hostel wings have the mixed students from different depts. For example, the hostel room allotment should be in alphabetical order irrespective of dept. 7nature, and character to follow through. It also makes them reflect on their relationship with their families and extended family in the college (with hostel staff and others). It also connects students with each other and with teachers so that they can share any difficulty they might be facing and seek help.

References:
Engineering Mathematics – I

Unit 1: Linear Algebra- Matrices
Inverse of a matrix by Gauss-Jordan method; Rank of a matrix; Normal form of a matrix; Consistency of non-homogeneous and homogeneous system of linear equations; Eigen values and eigen vectors; Properties of eigen values and eigen vectors (without proofs); Cayley-Hamilton’s theorem (without proof) and its applications. [6 Hours]

Unit 2: Partial Differentiation
Partial derivatives of first and higher orders; Homogeneous functions – Euler’s Theorem for functions containing two and three variables (with proofs); Total derivatives; Change of variables. [06 Hours]

Unit 3: Applications of Partial differentiation
Jacobians - properties; Taylor’s and Maclaurin’s theorems (without proofs) for functions of two variables; Maxima and minima of functions of two variables; Lagrange’s method of undetermined multipliers. [06 Hours]

Unit 4: Reduction Formulae and Curve Tracing
Reduction formulae for \( \int_0^{\frac{\pi}{2}} \sin^n x \, dx \), \( \int_0^{\frac{\pi}{2}} \cos^n x \, dx \), \( \int_0^{\frac{\pi}{2}} \sin^m x \cos^n x \, dx \); Tracing of the curves given in Cartesian, parametric & polar forms. [06 Hours]

Unit 5: Multiple Integrals
Double integration in Cartesian and polar co-ordinates; Evaluation of double integrals by changing the order of integration and changing to polar form; Triple integral; Applications of multiple integrals to find area as double integral, volume as triple integral and surface area. [08 Hours]

Text Books
3) A Course in Engineering Mathematics (Vol I) by Dr. B. B. Singh, Synergy Knowledgeware, Mumbai.

Reference Books

General Instructions:
The tutorial classes in Engineering Mathematics-I are to be conducted batchwise. Each class should be divided into three batches for the purpose.
The internal assessment of the students for 20 marks will be done based on assignments, surprise tests, quizzes, innovative approach to problem solving and percentage attendance.
The minimum number of assignments should be eight covering all topics.
Objectives:
1. To provide a firm grounding in the basic physics principles and concept to resolve many Engineering and technological problems.

2. To understand and study the Physics principles behind the developments of Engineering materials.

Unit I
Oscillatio, Ultrasonics and Dielectric Materials: (06 Hrs)
Free oscillation, damped oscillation, Forced oscillation and Resonance, differential wave equation, Ultrasonic waves, production of ultrasoneics (Piezoelectric effect, Magnetostriction effect) and its applications.
Dielectric parameters (Dielectric constant, Electric displacement, Polarization & Polarizability), Types of polarization, temperature and frequency dependences of dielectric materials.

Unit II
Optics, Fibre Optics and Laser: (06 Hrs)
Interference of light in thin film, wedge shaped film, Newton’s rings, polarization of light, methods for production of polarized light (Reflection, Refraction & Double refraction), Huygen’s theory of double refraction, Laurent’s half shade Polarimeter, Principle and structure of optical fibre, acceptance angle, acceptance cone, numerical aperture.
Principle of laser, Einstein’s coefficients, Types of laser – Ruby and He-Ne laser and their applications.

Unit III
Electron Optics, Nuclear Physics and Quantum Mechanics: (06 Hrs)
Measurement of ‘e/m’ by Thomson’s method, Determination of electronic charge by Millikan’s oil drop method, Bainbridge mass spectrograph, G.M. counter, Heisenberg’s uncertainty principle, Schrödinger’s time dependent and time independent wave equations, physical significance of wave function.

Unit IV
Crystal Structure, X-rays and Electrodynamics: (06 Hrs)
Unit cell, Bravais lattice, cubic system, number of atoms per unit cell, coordination number, atomic radius, packing density, relation between lattice constant and density, lattice planes and Miller indices, Interplaner spacing for cubic system, Bragg’s law, X-ray diffraction, Line and Continuous Spectrum of X-ray, Mosley’s law. Introduction of Maxwell equations (no derivation), Electromagnetic wave in free space.

Unit V
Magnetic, Superconducting and Semiconducting materials: (06 Hrs)
Types of magnetic materials (Ferrimagnetic & Antiferromagnetic, Ferrites & Garnets), B-H curve, Classical free electron theory-electrical conductivity, resistivity and its temperature dependence, microscopic Ohm’s law, Superconductivity, types of superconductors, Meissner effect and Applications. Band theory of solids, conductivity of semiconductors, Hall effect.

Expected Outcome:
1. The student will be able to understand Engineering problems based on the principle of Oscillation, Ultrasonics, Optics, Laser, Fibre optics, Nuclear physics, Quantum mechanics.

2. The student will be able to understand Fundamental of Electrodynamics, Semiconductor, Dielectric, Magnetic and Superconducting materials which forms the base of many modern devices and technologies.

Text books:

Reference books:
1. Introduction to Electrodynamics – David R. Griffiths.
7. Introduction to solid state physics – Charles Kittel. John Willey and Sons
Engineering Physics Lab.

At least 10 experiments should be performed from the following list.
1. Newton’s rings - Determination of radius of curvature of Plano convex lens / wavelength of light
2. Wedge Shaped film - Determination of thickness of thin wire
3. Half shade Polarimeter - Determination of specific rotation of optically active material
4. Laser - Determination of wavelength of He-Ne laser light
5. Magnetron Tube - Determination of ‘e/m’ of electron
6. G.M. Counter - Determination of operating voltage of G.M. tube
7. Crystal Plane – Study of planes with the help of models related Miller Indices
8. Hall Effect - Determination of Hall Coefficient
9. Four Probe Method - Determination of resistivity of semiconductor
10. Measurement of Band gap energy of Semiconductors
11. Study of I-V characteristics of P-N junction diode
12. Experiment on fibre optics
13. Ultrasonics Interferometer
14. B-H Curve Experiment
15. Susceptibility measurement experiment
Unit 1: Drawing standards and geometrical construction: 4hrs

Drawing standard SP: 46, Type of lines, lettering, dimensioning, scaling conventions. Geometrical construction: Dividing a given straight line into any number of equal parts, bisecting a given angle, drawing a regular polygon given one side, special methods of constructing a pentagon and a hexagon.

Unit 2: Orthographic Projections and Projections of Points: 4hrs

Introduction to orthographic projection, drawing of orthographic views of objects from their isometric views. Projection of points lying in four quadrants.

Unit 3: Projections of Straight Lines and Planes and their Traces: 4hrs

Projections of lines parallel and perpendicular to one or both planes, projections of lines inclined to one or both planes. Traces of lines.

Projections of planes parallel and perpendicular to one or both planes, projection of planes inclined to one or both planes.

Unit 4: Projections of Solids 4hrs

Types of solids, projections of solids with axis perpendicular and parallel to HP and VP, solids with axis inclined to one or both the planes. Projections of spheres touching each other.

Unit 5: Sectioning of Solids, Isometric Projections 4hrs

Sectioning of solids: Section planes perpendicular to one plane and parallel or inclined to other plane. Isometric projections: Isometric scale, drawing of isometric projections from given orthographic views.

Reference/Text Books:

List of Practical:
1. Lines, lettering and dimensioning.
2. Geometrical Constructions.
3. Orthographic projections.
4. Projections of points.
5. Projections of straight lines.
6. Projections of planes.
7. Projections of solids.
8. Section of solids.
Communication Skills

Unit 1: Communication and Communication Processes (04 hrs)
Introduction to Communication, Forms and functions of Communication, Barriers to Communication and overcoming them, Verbal and Non-verbal Communication

Reading: Introduction to Reading, Barriers to Reading, Types of Reading: Skimming, Scanning, Fast Reading, Strategies for Reading, Comprehension.

Listening: Importance of Listening, Types of Listening, Barriers to Listening.

Unit 2: Verbal & Non-verbal Communication (04 hrs)

Unit 3: Study of Sounds in English (02 hrs)
Introduction to phonetics, Study of Speech Organs, Study of Phonemic Script, Articulation of Different Sounds in English.

Unit 4: English Grammar (05 hrs)
Grammar: Forms of Tenses, Articles, Prepositions, Use of Auxiliaries and Modal Auxiliaries, Synonyms and Antonyms, Common Errors.

Unit 5: Writing Skills, Reading Skills & Listening Skills (04 hrs)


Text book:
Mohd. Ashraf Rizvi, Communication Skills for Engineers, Tata McGraw Hill

Reference Books:
1) Sanjay Kumar, Pushp Lata, Communication Skills, Oxford University Press, 2016
2) Meenakshi Raman, Sangeeta Sharma, Communication Skills, Oxford University Press, 2017
6) Atreya N and Guha, Effective Credit Management, MMC School of Management, Mumbai (1994).
Communication Skills Lab

List of Practicals (Any 10 PR sessions can be conducted)

1) How to introduce oneself? (02 hrs)
2) Introduction to Phonemic symbols (02 hrs)
3) Articulation of sounds in English with proper manner (02 hrs)
4) Practice and exercises on articulation of sounds (02 hrs)
5) Read Pronunciations/transcriptions from the dictionary (02 hrs)
6) Practice and exercises on pronunciations of words (02 hrs)
7) Introduction to stress and intonation (02 hrs)
8) Rapid reading sessions (02 hrs)
9) Know your friend (02 hrs)
10) How to introduce yourself (02 hrs)
11) Extempore (02 hrs)
12) Group discussion (02 hrs)
13) Participating in a debate (02 hrs)
14) Presentation techniques (02 hrs)
15) Interview techniques (02 hrs)
Energy and Environment Engineering

Unit 1

Conventional Power Generation: Steam power station, Nuclear power plant – Gas turbine power plant- Hydro power station: Schematic arrangement, advantages and disadvantages, Thermo electric and thermionic generators, Environmental aspects for selecting the sites and locations of power plants. [4 hrs]

Unit 2

Renewable Power Generation: Solar, Wind, Biogas and Biomass, Ocean Thermal energy conversion (OTEC), Tidal, Fuel cell, Magneto Hydro Dynamics (MHD): Schematic arrangement, advantages and disadvantages. [4 hrs]

Unit 3

Energy conservation: Scope for energy conservation and its benefits Energy conservation Principle – Maximum energy efficiency, Maximum cost effectiveness, Methods and techniques of energy conservation in ventilation and air conditioners, compressors, pumps, fans and blowers, Energy conservation in electric furnaces, ovens and boilers., lighting techniques. [4 hrs]

Unit 4

Air Pollution: Environment and Human health - Air pollution: sources- effects- control measures - Particulate emission, air quality standards, and measurement of air pollution. [4 hrs]

Unit 5

Water Pollution: Water pollution- effects- control measures- Noise pollution –effects and control measures, Disposal of solid wastes, Bio-medical wastes-Thermal pollution – Soil pollution -Nuclear hazard. [4 hrs]

Reference/Text Books:
Basic Civil and Mechanical Engineering

Module 1: Introduction to civil engineering 4hrs
Various Branches, role of civil engineer in various construction activities, basic engineering properties and uses of materials: earth, bricks, timber, stones, sand, aggregates, cement, mortar, concrete, steel, bitumen, glass, FRP, composite materials.

Module 2: Building Components & Building Planning 4hrs
Foundation and superstructure, functions of foundation, types of shallow and deep foundations, suitability in different situation, plinth, walls, lintels, beams, columns, slabs, roofs, staircases, floors, doors, windows, sills, Study of Building plans, ventilation, basics of plumbing and sanitation

Module 3: Surveying 4hrs
Principles of survey, elements of distance and angular measurements, plotting of area, base line and offsets, introduction to Plane table surveying, introduction to levelling, concept of bench marks, reduced level, contours

Part II Basic Mechanical Engineering

Unit 1: Introduction to Mechanical Engineering, Introduction to Laws of Thermodynamics with simple examples pertaining to respective branches, IC Engines: Classification, Applications, Basic terminology, 2 and 4 stroke IC engine working principle, Power Plant: Types of Power plant; Gas power plant, Thermal power plant, Nuclear power plant, Automobiles: Basic definitions and objectives [4 hrs]

Unit 2: Design Basics, Machine and Mechanisms, Factor of safety, Engineering Materials: types and applications, basics of Fasteners Machining and Machinability, Introduction to Lathe machine, Drilling machine, Milling machine, basics of machining processes such as turning, drilling and milling, Introduction to casting [4 hrs]

Text Books
- M. S. Palani Gamy, “Basic Civil Engineering”, Tata Mc-Graw Hill Publication
- Gopi Satheesh, “Basic Civil Engineering”, Pearson Education
• Serope Kalpakaji and Steven R Schimd “Amanufacturing Engineering and Technology” Addison
  Wsley Laongman India 6th Edition 2009
Engineering Mathematics – II

Unit 1: Complex Numbers
Definition and geometrical representation; De-Moivre’s theorem (without proof); Roots of complex numbers by using De-Moivre’s theorem; Circular functions of complex variable – definition; Hyperbolic functions; Relations between circular and hyperbolic functions; Real and imaginary parts of circular and hyperbolic functions; Logarithm of Complex quantities. [07 Hours]

Unit 2: Ordinary Differential Equations of First Order and First Degree and Their Applications
Linear equations; Reducible to linear equations (Bernoulli’s equation); Exact differential equations; Equations reducible to exact equations; Applications to orthogonal trajectories, mechanical systems and electrical systems. [07 Hours]

Unit 3: Linear Differential Equations with Constant Coefficients
Introductory remarks - complementary function, particular integral; Rules for finding complementary functions and particular integrals; Method of variation of parameters; Cauchy’s homogeneous and Legendre’s linear equations. [07 Hours]

Unit 4: Fourier Series
Introductory remarks - Euler’s formulae; Conditions for Fourier series expansion - Dirichlet’s conditions; Functions having points of discontinuity; Change of interval; Odd and even functions; expansions of odd and even periodic functions; Half-range series. [07 Hours]

Unit 5: Vector Differential Calculus
General rules of vector Differentiation; Scalar and vector fields: Gradient, divergence and curl; Solenoidal and irrotational vector fields; Vector identities. [07 Hours]

Unit 6: Vector Integral Calculus
Vector Integration: line integral, surface integral and volume integral; Green’s lemma, Gauss’ divergence theorem and Stokes’ theorem (without proofs). [07 Hours]

Text Books
3. A Course in Engineering Mathematics (Vol II) by Dr. B. B. Singh, Synergy Knowledge ware, Mumbai.

Reference Books

General Instructions:
1. The tutorial classes in Engineering Mathematics-II are to be conducted batchwise. Each class should be divided into three batches for the purpose.
2. The internal assessment of the students for 20 marks will be done based on assignments, surprise tests, quizzes, innovative approach to problem solving and percentage attendance.
3. The minimum number of assignments should be eight covering all topics.
ENGINEERING CHEMISTRY

Unit 1: Water Treatment (6L)

Unit 2: Phase Rule (7L)
Phase Rule, statement, Explanation of the terms – Phase, Components, Degrees of freedom. One component system – Water and Sulphur. Reduced phase rule equation, Two components alloy system- Phase diagram of Silver- Lead alloy system.

Unit 3: Metallurgy (6L)

Unit 4: Fuels and Lubricants (7L)
**Fuels:** Introduction, classification of fuel, Calorific value of a fuel, characteristics of a good fuel, solid fuel- Coal, Various types of Coal, Analysis of coal- Proximate and Ultimate analysis, liquid fuel- Refining of Petroleum

**Lubricants:** Introduction, classification of lubricants - Solid, Semi –solid and Liquid Lubricants, properties of lubricants ,Physical properties – Viscosity, Viscosity index, surface tension, Flash point and Fire point. Chemical properties – Acidity, Saponification.

Unit 5: Electrochemistry (6L)
Introduction - **Basic concepts:** Definition and units of Ohm’s law, Specific resistance, Specific Conductance, Equivalent conductance, Molecular conductance, Method of conductance measurement by Wheatstone bridge method, Cell constant.
Debye- Huckel theory of strong electrolyte, Conductometric titrations, Ostwald’s theory of acid-base indicator, Quinonoid theory, Glass electrode.

Text books:

Reference books:
3. WILEY, Engineering Chemistry, Wiley India, New Delhi 2014.
4. Atkins, Physical chemistry.
List of Experiments: (Perform any 10 Experiments)

1. Determination of Hardness of water sample by EDTA method.
2. Determination of Chloride content in water sample by precipitation titration method.
3. Determination of Dissolve Oxygen in water by Iodometric method.
4. Determination of percent purity of Bleaching Powder.
5. pH – metric Titration (Acid Base titration)
6. Conducto-metric Titration (Acid Base titration)
7. Surface tension
8. Viscosity
9. To determine acidity water sample.
10. To determine calorific value of a fuel.
11. Determination of Acid value of an oil sample.
12. Determination of Saponification value of an oil sample.
13. Experiment on water treatment by using Ion exchange resins.
14. To find out P-T curve diagram of steam.
15. To determine alkalinity water sample.

Reference Books:

Engineering Mechanics

Course Contents

Module 1: Basic Concepts (7 Lectures)
Objectives of Engineering Analysis and Design, Idealization of Engineering Problems, Simplification of real 3D problems to 2-D and 1-D domain, Basis of Assumptions, types of supports, types of load, free body diagram, Laws of Motion, Fundamental principles, Resolution and composition of a forces, Resultant, couple, moment, Varignon’s theorem, force systems, Centroid of composite shapes, moment of inertia of planer sections and radius of gyration

Module 2: Equilibrium (7 Lectures)
Static equilibrium, analytical and graphical conditions of equilibrium, Lamé’s theorem, equilibrium of coplanar concurrent forces, coplanar non concurrent forces, parallel forces, beams reactions, Simple trusses (plane and space), method of joints for plane trusses, method of sections for plane trusses

Friction: Coulomb law, friction angles, wedge friction, sliding friction and rolling resistance

Module 3: Kinematics (7 Lectures)
Types of motions, kinematics of particles, rectilinear motion, constant and variable acceleration, relative motion, motion under gravity, study of motion diagrams, angular motion, tangential and radial acceleration, projectile motion, kinematics of rigid bodies, concept of instantaneous center of rotation, concept of relative velocity

Module 4: Kinetics (6 Lectures)
Mass moment of inertia, kinetics of particle, D’Alembert’s principle: applications in linear motion, kinetics of rigid bodies, applications in translation, applications in fixed axis rotation

Module 5: Work, Power, Energy (6 Lectures)
Principle of virtual work, virtual displacements for particle and rigid bodies, work done by a force, spring, potential energy, kinetic energy of linear motion and rotation, work energy equation, conservation of energy, power, impulse momentum principle, collision of elastic bodies

Text Books
Engineering Mechanics Laboratory

Students are expected to satisfactorily complete any ten experiments listed below.

List of Practical’s/Experiments/Assignments
1. Polygon law of coplanar forces.
2. Centroid of irregular shaped bodies.
3. Bell crank lever.
4. Support reaction for beam.
5. Problems on beam reaction by graphics statics method.
7. Inclined plane (to determine coefficient of friction).
10. Verification of law of Machine using Screw jack
11. Verification of law of Machine using Worm and Worm Wheel
12. Verification of law of Machine using Single and Double Gear Crab.
13. Assignment based on graphics statics solutions
14. Application of Spreadsheet Program for concepts like law of moments, beam reactions, problems in kinematics, etc.
15. Any other innovative experiment relevant to Engineering Mechanics.
Unit 1

Process of programming: Editing, Compiling, Error Checking, executing, testing and debugging of programs. IDE commands. Eclipse for C Program development, Flowcharts, Algorithms. (4 Lectures)

Unit 2

Types, Operators and Expressions: Variable names, Data types, sizes, constants, declarations, arithmetic operators, relational and logical operators, type conversions, increment and decrement operators, bitwise operators, assignment operators and expressions, conditional expressions precedence and order of evaluation. (4 Lectures)

Unit 3

Control Flow: Statements and Blocks. If-else, else-if switch Loops while and for, do-while break and continue goto and Labels. Functions and Program Structure: Basic of functions, functions returning non-integers external variables scope rules. (4 Lectures)

Unit 4

Arrays in C: Initializing arrays, Initializing character arrays ,multidimensional arrays. (4 Lectures)

Unit 5

Structures C: Basics of structures, structures and functions arrays of structures, Pointer in C. Pointers to integers, characters, floats, arrays, structures. (4 Lectures)

Special Note: Topic of Pointers in C is only for lab exercises and not for end semester examinations.

Reference/Text Books:
4. Balguruswamy, Programming in C, PHI.
5. Yashwant Kanitkar, Let Us C, PHI
List of Practical:

1. Assignment on Flow Chart.
2. A Simple program to display a message “Hello world” on screen.
3. A Program to take input from user and display value entered by user on screen.
4. Basic example for performing different C Operations using operator. (With and without using scanf()).
5. Basic Program on Operator. (Using scanf()).
   a) Program to find and print area, perimeter and volume of geometric objects.
   b) Program to check a number entered by user is Perfect number or not.
6. Program to find maximum and minimum between two numbers given by user using if-else and conditional Operators.
7. Program to swap two numbers.
8. Program to print square and factorial of an entered number using while loop.
9. Program to check a number is Palindrome number or not.
10. Program to check Armstrong number.
11. Program to check and generate prime numbers up to n.
12. Program to find GCD of two entered numbers.
13. Program to find maximum and minimum from n entered numbers.
14. Program to print alternate numbers from n entered numbers.
15. Program to search an element in an Array using linear and binary search.
16. Program to print entered numbers in ascending order using sorting.
17. Program to print addition, subtraction and multiplication of Matrices.
18. Program to find length of string. (With and without using library function).
19. Programs demonstrating use of Structures, Arrays of Structures and Structure containing arrays.
20. Programs demonstrating use of pointers to integers, floats, char, strings, structures and arrays.
Unit 1 (4 Lectures)

**Elementary Electrical Concepts:**
Fundamental of Electrical system: Potential difference, Ohm's law, Effect of temperature on resister, resistance temperature coefficient, Electrical wiring system: Study of different wire gauges and their applications in domestic and industry. Energy Resources and Utilization: Conventional and nonconventional energy resources; Introduction to electrical energy generation from different resources, transmission, distribution and utilization, Advantages & Disadvantages of AC & DC transmission. Concept of Supply Demand, Power Factor, Need of unity factor.

Unit 2 (4 Lectures)

**Measurement of Electrical Quantities:**
Measurement of Voltage, Current, and Power; Measurement of 3 phase power; Study of Energy meters. Study of Electrical Storage devices: Batteries such as Nickel-cadmium (NiCd), Lithium-ion (Li-ion), Lithium Polymer (Li-pol.) batteries. Study of circuit breakers & Actuators (MCB & MPCB, Power Contactors & Aux contactors, Electro-Mechanical & Solid state Relays).

Unit 3 (4 Lectures)

**Diodes and Circuits:**
The P-N Junction Diode, V-I characteristics, Diode as Rectifier, specifications of Rectifier Diodes, Half Wave, Full wave, Bridge rectifiers, Equations for $I_{DC}$, $V_{DC}$, $I_{RMS}$, $V_{RMS}$, Efficiency and Ripple Factor for each configuration. Filters: Capacitor Filter, Choke Input Filter, Capacitor Input Filter(Π Filter), Zener Diode, Characteristics, Specifications, Zener Voltage Regulator, Types of Diodes: LED, Photodiode.

Unit 4 (4 Lectures)

**Semiconductor Devices and Applications:**
Transistors: Introduction, Classification, CE, CB, and CC configurations, $\alpha$, $\beta$, concept of gain and bandwidth. Operation of BJT in cut-off, saturation and active regions (DC analysis). BJT as an amplifier, biasing techniques of BJT, BJT as a switch. Introduction to Digital Electronics: Number System, Basic logic Gates, Universal Gates, Boolean Postulates, De-Morgan Theorems.

**Reference/Text Books:**
5. Edward Hughes, Electrical Technology, Pearson Education.

Note: Students are advised to use internet resources whenever required.
Instructions to the student:

Each student is required to maintain a „workshop diary“ consisting of drawing / sketches of the jobs and a brief description of tools, equipment, and procedure used for doing the job.

List of Practical:

1. Wood sizing exercises in planning, marking, sawing, chiseling and grooving to make half lap joint and cross lap joint.
2. A job involving cutting, filing to saw cut, filing all sides and faces, corner rounding, drilling and tapping on M. S. plates.
3. A job on use of plumbing tools and preparation of plumbing line involving fixing of water tap and use of elbow, tee, union and coupling, etc.
4. Making a small parts using GI sheet involving development, marking, cutting, bending, brazing and soldering operations- i)Tray ii) Funnel and similar articles.
5. Exercise in Arc welding (MMAW) to make a square butt joint.
6. Exercise in Resistance (Spot) welding to make a lap joint.
7. A job using power operated tools related to sheet metal work, Welding, Fitting, Plumbing, Carpentry and pattern making.
8. A job on turning of a Mild Steel cylindrical job using center lathe.

Contents:


c) Fitting and Plumbing: Fitting operation like chipping, filing, right angle, marking, drilling, tapping etc., Fitting hand tools like vices, cold chisel, etc. Drilling machine and its operation, Different types of pipes, joints, taps, fixtures and accessories used in plumbing, safety precautions.

d) Sheet Metal Work: Simple development and cutting, bending, Beading, Flanging, Lancing and shearing of sheet metal, Sheet metal machines - Bending Machine, Guillotine shear, Sheet metal joints, Fluxes and their use.

e) Machine shop: Lathe machine, types of lathes, major parts, cutting tool, turning operations, safety precautions

Reference/Text Books:

2. Hazra and Chaudhary, Workshop Technology-I, Media promoters & Publisher private limited.