West Bengal University of Technology

BF-142, Salt Lake City, Kolkata-700064
Syllabus of First Year B.E/B.Tech
(ME,CE,BT,FT,CHE,PE,IT,CSE,BME,Marine,LT,TT,Ceramic,AUE)from 2007

FIRST YEAR FIRST SEMESTER

A. THEORY

SL. N O.	CODE	THEORY	L	T	P	TOT AL	CREDITS
			CONTACTS (PERIODS/WEEK)				
1	HU101	English Language & Communication	2	1		3	3
2	PH101	Engineering Physics	3	1		4	4
3	M 101	Mathematics	3	1		4	4
4	ME 101	Mechanical Sciences	3	1		4	4
5	EC101	Basic Electronics Engineering	3	1		4	4
6	CH 101	Environment & Ecology	3			3	3
		Total of Theory				**22**	**22**

B. PRACTICALS

SL. N O.	CODE	THEORY	L	T	P	TOT AL	CREDITS
7	PH 191	Engineering Physics Lab			3	3	2
8	EC191	Electronics Engineering Lab			3	3	2
9	ME 191	Engineering Graphics			3	3	2
10	ME 192	Workshop Practical			3	3	2
		Total of Practical				**12**	**8**
		Total of Semester				**34**	**30**

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FIRST YEAR SECOND SEMESTER

A. THEORY

SL .NO.	CODE	THEORY	L	T	P	TOTAL	CREDITS
			CONTACTS (PERIODS/WEEK)				
1	PH 201	Engineering Physics	4			4	4
2	M 201	Mathematics	3	1		4	4
3	ME 201	Mechanical Sciences	3			3	3
4	CS 201	Introduction to Computing	2	1		3	3
5	EE201	Basic Electrical Engg.	3	1		4	4
6	CH 201	Engineering Chemistry	3			3	3
		Total of Theory				**21**	**21**

B. PRACTICALS

SL .NO.	CODE	THEORY	L	T	P	TOTAL	CREDITS
7	PH 291	Engineering Physics Lab			$\frac{3}{2}$	3/ 2	1
8	CH 291	Engineering Chemistry Lab			$\frac{3}{2}$	3/ 2	1
9	CS 291	Computing Lab			3	3	2
10	EE291	Electrical Engineering Lab			3	3	2
11	ME 291	Engineering Graphics			3	3	2
12	ME 292	Workshop Practical			3	3	2
		Total of Practical				**15**	**10**
		Total of Semester			**36**		**31**

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ENGLISH LANGUAGE & COMMUNICATION

Code : HU 101 (First Semester)
Contact : 2L + I T = 3
Credits: 3

<div align="center">Guidelines for Course Execution</div>

Objective of the Course
To impart basic skills of communication in English through intensive practice to the first year UG students of Engineering so as to enable them to function confidently and effectively in that language in the professional sphere of their life.

Desired Entry Behaviour
The student must have some basic command of English that is must be able to :

1. Write reasonably grammatically
2. Understand (if not use) at least some 2500 general purpose words of English to express himself in writing and 1500 words to talk about day-to-day events and experiences of life.
3. Understand slowly-delivered spoken material in Standard Indian English , and
4. Speak reasonably clearly (if not fluently) on routine matters with his fellow students.

Strategies for Course Execution

- The topics must be conveyed through plenty of examples. Lecture classes must be conducted as lecture-cum-tutorial classes.
- It is a course that aims to develop skills. It is therefore "practical" in orientation. Plenty of exercises of various kinds must be done by the students both inside and outside the classroom.
- The teacher must not depend on a single or a set of two or three text books. He must choose his materials from diverse sources.
- Keeping in view the requirements of his students , the teacher may have to prepare some teaching and exercise material.
- For practice in listening , good tape recorders can be used if the more advanced facilities (for example , language laboratory) are not available. In fact they can be used very fruitfully.
- The teacher must function as a creative monitor in the class-room.
- Minimum time should be spent in teaching phonetic symbols , stress , intonation , etc. The aim should be to enable the students to find out for himself the correct pronunciation of a word from a learner's dictionary. In teaching speaking, emphasis should be on clarity , intelligibility and reasonable fluency rather than on " correct " pronunciation of words. Classroom presentation and group discussion sessions should be used to teach speaking.

End Results from the Course
Some Key Concepts

Communication as sharing; context of communication; the speaker / writer and the listener / reader; medium of communication; barriers to communication; brevity, clarity and appropriateness in communication.

<u>Writing</u>
Selecting material for expository, descriptive , and argumentative pieces, business letters; formal report; summarizing and abstracting ; expressing ideas within a restricted word limit; paragraph division; the introduction and the conclusion; listing reference material; use of charts, graphs and tables ; punctuation and spelling; semantics of connectives, modifiers and modals; variety in sentences and paragraphs.

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Reading Comprehension

Reading at various speeds (slow , fast , very fast) ; reading different kinds of texts for different purposes (for example , for relaxation , for information , for discussion at a later stage , etc.) ; reading between the lines.

Speaking

Achieving desired clarity and fluency ; manipulating paralinguistic features of speaking (voice quality , pitch , tone , etc.) pausing for effectiveness while speaking ; task-oriented , interpersonal , informal and semiformal speaking ; task-oriented, interpersonal , informal and semiformal speaking; making a short , classroom presentation.

Group Discussion

Use of persuasive strategies including some rhetorical devices (for emphasizing , for instance; being polite and firm; handling questions and taking in criticism of self; turn-taking strategies and effective intervention ; use of body language.

Telephonic Conversation.

Listening Comprehension

Achieving ability to comprehend material delivered at relatively fast speed; comprehending spoken material in Standard Indian English, British English and American English ; intelligent listening in institutions such as an interview in which one is a candidate.

Syllabus Details:

Grammar – Correction of sentence, Vocabulory / word formation, Single word for a group of words, Fill in the blank, transformation of sentences, Structure of sentences – Active / Passive Voice – Direct / Indirect Narration   (5 lectures)

Essay – Descriptive – Comparative – Argumentative – Thesis statement- Structure of opening / concluding paragraphs – Body of the essay
          (7 lectures)

Reading Comprehension – Global – Contextual – Inferential – Select passages from recommended text
          (8 lectures)

Business Correspondence – Letter Writing – Formal. Drafting. Biodata- Resume′- Curriculum Vitae
          (7 lectures)

Report Writing – Structure , Types of report – Practice Writing   (8 lectures)

Communication / Public Speaking skills , Features of effective speech, verbal-nonverbal
          (7 lectures)

Group discussion – principle – practice   (6 lectures)

Distribution of marks:

Examination

Letters including official	10
Precis	10
Comprehension (chart / graph)	10
Report writing including technical/scientific	10
Essay	10
Grammar	20
	70

Assessment

Class tests	10
Unit Tests	
Reading ability	5

Speaking ability	5
Group Discussion	5
Formal conversation	5
	30

References / Books:

1. Mark MaCormack : "Communication"
2. John Metchell " How to write reports"
3. S R Inthira & V Saraswathi " Enrich your English – a) Communication skills b) Academic skills " Publisher CIEFL & OUP
4. R.C. Sharma and K.Mohan , "Business Correspondence and Report Writing " , Tata McGraw Hill , New Delhi , 1994
5. L.Gartside , "Model Business Letters" , Pitman , London , 1992
6. Longman , "Longman Dictionary of Contemporary English" (or 'Oxford Advanced Learner's Dictionary of Current English' , OUP , 1998.
7. Maxwell Nurnberg and Rosenblum Morris , "All About Words" , General Book Depot, New Delhi , 1995
8. A Text Book for English foe Engineers & Technologists
9. Written Communication in English by Sara-Freeman – Orient Longman
10. English skills for Technical Students by British Council
11. The Young Writer's TheraurusS by A.J.Koutsoukis – Orient Longman
12. Communicating at Work by Alder & Elmhorst – McGraw-Hills International
13. Succeeding Through Communication – Subhash Jagota, EXCEL BOOKS
14. Art of Effective Communication – Charles J Margerison, EXCEL BOOKS
15. Communication Skill For Effective Management – A.Ghanekar.EPH
16. Communication Skill – L.M.Shaikh.EPH
17. Communication Skill for Technical Students – Faratullah, Orient Longman
18. English Skills for Technical Students – Orient Longman
19. English Online – Jayasree Mohan Raj, Orient Longman
20. Spoken English – R.K.Bansal, Orient Longman
21. English for Engineers & Technologists Vol.1 & 2 – Orient Longman
22. Speak English (with Audio Cassettes Vol.1 – Vol.8) – Don Dallas,Orient Longman

SYLLABUS OF ENGINEERING PHYSICS COURSE

Code: PH-101(First Semester)
Contacts: 4L
Credit: 4

Module 1: Classical Mechanics

1.1 Newtonian Mechanics – Newton's laws of motion-system of particles (2 body problem) conservation of linear and angular momentum (1D and 2D elastic and in-elastic collision) and related problems

4L

1.2 Lagrangian formulation- difficulties to handle coupled equations, Constraints (both time dependent and time independent), Degrees of freedom, Generalised co-ordinates, Generalized force, potential and kinetic energy, Lagrange's equation of motion and Lagrangian, Ignorable co-ordinates, Hamilton's equation and Hamiltonian.   The course should be discussed along with physical problems of 1-D motion).

6L

Module 2: Vibration and Wave :-
Simple harmonic motion - its expression and differential equation and solution , Superposition of two linear SHMs (*with same frequency*), Lissajous' figures.
Damped vibration – differential equation and its solution, Critical damping, Logarithmic decrement, Analogy with electric circuits.
Forced vibration – differential equation and solution, Amplitude and Velocity resonance, Sharpness of resonance and Quality factor.
Progressive wave equation and its differential form, Difference between elastic (mechanical) and electromagnetic waves.

8L

Module 3: Electricity and Magnetism
3.1 Examples of vector and scalar field, grad, div, curl, Line integral, surface integral, volume integral- physical examples in the context of electricity and magnetism, Stokes theorem and Gauss theorem [No Proof], Expression of grad, div, curl and Laplacian in Spherical and Cylindrical co-ordinates.

6L

3.2 Coulombs law, Gauss's law in integral form and conversion to differential form and application, Coulomb's theorem, Electrostatic potential and field, Poisson's Eqn and Laplace's eqn (Application to Cartesian, Spherically and Cylindrically symmetric systems – effective 1D problems) Electric current, drift velocity, current density, continuity equation, steady current, conservation of charge, ampere, esu.

.7L

3.3 Lorentz force, force on a small current element placed in a magnetic field, Biot-Savart law and its simple applications, divergence of magnetic field, vector potential, Ampere's law in integral form and conversion to differential form- applications,

5L

3.4 Faraday's law of electro-magnetic induction in integral form and conversion to differential form, Maxwell's field equations, Concept of displacement current, Maxwell's wave equation and its solution for free space.

4L

Total Number of Lectures = 40

Code: PH-201(Second Semester)
Contact: 4L
Credit: 4

Module 1: Optics:

1.1 General concept of Polarization, Plane of vibration and plane of polarization, Malus's law, Qualitative discussion on Plane, Circularly and Elliptically polarized light, Polarization through reflection and Brewster's law, Double refraction (birefringence) - Ordinary and Extra-ordinary rays, Polaroid, Nicol prism.

5L

1.2 Interference of electromagnetic waves, Conditions for sustained interference, double slit as an example. Spatial and Temporal Coherence, Conservation of energy and intensity distribution, Newton's ring (No deduction necessary)

3L

1.3 Diffraction of light – Fresnel and Fraunhofer class, Fraunhofer diffraction for single slit and double slits: Intensity distribution, N-slits and plane transmission grating, (No deduction of the intensity

distributions are necessary). Missing orders and Rayleigh criterion, Resolving power of grating and microscope. (definition and formulae)

4L

Module 2: Quantum Mechanics:

2.1 Concept of dependendence of mass with velocity, mass energy equivalence, energy- momentum relation, Inadequacy of Classical Physics in explaining (i) Black body radiation (*derivation required*) - Rayleigh Jeans' law, Wien's law, Ultraviolet catastrophy, Planck's radiation law (Calculation of the average energy of the oscillator) , (ii) Einstein's Photoelectric effect, (iii) Compton effect (*calculation of Compton wavelength is required*).

4L

2.2 Wave-particle duality and de Broglie's hypothesis, Concept of matter waves, Davisson-Germer experiment, Notion of wave packets and Heisenberg's uncertainty principle, notion of group velocity and phase velocity..

4L

2.3 Concept of probability and probability density, operators, commutators. Formulation of quantum mechanics and Basic postulates, Operator correspondence, Time dependent Schroedinger's equation, formulation of time independent Schroedinger's equation by method of separation of variables, Physical interpretation of wave function ψ (*normalization and probability interpretation*), Expectation values, Application of Schroedinger equation – Particle in an infinite square well potential (*1-D and 3-D potential well*), Discussion on degenerate levels.

9L

Module 3: Statistical Mechanics:

3.1 Concept of energy levels and energy states. Microstates, macrostates and thermodynamic probability, equilibrium macrostate., MB, FD, BE statistics (No deduction necessary), fermions, bosons (definitions in terms of spin, examples), physical significance and application, classical limits of quantum statistics Fermi distribution at zero & non-zero temperature, Calculation of Fermi level in metals, also total energy at absolute zero of temperature and total number of particles, Bose-Einstein statistics – Planck's law of blackbody radiation..

7L

Module 4: Crystallography:

4.1 Elementary ideas of crystal structure - lattice, basis, unit cell, Fundamental types of lattices – Bravais lattice, Simple cubic, f.c.c. and b.c.c. lattices, (use of models in the class during teaching is desirable] Miller indices and miller planes, Co-ordination number and Atomic packing factor.
X-rays – Origin of Characteristic and Continuous X-ray, Bragg's law (*No derivation*), Determination of lattice constant.

5L

Module 5: **Laser and Fibre optics**

5.1 Spontaneous and Stimulated emission of radiation, Population inversion, Einstein's A & B co-efficient (derivation of the mutual relation), Optical resonator and Condition necessary for active Laser action, Ruby Laser, He-Ne Laser- applications of laser.
Optical Fibres – Core and cladding, total internal reflection step index and graded index fibre, Calculation of Numerical aperture and acceptance angle, losses in the fibre, applications.

5L

Total No of Lectures = 46

Reference:
Engineering Physics 1 (TMH WBUT Series), Bhattacharya & Pal, TMH

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Code: PH-191(First Semester)
Contacts: 3P
Credit:2

Group 1: Experiment from Higher Secondary knowledge of Physics
1. Determination of thermal conductivity of a good conductor by Searle's mothod.
2. Determination of thermal conductivity of a bad conductor by Lees and Chorlton's method.
3. Determination of dispersive power of the material of given prism.

Group 2: Experiments on General Properties of matter

4. Determination of Young's modulus by Flexure method and calculation of bending moment and shear force at a point on the beam.
5. Determination of modulus of rigidity by static/ dynamic method.
6. Determination of co-efficient of viscosity by Poiseulle's capillary flow method.

Group 3: Experiments on Electricity and Mangentism

7. Determination of dielectric constant of a given dielectric material.
8. Use of Carry Foster's bridge to determine unknown resistance.
9. Determination of resistance of ballistic galvanometer by half deflection method and study of variation of logarithmic decrement with series resistance.
10. Determination of the thermo-electric power at a certain temperature of the given thermocouple.
11. Determination of specific charge (e/m) of electron by J.J. Thomson's method.

a) A candidate is required to perform 3 experiments taking one from each group. Initiative should be taken so that most of the Experiments are covered in a college in the distribution mentioned above. Emphasis should be given on the estimation of error in the data taken.

b) In addition, a student should perform one more experiments where he/she will have to convert the non-electrical signals (viz. Temperature, Intensity of Light, Pressure etc.) present in an Experiment into electrical signals and measure them with the help oh Multi-meters/ Oscilloscopes. Student should calibrate the Sensor for Experiment before use.

c) Innovative experiment: One more experiment designed by the student or the concerned teacher or both.

Note:

i. Failure to perform each experiment mentioned in b] and c] should be compensated by *two* experiments from two different groups mentioned in the above list.

ii. At the end of the semester report should sent to the board of studies regarding experiments, actually performed by the college, mentioned in b] and c]

iii. Experiment in b] and c] can be coupled and parts of a single experiment.

Code: PH-291(Second semester)
Contacts: (2P)
Credit: (2)

Group 1:
1. Determination of wavelength of light by Newton's ring method.
2. Determination of wavelength of light by Fresnel's bi-prism method
3. Determination of wavelength of light by Laser diffraction method.
4. Determination of numerical aperture and the energy losses related to optical fibre experiment

Group 2:
5. Determination of Planck's constant using photocell.
6. Determination of Lande'g factor using Electron spin resonance spetrometer.
7. Determination of Stefan's radiation constant
8. To study current-voltage characteristics, load response, areal characteristics and spectral response of photovoltaic solar cells.

Group 3:
9. Determination of Hall co-efficient of semiconductors.
10. Determination of band gap of semiconductors.

11. Determination of Rydberg constant by studying Hydrogen/ Helium spectrum

12. Verification of Bohr's atomic orbital theory through Frank-Hertz experiment.

a) A candidate is required to perform 3 experiments taking one from each group. Initiative should be taken so that most of the Experiments are covered in a college in the distribution mentioned above. Emphasis should be given on the estimation of error in the data taken.

b) In addition a student should perform one more experiments where he/she will have to transduce the output of any of the above experiments or the experiment mentioned in c] into electrical voltage and collect the data in a computer using phoenix or similar interface.

c) Innovative experiment: One more experiment designed by the student or the concerned teacher or both.

Note:
  i. Failure to perform each experiment mentioned in b] and c] should be compensated by *one* experiments mentioned in the above list.
  ii. At the end of the semester report should sent to the board of studies regarding experiments, actually performed by the college, mentioned **in b] and c]**
  iii. Experiment in b] and c] can be coupled and parts of a single experiment.

Recommended Text Books and Reference Books:
1. R.K. Kar (Engineering Physics)
2. Mani and Meheta (Modern Physics)
3. Arthur Baiser (Perspective & Concept of Modern Physics)

Classical Mechanics
1. H. Goldstein
2. A.K. Roychaudhuri
3. R.G. Takwal and P.S. Puranik
4. Rana and Joag
5. M. Speigel (Schaum Series)
6. J.C. Upadhya (Mechanics)
7. **Gupta Kumar and Sharma**

Electricity and Magnetism
1. Reitz, Milford and Christy
2. David J. Griffith
3. D. Chattopadhyay and P.C. Rakshit

4. Shadowitz (The Electromagnetic Field)

Vibration and Waves
1. Kingsler and Frey
2. D.P. Roychaudhury
3. N.K. Bajaj (Waves and Oscillations)
4. K. Bhattacharya
5. R.P. Singh (Physics of Oscillations and Waves)
6. A.B. Gupta (College Physics Vol.II)
7. Chattopadhya and Rakshit (Vibration, Waves and Acoustics)
8. **D. P. Roychaudhury**

Optics
1. Möler (Physical Optics)
2. A.K. Ghatak
3. E. Hecht (Optics)
4. E. Hecht (Schaum Series)
5. F.A. Jenkins and H.E. White
6. 6. Chita Ranjan Dasgupta (Degree Physics Vol 3)

Quantum Physics
1. Eisberg and Resnick
2. A.K. Ghatak and S. Lokenathan
3. S.N. Ghoshal (Introductory Quantum Mechanics)
4. E.E. Anderson (Modern Physics)
5. Haliday, Resnick and Crane (Physics vol.III)

Quantum Statistics
1. Sears and Sallinger (Kinetic Theory, Thermodynamics and Statistical Thermodynamics)
2. Mondal (Statistical Physics)
3. S.N. Ghoshal (Atomic and Nuclear Physics)
4. Singh and Singh
5. B.B. Laud (Statistical Mechanics)

Crystallography
1.S.O. Pillai (a. Solid state physics b. Problem in Solid state physics)
2. A.J. Dekker
3. Aschroft and Mermin
4.Ali Omar
5.R.L. Singhal
6.Jak Tareen and Trn Kutty (Basic course in Crystallography)

Module 5: Laser and Fibre Optics
1. A.K. Ghatak and Thyagarajan (Laser)
2. Tarasov (Laser)
3. P.K. Chakraborty (Optics)
4. B. Ghosh and K.G. Majumder (Optics)
5. B.B. Laud (Laser and Non-linear Optics)

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Basic Electrical Engineering(Second Semester)

Code: EE 201
Contacts: 3L+1T=4
Credits: 4

Electrostatics: Coulomb's law. Electric Field Intensity, electric field due to a group of charges, continuous charge distribution. Electric flux, Flux density. Electric potential, potential difference. Gauss's law, proof of gauss's law, its applications to electric field and potential calculation. Capacitor, capacitance of parallel plate capacitor, spherical capacitor, isolated spheres, concentric conductors, parallel conductors. Energy stored in a capacitor.   5L

DC Network Theorem: Definition of electric circuit, network, linear circuit, non-linear circuit, bilateral circuit, unilateral circuit. Kirchhoff's law. Principle of superposition. Source equivalence and conversion, Thevenin's theorem, Norton Theorem, nodal analysis, mesh analysis, star-delta conversion. Maximum power transfer theorem with proof.
          5L

Electromagnetism: Biot-savart law, Ampere's circuital law, field calculation using Biot-savart and ampere's circuital law.   Magnetic circuits, Analogous quantities in magnetic and electric circuits, Faradays's law, self and mutual inductance. Energy stored in a magnetic field, Hysteretic and Eddy current losses. Electro-mechanical energy conversion.
                    5L

DC Machines: Construction, Basic concepts of winding (Lap and wave).
DC generator: Principle of operation, EMF equation, characteristics (open circuit, load)
DC motors: Principle of operation, Speed-torque Characteristics (shunt and series machine), starting (by 3 point starter), speed control (armature voltage and field control)
                                                                                                6L

AC fundamental: Production of alternating voltage, waveforms, average and RMS values, peak factor, form factor, phase and phase difference, phasor representation of alternating quantities, phasor diagram, behavior of AC series , parallel and series parallel circuits, power factor, power in AC circuit, Effect of frequency variation in RLC series and parallel circuits, Resonance in RLC series and parallel circuit. Q factor, band width of resonant circuit.
            9L

Single phase transformer: Core and shell type construction, EMF equation, no load and on load operation, phasor diagram and equivalent circuit, losses of a transformer, open and short circuit tests, regulation and efficiency calculation.   4L

3 phase induction motor: Types, Construction, production of rotating field, principle of operation, equivalent circuit and phasor diagram, rating, torque-speed characteristics (qualitative only). Starter for squirrel cage and wound rotor induction motor. Brief introduction of speed control of 3 phase induction motor (voltage control, frequency control, resistance control)
          5L

Three phase system: Voltages of three balanced phase system, delta and star connection, relationship between line and phase quantities, phasor diagrams. Power measurement by two watt meters method.
                                    3L

General structure of electrical power system: power generation to distribution through overhead lines and under ground cables with single lone diagram   1L

Text books:
1. Basic Electrical engineering, D.P Kothari & I.J Nagrath, TMH, Second Edition
2. Fundamental of electrical Engineering, Rajendra Prasad, PHI, Edition 2005.
3. Basic Electrical Engineering, V.N Mittle & Arvind Mittal, TMH, Second Edition
4. Basic Electrical Engineering, J.P. Tewari, New age international publication

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Reference books:
1. Basic Electrical Engineering(TMH WBUT Series), Abhijit Chakrabarti & Sudipta Nath, TMH
2. Electrical Engineering Fundamental, Vincent.D.Toro, Pearson Education,
   Second Edition.
2. Hughes Electrical & Electronics Technology, 8/e, Hughes, Pearson Education.
3. Basic Electrical Engineering, T.K. Nagsarkar & M.S. Sukhija, Oxford
4. Introduction to Electrical Engineering, M.S. Naidu & S, Kamakshaiah, TMH
5. Basic Electrical Engineering, J.J. Cathey & S.A Nasar, TMH, Second Edition.

BASIC ELECTRICAL ENGINEERNG LABORATORY(Second Semester)

(Paper code: EE 291)

List of Experiments:

Sl. No	Name of the Experiments
1.	Characteristics of Fluorescent lamps
2.	Characteristics of Tungsten and Carbon filament lamps
3.	Verification of Thevenin's theorem.
4.	Verification of Norton's theorems.
5.	Verification of Maximum power theorem.
6.	Verification of Superposition theorem
7.	Calibration of ammeter and voltmeter.
8.	Study of R-L-C Series circuit
9.	Study of R-L-C parallel circuit
10.	Open circuit and Short circuit test of a single phase Transformer.
11.	No load characteristics of D.C shunt Generators
12.	Starting and reversing of speed of a D.C. shunt
13.	Speed control of DC shunt motor.
14.	Measurement of power in a three phase circuit by two wattmeter method.

ENVIRONMENT & ECOLOGY

Code: Ch 101(First Semester)
Contacts: 3L = 3
Credits: 3
General

Basic ideas of environment, basic concepts related to environmental perspective, man, society and environment, their inter relationship.   1L

Mathematics of population growth and associated problems, definition of resource, types of resource, renewable, nonrenewable, potentially renewable, effect of excessive use vis-à-vis population growth,

definition of pollutant and contaminant. Environmental impact assessment.
2L

Environmental degradation:
Acid rain, toxic element, particulates, noise pollution , air pollution and its effect on man.
1L
Overall methods for pollution prevention, environmental problems and sustainable development ,
components of environment   1L

Ecology
Elements of Ecology :
System, open system, closed system, definition of ecology, species, population, community, definition of ecosystem, biotic and abiotic components.
Ecological balance and consequence of change:
Effect of abiotic factor on population, flow chart of different cycles with only elementary reaction [oxygen, nitrogen, phosphate, sulphur], food chain [definition and one example of each food chain]
3L

Air Pollution and Control
Atmospheric Composition: Troposphere, stratosphere, mesosphere, thermosphere, tropopause, stratopause and mesopause   1L
Energy Balance:
Conductive and convective heat transfer, radiation heat transfer, simple global temperature modal [Earth as a black body, earth albedo]), problems.   3L

Green-house effects:
Definition, impact of greenhouse gases on the global climate and consequently on sea water level, agriculture and marine food.   1L

Climate , weather:
Difference between climate and weather
Global warming and its consequence: 2L
Adiabatic lapse rate, atmospheric stability, temperature inversion, radiation inversion
Atmospheric dispersion:
Maximum mixing depth, ventilation coefficient, smokestack plumes and atmospheric lapse rate.
1L
The point-source Gaussian plume model excluded.
Source and effect of pollutants:
Toxic chemicals in the environment , toxic chemicals in air , suspended particulate matter, carbon dioxide, sulphur dioxide, nitric oxide, lead, carbon monoxide.   2L
Primary and secondary pollutants:
Emission standard, criteria pollutant, oxides of carbon, oxide of nitrogen, oxide of sulphur, particulate, PAN
Depletion Ozone layer:
CFC, destruction of ozone lair by CFC, impact of other greenhouse gases, effect of ozone modification.
1L
Standards and control measures:
Industrial, commercial and residential air quality air quality standard, Control measure (ESP, Cyclone separator, bag house, catalytic converter, scrubber (ventury). Statement with brief reference)
1L
Water Pollution and Control
Hydrosphere:
Hydrological cycle   1L

 Natural water

Pollutants : their origin and effects :

Oxygen demanding wastes, pathogens, nutrients, salts, thermal application, heavy metals, pesticides, volatile organic compounds   1L

River / lake / ground water pollution

River

DO, 5day BOD test, BOD reaction rate constants, temperature dependents of BOD, effect of oxygen demanding wastes on river [Deoxygenation, reaeration], COD , Oil, Grease, pH.

2L

Lake

Eutrophication [Definition, source and effect]   1L

Ground Water:

Aquifers, hydraulic gradient, ground water flow. (Definition only)   1L

Standard and control:

Waste water standard [BOD,COD,Oil, Grease], Water treatment system [coagulation and flocculation, sedimentation and filtration, disinfection, hardness and alkalinity, softening], wastewater treatment, primary treatment , secondary treatmens [Trickling filters, rotating biological contractor, activated sludge, sludge treatment, oxidation ponds], tertiary treatment definition.

3L

Arsenic pollution :

Biochemical effect, contamination, speciation   2L

Land Pollution

Lithosphere

Composition

Pollutants

Municipal, industrial, commercial, agricultural, hazardous solid wastes   1L

Recovery and conversion method   2L

Waste and waste management

Land filling, incineration, composting

Noise Pollution   **2L**

Cources, effects

Definition of noise, effect of noise pollution , noise classification, transport noise, occupational noise, neighbourhood noise, definition of noise intensity, noise threshold limit value.

References / Books:

1. Masters , G.M., "Introduction to Environmental Engineering and Science", Prentice – Hall of India Pvt. Ltd. , 1991
2. Basak: Environmental Engineering TMH
3. Nebel , B.J., "Environmental Science", Prentice –Hall Inc., 1987
4. Odum , E.P., "Ecology: The Link between the natural and social sciences" , IBH Publishing Com. , Delhi
5. Dash: Fundamentals Of Ecology TMH
6. Environmental Management – N.K. Uberoi, EXCEL BOOKS
7. Fundamentals of environmental studies by D.K.Sinha, & A.D.Mukherjee
8. Introduction to Environmental Engineering Sc. by G.Mmasters
9. Environmental Chemistry by A.K.De, New Age International
10. Environmental Management- Mukherjee, Vikas
11. Environmental Management- Pandey, Vikas
12. Environmental Chemistry – Sindhu P.S., New Age International
13. Water Pollution & Management – Varshney C.K., New Age International
14. Water Chemistry – Venkateswarlu K.S., New Age International
15. Water Pollution: Causes, Effects & Control – Goel P.K., New Age International
16. Environmental Pollution Control Engg – Rao C.S., New Age International
17. Land Treatment of Waste Water – Gohil M.B., New Age International
18. Environmental Pollution Analysis – Khopkar S.M., New Age International
19. Soil Erosion & Conservation – Tripathi R.P., New Age International
20. Environmental Studies – De A.K., New Age International
21. Environmental Impact Assessment – Barthwal R.R., New Age International
22. Man, Nature & Environment – De A.K., New Age International

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INTRODUCTION TO COMPUTING

Code : CS 201(First Semester)
Contacts : 2L + 1T = 3
<u>**Credits : 3**</u>
Fundamentals of Computer:

History of Computer, Generation of Computer, Classification of Computers   2L

Basic Anatomy of Computer System, Primary & Secondary Memory, Processing Unit, Input & Output
devices   3L

Binary & Allied number systems representation of signed and unsigned numbers. BCD, ASII. Binary
Arithmetic & logic gates   6L

Assembly language, high level language, compiler and assembler (basic concepts)

2L

Basic concepts of operating systems like MS DOS, MS WINDOW, UNIX, Algorithm & flow chart

2L

C Fundamentals:
The C character set identifiers and keywords, data type & sizes, variable names, declaration, statements   3L
Operators & Expressions:
Arithmetic operators, relational and logical operators, type, conversion, increment and decrement
operators, bit wise operators, assignment operators and expressions, precedence and order of evaluation.
Input and Output: Standard input and output, formatted output -- printf, formatted input scanf.

5L

Flow of Control:
Statement and blocks, if - else, switch, loops - while, for do while, break and continue, go to and labels

2L

Fundamentals and Program Structures:
Basic of functions, function types, functions returning values, functions not returning values, auto,
external, static and register variables, scope rules, recursion, function prototypes, C preprocessor,
command line arguments.   6L
Arrays and Pointers:
One dimensional arrays, pointers and functions, multidimensional arrays.   6L
Structures Union and Files:
Basic of structures, structures and functions, arrays of structures, bit fields, formatted and unformatted
files.   5L
Recommended reference Books:
Introduction To Computing (TMH WBUT Series), E. Balagurusamy,TMH

Kerninghan, B.W.	The Elements of Programming Style
Yourdon, E.	Techniques of Program Structures and Design
Schied F.S.	Theory and Problems of Computers and Programming
Gottfried	Programming with C Schaum
Kerninghan B.W. & Ritchie D.M.	The C Programming Language
Rajaraman V.	Fundamental of Computers
Balaguruswamy	Programming in C
Kanetkar Y.	Let us C
M.M.Oka	Computer Fundamentals,EPH
Leon	Introduction to Computers,Vikas
Leon-	Fundamental of Information Technology,Vikas

Ram B.	Computer Fundamentals, New Age International
Ravichandran D.	Programming in C, New Age International
Xavier C.	C Language & Numerical Methods, New Age Inter.
Xavier C.	Introduction to Computers, New Age International
Rao S.B.	Numerical Methods with Programs in Basic Fortran Pascal & C++, Universities Press
Dutta N.	Computer Programming & Numerical Analysis, Universities Press
Bhanu Pratap	Computer Fundamentals
Rajaram	Computer Concepts & C Program, Scitech

BASIC ELECTRONICS ENGINEERING

Code : EC 101(First Semester)
Contacts : 3L + 1T = 4
Credits : 4
Introduction:
Crystalline material: mechanical properties, energy band theory, Fermi levels   2L

Conductors, Semiconductors and Insulators: electrical properties, band diagrams. Semiconductors: intrinsic and extrinsic, energy band diagram, electrical conduction phenomenon, P-type and N-type semiconductors, drift and diffusion carriers, mass action law and continuity equation (statement only)
                                                                                                 6L

Formation of P-N junction, energy band diagram, built-in-potential forward and reverse biased P-N junction, formation of depletion zone, V-I characteristics, Zener breakdown, Avalanche breakdown and its reverse characteristics, junction capacitance and varactor diode.
                                                                                                 6L

Simple diode circuits, load line, linear piecewise model; rectifiers: half wave, full wave, its PIV, DC voltage and current, ripple factor, efficiency Clipper and Clamper circuits
                                                                                                 5L

Introduction to Transistors:
Formation of PNP / NPN junctions, energy band diagram; transistor mechanism and principle of transistors, CE, CB, CC configuration, Ebers-Moll model of transistor; transistor characteristics: cut-off active and saturation mode, early effect.
                                                                                                 4L

Biasing and Bias stability: calculation of stability factor with variation of Ico Different operating modes; CE, CB, CC and their properties; small signal low frequency operation of transistors; equivalent circuits h parameters as a two port network.
                                                                                                 4L

Transistors as amplifier: expression of voltage gain, current gain, input impedance and output impedance, frequency response for CE amplifier with and without source impedance (qualitative)
                                                                                                 4L

Introduction to Field Effect Transistor:
Construction and characteristics of JFET (N channel only), Transfer characteristics; construction and characteristics of MOSFET (N channel only), depletion and enhancement type; CS, CG, CD configuration   5L

Feed Back Amplifier:
Concept (Block diagram), properties, positive and negative feed back, loop gain, open loop gain, feed back factors; topologies of feed back amplifier; effect of feed back on gain, output impedance, input impedance, sensitivities (qualitative), bandwidth stability; effect of positive feed back: instability and oscillation, condition of oscillation, Barkhausion criteria.
                                                                                                 5L

Operational Amplifier:

Introduction to integrated circuits, operational amplified and its terminal properties, specification of M741   2L

Application of operational amplified: concept of virtual earth, inverting and non-inverting mode of operation, voltage summing, difference, constant gain multiplier, voltage follower, comparator, integrator, differentiator.   3L

Special Semiconductor devices:

Silicon Controlled Rectifier (SCR): constructional features, physical operation, characteristics, simple application (Saw tooth generator); concept of TRIAC, DIAC and UJT; insulated gate bipolar transistor (IGBT)   4L

Cathode Ray Oscilloscope:

Construction features of cathode ray tube, concept of dual beam CRO; application of CRO for different electrical measurements: amplitude frequency and phase of sine wave, Lissajous figure.

3L

Recommended reference Books:

Malvino	Electronic Principle
Millman & Halkias	Integrated Electronics
Mottershed	Electronics Devices & Circuits
Millman & Grabal	Microelectronics
Schilling & Belove	Electronics Circuits
Salivahanan	Electronics Devices & Circuits
Manish Mukherjee	Foundation Of Electronics Devices &Circuits.
Bhargava	Basic Electronics and Linear Circuits
Rakshit & Chattopadhyay	Foundation of Electronics
Storey	Electronics
S.C.Sarkar	Electronics Devices And Circuits. Vol. I&II.EPH
Basavrag	Basic Electronics,Vikas
Mann, K.	Introductory A.C. Circuits Theory, Universities Press
Ray Dilip Kumar	Physics of Semiconductor Devices, Universities Press
Chattopadhyay & Rakshit	Electronics :Fundamentals & Application, New Age
Paul P. John	Electronics Devices & Circuits,New Age
Poornachandra	Electronics Devices & Circuits

ENGINEERING CHEMISTRY

Code : CH 201(Second Semester)
Contacts : 3L = 3
Credits : 3

Chemical Thermodynamics:

Concept of Thermodynamic System: diathermal wall, adiabatic wall, isolated system, closed system, open system, extensive property, intensive property

Introduction to first law of thermodynamics: different statements, mathematical form; internal energy: physical significance, mathematical expression (ideal and real gas), Enthalpy: physical significance,

mathematical expression   3L

C_p and C_v: definition and relation; adiabatic changes; reversible and irreversible processes; application of first law of thermodynamics to chemical processes: exothermic, endothermic processes, law of Lovoisier and Laplace, Hess's law of constant heat summation, Kirchoff's law

3L

Second law thermodynamics; Joule Thomson and throttling processes; inversion temperature; evaluation of entropy: characteristics and expression, entropy change in irreversible process, entropy change for irreversible isothermal expression of an ideal gas, entropy change of a mixture of gases

2L

Work function and free energy: physical significance, mathematical expression for ideal and real gases obeying Vander Waals' equation, Gibbs Helmholtz equation

2L

Condition of spontaneity and equilibrium; non ideal systems, activity and activity coefficient, partial molar properties, chemical potential to multicomponent systems, Gibbs Duhem relation; application of thermodynamics to phase transition

4L

Atoms and Molecules:
Homonuclear and heteronuclear diatomics, covalent bonds, ionic bonds and electronegativity concepts, hybridzation and shapes of molecules, non-covalent interaction (Vander Waals and hydrogen bonding).

3L

Solid State Chemistry:
Introduction to stoichiometric defects (Schottky & Frenkel) and non-stoichiometric defects (Metal excess and metal deficiency); role of silicon and germanium in the field of semiconductor, transistors, rectifier and photovoltaic cells; the process for preparing microminiaturized semiconductor devices: integrated circuits

5L

Instrumental Methods of Analysis:
Introduction to instrumental metals such as IR, UV,-Vis, NMR and Mass spectrometry.

1L

Reaction Dynamics:
Reaction laws: rate and order; molecularity; first and second order kinetics; mechanism and theories of reaction rates (Transition state theory, Arrhenius equation)

2L

Transition and Metal Chemistry:
Structures of coordination compounds corresponding to coordination number 6; types of ligands; isomerism (geometrical, optical, ionization, linkage and coordination).

2L

Structure and Reactivity of Organic Molecule:
Inductive effect; resonance; hyperconjugatin; electromeric effect; carbanion and free radicals; brief study of some addition, elimination and substitution reactions

4L

Polymerization:
Concepts, classifications and industrial applications; polymerization processes, degree of polymerization (addition and condensation polymerization); preparation, structure and use of some common polymers: plastic (PE, PP, PVC bakelite), rubber (natural rubber, SBR, NBR), fibre (nylon 6,6, polyester); conducting and semiconducting polymers

6L

Industrial Chemistry:
Solid, liquid and gaseous fuels; constituents of coal, carbonization of coal, coal analysis, proximate and ultimate analysis; classification of coal
Petroleum, gasoline, octane number, aviation fuel, diesel, cetane number; natural gas, water gas.

5L

Electrochemistry:
Conductance of electrolytic solutions, specific conductance, equivalent conductance, molar conductance

and ion conductance; effect of temperature and concentration; basic ideas and inter ionic attractions; transport numbers and hydration ions, electrochemicals cells; cell emf and its thermodynamic significance; single electrode potentials and its applications; hydrogen half cell and calomel half cell; conductometric titrations: SA vs SB & SA vs WB; precipitation titration KCL vs $AgNO_3$

5L

Recommended reference Books:
Engineering Chemistry (TMH WBUT Series), Paladhi,TMH

Rakshit P. C.	Physical Chemistry
Dutta R. L.	Inorganic Chemistry
Levine	Physical Chemistry
Finar I. L.	Organic Chemistry
Sarkar Samir	Fuels and Combustion
Carey	Organic Chemistry
Glasston Samuel	Text Book of Physical Chemistry
Lee J. D.	Concise Inorganic Chemistry
Ghosh P.	Polymer Science and Technology of Plastics & Rubbers
Gopalan-	Applied Chemistry for Engineers,Vikas
Gopalan-	Concise coordination Chemistry,Vikas
Sharma	Physical Chemistry,Vikas
Raman	Physical Chemistry,Vikas
Rao Y.V.C.	Chemical Engineering Thermodynamics, Univs Press
Moore W.J.	Physical Chemistry, Orient Longman
Satyanarayan Rao V.	Polarography & Allied Techniques, Universities Press
Mann F.G.	Practical Organic Chemistry, Orient Longman
Sykes,P.	Guidebook to Mechanism in Org.Chems. Orient Longman
Sathyaranarana , D.N.	Electronic Absorptions Spectrocopy & Related Techniques, Univs Press
Negi A.S.	A Textbook of Physical Chemistry, New Age International
Chakraborty D.K.	**Solid State Chemistry, New Age International**
Singh S.K	Fundamentals of Engg Chemistry, New Age Inter.
Gupta M.C.	Atomic & Molecular Spectroscopy, New Age
Gowarikar V.R.	Polymer Science, New Age
Mishra G.S.	Introductory Polymer Chemistry, New Age
Mukherji S.M.	Organic Chemistry Vol.1,2,3, New Age
Nasipuri D.	Stereochemistry of Organic Compounds, New Age
Kalsi P.S	**Spectroscopy of Organic Compounds, New Age**
Kalsi P.S.	Organic Reactions & their Mechanism, New Age
Bansal R.K.	A Textbook of Organic Chemistry, New Age
Chakraborty D.K.	Absorption & Catalysis by Solids, New Age
Kalidas C.	Chemical Kinetic Methods, New Age
Reddy K.H.	Bioinorganic Chemistry

ENGINEERING CHEMISTRY LABORATORY

Code : CH 291(Second Semester)
Contacts : 3/2 P
Credits: 1
Suggested List of Experiments

1. Acid –base titration (estimation of commercial caustic soda)
2. Redox titration (estimation of iron using permanganometry)
3. Complexometric titration (estimation of hardness of water using EDTA titration)
4. Preparation and analysis of a metal complex (for example thiourea / copper sulfate or nickel chloride / ammonia complexes)
5. Chemical Kinetics (determination of relative rates of reaction of iodide with H_2O_2 at room temperature (clock reaction)
6. Heterogeneous equilibrium (determination of partition coefficient of acetic acid between n-butanol and water)
7. Photochemical oxidation-reduction (study of photochemical reduction of ferric salt)
8. Viscosity of solutions (determination of percentage composition of sugar solution from viscosity)
9. Conductometric titration for determination of the strength of a given HCl solution by titration against a standard NaOH solution
10. pH- metric titration for determination of strength of a given HCl solution against a standard NaOH solution.

COMPUTING LAB

Code: CS 291(Second Semester)
Contacts: 3 P
Credits: 2
Exercises should include but not limited to:

1. DOS System commands and Editors (Preliminaries)
2. UNIX system commands and vi (Preliminaries)
3. Simple Programs: simple and compound interest. To check whether a given number is a palindrome or not, evaluate summation series, factorial of a number , generate Pascal's triangle, find roots of a quadratic equation
4. Programs to demonstrate control structure : text processing, use of break and continue, etc.
5. Programs involving functions and recursion
6. Programs involving the use of arrays with subscripts and pointers
7. Programs using structures and files.

BASIC ELECTRONICS ENGINEERING LAB
Code: EC 191(First Semester)
Contacts: 3P
Credits: 2

1. Familiarization with Electronic components such as Resistors, Capacitors, Diodes, Transistors etc.
2. Familiarization with electrical devices and measuring equipment like DC power supply, Multimeter, Trainer kit etc.
3. Familiarization with measuring and testing equipment like CRO, Signal generator.
4. Study on V-I characteristics of Junction Diode.
5. Study on V-I characteristics of Zener Diode.
6. Study on Half Wave and Full Wave rectifiers.
7. Study on characteristics of Field Effect Transistors.
8. Determination of Input offset voltage, Input Bias current, Slew rate of Op-Amp.
9. Determination of Common Mode Rejection Ratio, Bandwidth, Offset null of Op-Amp.
10. Characteristics Curve for common base emmitor & common collector transducers
11. Study of working of data acquisition system.

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MATHEMATICS

Code: M 101(First Semester)
Contacts: 3L + 1 T = 4
Credits: 4

Infinite Series:

Sequence, Convergence and Divergence of Infinite series – and typical examples of convergent and divergent series. *1L*

Comparison test (statement only) and related problems *1L*

Ratio test (statement only) and related problems *1L*

Cauchy's root test (statement only) and related problems *1L*

Alternating series, Leibnitz's theorem (without proof), absolute convergence and related problems. *2L*

Calculus of Functions of One Variable:
Review of limit and continuity and differentiability. *1L*

Successive differentiation, Leibnitz's theorem (without proof but with problems of the type of recurrence relations in derivatives of different orders and also to find $(y_n)_0$): *3L*

Rolle's theorem (statement only); Mean Value Theorems—Lagrange & Cauchy (statement only), Taylor's theorem (without proof and problems in respect of direct use and applications of the theorem only), Expansions of functions by Taylor and Maclaurin series. Maclaurin's expansion in infinite series of the functions: log (1+x), e^x , sinx, cosx, $(a+x)^n$, n being a negative integer or a fraction L'Hospital's Rule (statement only) and related problems. *6L*

Integration of *2L*

$$\int_0^{\pi/2}\cos^n x \, dx, \quad \int_0^{\pi/2}\sin^n x \, dx, \quad \int_0^{\pi/2}\cos^n x \sin^m x \, dx, \quad \int_0^{\pi/2}\cos \, mx \sin \, nx \, dx, \quad m, \quad n \quad \text{are} \quad \text{positive}$$

integers.

Application:
Rectification *1L*

Three Dimensional Geometry (Cartesian):
Direction Cosine, Direction Ratio; Equation of a Plane (general form, normal form and intercept form); Equation of a Straight Line passing through one point and two points; Pair of intersecting planes representing a straight line. *4L*

Elementary ideas of surfaces like sphere, Right Circular Cone and Right Circular Cylinder (through Geometrical configuration) and equations in standard forms.

Calculus of Functions of Several Variables:
Introduction of Function of several variables and examples. *2L*
Knowledge of limit and continuity.

Partial derivative & related problems. Homogeneous Functions and Euler's Theorem (statement only) & Problems upto 3 variables. *3L*

Chain rules and related problems.	*4L*
Differentiation of implicit functions & related problems.	
Total differentials and related problems.	
Maxima, minima and saddle points – definition, condition of extrema & problems for two variables.	*2L*
Lagrange's multiplier method – problems related to two variables only.	
Line Integral, Double Integrals, Triple Integral – Discussion w.r.t. different types of limits and problems; Moment of Inertia, Centre of Gravity.	*3L*
Jacobian – Definition and related problems for two variables.	*2L*
Applications to areas and volumes, surface area of revolution.	

Vector Calculus:

Scalar and Vector fields – Definition and Terminologies; Products: dot, cross, box, vector triple product.	*2L*
Gradient, directional derivative, divergence, curl. (with problems).	*2L*
Tangent planes and normals and related problems.	*1L*
Statements of	*4L*
Green's theorem, Divergence theorem, Stokes' theorem with applications.	

Total   48L

References / Books:

1. G.B.Thomas and R.L. Finney, "Calculus and Analytic Geometry", 6th edition, Addison Wesley / Narosa, 1985.
2. Piskunov, "Differential and Integral Calculus", Vol-I & II, Mir Publishers, Moscow, 1979.
3. B.S. Grewal "Engineering Mathematics", S. Chand & Co., New Delhi.
4. Integral Calculus, Das & Mukherjee
5. An Introduction to Real Analysis- S.K.Mapa
6. Higher Algebra – Lahiri & Roy
7. Higher Algebra, Ghosh & Chakraborty
8. Higher Algebra, Bernard & Child
9. Differential Calculus, Maity & Ghosh
10. Integral Calculus, Maity & Ghosh
11. Engineering Mathematics, Prof.T.Majumdar
12. An Introduction to Analysis, Mallick & Arora
13. Undergraduate Engg Math- Jana, Vikas
14. Engineering Math Vol 1,2,3- Lakshami, Vikas
15. Calculus of One Vairable – Pandey G.S. (New Age International)
16. Differential Calculus – Dhami H.S. (New Age International)
17. Integral Calculus – Dhami H.S. (New Age International)
18. Numerical Methods for Engineers – Gupta S.K. (New Age International)
19. A Textbook of Engg Maths Vol.1 & Vol.2 – Dutta D. (New Age Inter.)
20. Advanced Engg. Mathematics By D.P. Das, Cyber Tech

MATHEMATICS
Code: **M 201(Second Semester)**
Contacts: **3L + 1T = 4**
Credits: **4**

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Linear Algebra:

Introduction to the idea of a matrix; equality of matrices; special matrices. Algebraic operations of matrices: commutative property, associative property and distributive property. Transpose of a matrix (properties $(A^t)^t = A$, $(A+B)^t = A^t + B^t$, $(cA)^t = cA^t$, $(AB)^t = B^t A^t$ to be stated (without proof) and verified by simple examples). Symmetric and Skew symmetric matrices. *2L*

Properties of determinant (statement only); minor, co-factors and Laplace expansion of determinant; Cramer's rule and its application in solving system of linear equations of three variables. *2L*

Singular and non-singular matrices; adjoint matrix; inverse of a matrix $[(AB)^{-1} = B^{-1}A^{-1}$ to be stated and verified by example. Elementary row and column operations on matrices; definition of rank of a matrix; determination of rank of a matrix using definition. *2L*

System of Linear Equations:

Consistency and Inconsistency. Gauss elimination process for solving a system of linear equations in three unknowns. *2L*

Vector Space:

Basic idea of set, mapping, Binary Composition and Scalar field. Definition of vector space over the field of real numbers; Examples of vector space; Definition of sub-space of a vector space and a criterion for a sub-space; Definition of Linear combination, Linear independence and linear dependence of vectors with examples. Definition of basis and dimension of vector space; Definition of Linear transformation: Definition of kernel and images of a Linear transformation; Kernel and Images of a Linear Transformation forming sub-spaces; Nullity and Rank of a Linear Transformation; Dim Ker T + Dim Im T = Dim V; Definition of Inner product space; Norm of a vector; Orthogonal and Ortho-normal set of vectors. *7L*

Eigenvalues and Eigenvectors of a matrix; Eigenvalues of a Real Symmetric Matrix; Necessary and Sufficient Condition of diagonalization of matrices (statement only); Diagonalization of a matrix (problems restricted to 2 x 2 matrix). *2L*

Ordinary Differential Equations (ODE):

Definition of order and degree of ODE; *4L*
ODE of the first order: Exact equations; Definition and use of integrating factor; Linear equation and Bernoulli's equation. ODE of first order and higher degree, simple problems.

General ODE of 2nd order: D-operator method for finding particular integrals. Method of variation of parameters. Solution of Cauchy-Euler homogeneous linear equations. Solution of simple simultaneous linear differential equations. *6L*

Verification of Legendre function ($P_n (x)$) and Bessel function ($J_n (x)$) as the solutions of Legendre and Bessel equations respectively. Graphical representations of these solutions. *2L*

Laplace Transform (LT):

Definition; Existence of LT; LT of elementary functions; First and second shifting properties; Change of scale property; LT of derivative of functions. LT of ($t^n f (t)$), LT of $f (t) / t^n$; LT of periodic function and unit step function. Convolution theorem (statement only). *6L*

Inverse LT; Solution of ODE's (with constant coefficients) using LT. *4L*

Numerical Methods:

Error: Absolute, Percentage, Relative errors. Truncation error, Round off error. *5L*
Difference operator (forward, backward, central, shift and average operators); Different table, Propagation of Error. Definition of Interpolation and Extra-polation. Newton's forward and backward interpolation formula; Lagrange interpolation formula and corresponding error formulae (statement only).

Numerical Differentiation: Using Newton's forward and backward interpolation formula.   *4L*
Numerical Integration: Trapezoidal rule and Simpson's 1/3rd rule and corresponding error terms (statement only).

                                                                                          Total   48L

Recommended Reference Books:

Kreyszig E.	Advance Engineering Mathematics
Krishnamurthy V., Mainra V.P. and Arora J.L.	An Introduction to Linear Algebra
Boyce and Diprima	Elementary Differential Equations and Boundary Value Problems
Grewal B.S.	Engineering Mathematics
S.K.Rathor	Higher Engineering Mathematics II.EPH
Lakshmninarayn	Engg Math,Vikas
Jana	UG Engg. Mathematics,Vikas
Chakraborty A.	Elements of Ord.Diff. Equations,New Age
Bhattacharya P.B.	First Course in Linear Algebra,New Age
Rao Sarveswar A.	Engineering Mathematics, Universities Press
Gupta S.K.	Numerical Methods for Engineers, New Age
Jain M.K.	Numerical Methods for Sc. & Engg Computation, New Age International
Jain M.K.	Numerical Solutions of Differential Equations
Balachandra Rao	Numerical Methods with Programs in Basic, Fortran Pascal and C++
Dutta N.	Computer Programming & Numerical Analysis: An Integral Approach,Universities Press
Rao S.B.	Differential Equations with Applications & Programs, Universities Press

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Murray D.A.   Introductory Course in Differential Equations

Bagchi S.C.   First Course on Representation Theory & Linear Lie Groups, Universities Press

Arumugam   Engineering mathematics,I,II & III, Scitech

ME 101   :   Mechanical Sciences(First Semester)
Contact   :   3L + 1T = 4
Credit   :   4
Assuming 12 weeks available,
No. of periods : 12 x 4 = 48

Sl. No.	Topics to be covered	Assigned Lectures & Tutorials	Recommended Text Books

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1.	Introduction to Statics: Fundamental idealization : Particle and Rigid body concept; Types of forces (collinear, concurrent, parallel, concentrated, distributed), Vector and scalar quantities, Transmissibility of a force (sliding vector); Lame's Theorem	2L	Engineering Mechanics, Vol-I (Statics) by Meriam & Kraige Chap. – 1 & 2
2.	Introduction to Vector Algebra, Vector Operations, Parallelogram law, Free vector, Bound Vector; representation of Forces and Moments in terms of i,j,k; Cross product and Dot product and their applications.	3L + 1T	Engineering Mechanics Statics & Dynamics by I.H. Shames. Chap – 2 Prob. 22,23,26,31,35,43,45
3.	Two and three dimensional force systems; Moment and Couple, Varignon's theorem, Resultants, Free body concept. Resolution of a coplanar force by its equivalent Force-couple system.	**3L**	Engineering Mechanics, Vol-I (Statics) by Meriam & Kraige Chap – 2, **Prob. 2,7,13,17,20,32,37,45, 51,58,60,63,66,68,83,91,92, 94, 97, 102**
4.	Concept of Equilibrium in Two and Three dimensions. Equations of Equilibrium	**2L + 1T**	- DO – [Chap – 3] Prob. 4,8,10,21,26,28,63,65,71,80
5.	Concept of Friction; Laws of Coulomb friction, Angle of Repose	**2L + 1T**	- DO – [Chap – 6] Prob. 3,5,9,15
6.	Distributed Force : Centroid and Centre of Gravity	2L	- DO – [Chap – 5] Prob. 6,15,18,39,41,42,51, 53,72
7.	Moments of inertia of plane figures : M.I. of plane figures : MI of plane figure with respect to an axis in its plane; MI of plane figure with respect to an axis perpendicular to the plane of the figure, Parallel axis theorem; Mass moment of inertia of symmetrical bodies, e.g. cylinder, sphere, rod.	3L + 1T	- DO – [Chap Appendix A & B] Prob. A/1, A/12, A/21, A/29, A/33
8.	Principle of virtual work with simple application	**2L + 1T**	- DO – [Chap – 7] Prob. 1, 2, 3

9.	Concept of simple stresses and strains: Normal stress, Shear stress, Bearing stress, Normal strain, Shearing strain, Hooke's law, poisson's ratio, Examples	**2L + 1T**	Elements of Strength of Materials by Timo & Young, ** [Chap – 1] Prob. Art 1.2, 3,4,5,8,9,10 and problem sheet. Art 1.3, Prob. 3,5,7
10.	Stress and strains under axial loading stress-strain diagram of ductile materials, Working stress, Factor of safety, Proportional limit, Elastic Limit, Ultimate stress, Yielding, Modulus of elasticity, Definitions of malleability, ductility, toughness and resilience.	**2L**	- DO – [Chap – 1.1]
11.	Concept of thermal stress	**1L**	- DO – [Chap – 1] **Problem Sheet**
12.	Introduction to Dynamics : Kinematics and Kinetics; Rectilinear motion of particles; determination of position velocity and acceleration – under uniform rectilinear motion (uniform and nonuniform accelerated rectilinear motion), Relative motion, construction of x-t, v-t and a-t graphs (simple problems)	2L + 1T	Engineering Mechanics (Vol-II) Dynamics by Mariam & Kraige [Chap – 2] Prob. 2,4,8,12,23,24,174,194 and Problem sheet
13.	Plane curvilinear motion of particles : Rectangular components (Projectile motion), Normal and Tangential components, Radial and Transverse components, simple problems	2L + 1T	- DO – [Chap – 2] Prob. 57,72,83,98,123,126 and Problem sheet
14.	Plane kinematics of Rigid bodies : Translation and Rotation	2L + 1T	- DO – [Chap – 5] Prob. 1,3,6,18 and Problem sheet
15.	Kinetics of particles : Rectilinear motion of particles; Plane kinetics of Rigid bodies : Rectilinear motion	2L + 1T	- DO – [Chap – 3 & 6] Chap 3. Prob. 2,13,18,23 Chap 6. Prob. 3,9,25,37,41
16.	Equation of motion, D.Alembert's principle Principle of work and energy applied to particle and rigid bodies, Principle of conservation of energy, Power and efficiency, simple examples	2L + 1T	- DO – [Chap – 3 & 6] Chap 3. Prob. 91,94,100 Chap 6. Prob. 112, 115, 116 and Problem Sheet
17.	Principle of Linear Impulse and Momentum	2L + 1T	- DO – [Chap – 3 & 6] Chap 3. Prob. 159,162, 189,191,197 and Problem sheet

West Bengal University of Technology

BF-142, Salt Lake City, Kolkata-700064
Syllabus of First Year B.E/B.Tech
(ME,CE,BT,FT,CHE,PE,IT,CSE,BME,Marine,LT,TT,Ceramic,AUE)from 2007

36L + 12T = 48 Periods

** Strength of Materials by S. Ramamruthan may be consulted for problems.

The students should attempt solving problems given in the Question Bank (Problem Sheet) besides the problems as indicated against each topic of the Recommended Books.
References:
Mechanical Science 1 (TMH WBUT Series), P.K.Nag, S.Pati & T.K.Jana,TMH
Fundamentals of Mechanical Sciences, Bhattacharya & Mukhopadhyay,Pearson Education

ME 201   :   Mechanical Sciences(Second Semester)
Contact   :   3L
Credit   :   3
Assuming 14 weeks available,
No. of periods : 14 x 3 = 42

Sl. No.	Topics to be covered	Assigned Lectures	Recommended Text Book

	A. THERMODYNAMICS		Engineering Thermodynamics by P.K. Nag (2nd Edition) :
1.	Introduction to Thermodynamics, Concepts of systems, control volume, state, properties, equilibrium, quasi-static process, reversible & irreversible process, cycles.	2	Art : 1.1, 1.2, 1.3, 1.4, 1.5, 1.6 P: 1.5, 1.8, 1.9 + problems solved. Q : 1.1 to 1.5
2.	Zeroeth Law and Temperature, Ideal Gas	1	Art : 2.1, 2.2, 2.6, 2.7 P : 2.3, 2.5 + problems solved. Q : 2.1 to 2.4, 2.13, 2.16
3.	Heat and Work	1	Art : 3.1, 3.2, 3.7, 3.8 P : 3.4, 3.5, 3.13, 3.15 + solved problems. Q : 3.1 to 3.7, 3.14 to 3.19
4.	Real gases, Equations of State, Processes of Ideal Gases. Law of Corresponding States	3	Art : 10.2, 10.3, 10.4, 10.5, 10.6, 10.7 P : 10.3, 10.7, 10.8, 10.9, 10.17 (entropy related parts to be done later) + solved problems Q : 10.1, 10.3, 10.5 to 10.7, 10.12, 10.13, 10.16, 10.17, 10.18, 10.31, 10.38
5.	(i) 1st Law of Thermodynamics for closed & open systems (ii) Non Flow Energy Equation (iii) Steady State, Steady Flow Energy Equation	3	Art : 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.9, 5.1, 5.2, 5.3, 5.4 P : 4.3, 4.5, 4.8, 4.13, 4.14 + solved problems Q : 4.1, 4.5, 4.6, 4.8 P: 5.1, 5.2, 5.3, 5.4 Q: 5.2, 5.3, 5.4
6.	2nd Law of Thermodynamics – Statements, Equivalence of two statements, Definition of Heat Engines, Heat pumps, Refrigerators	2	Art : 6.1, 6.2, 6.3, 6.4, 6.5, 6.6 P : 6.1, 6.2, 6.3, 6.4, 6.5, 6.6, 6.7, 6.8 + solved problems Q : 6.2, 6.10, 6.12 to 6.18
7.	Carnot Cycle; Carnot efficiency, Concept of absolute temperature, Thermodynamic scale of temperature	2	Art : 6.10, 6.11, 6.12, 6.13, 6.14, 6.15, 6.16 P : 6.9, 6.10, 6.13, 6.15 + solved problems. Q : 6.35, 6.41, 6.42, 6.43

8	Clausius inequality, Entropy and irreversibility.	2	Art : 7.3, 7.4, 7.5, 7.6, 7.7 P : 7.1, 7.2, 7.3, 7.4, 7.5, 7.16 + solved problems Q : 7.3 to 7.7
9	Properties of Pure Substances – Use of Steam Tables and Mollier Charts	3	Art : 9.1, 9.2, 9.3, 9.4, 9.5, 9.6, 9.7, 9.8 P : 9.1, 9.2, 9.3, 9.4, 9.5, 9.6 + solved problems Q : 9.1, 9.2, 9.3, 9.4, 9.5
10	Air Standard cycles – Otto and Diesel cycle and their efficiencies	4	Art : 13.4, 13.5, 13.6 P : 13.4, 13.6, 13.7, 13.8, 13.9 + solved problems Q : 13.5, 13.7
11	Steam Power Cycle – Rakine cycle, p-v & T-S plots, Rankine efficiency	2	Art : 12.1, 12.2 P : 12.1 Q : 12.1, 12.2, 13.3, 12.4
12	Vapur compression refrigeration cycle	1	Art : 14.3 No problems. Q : 14.1, 14.2
		Total = 26	

	B. FLUID MECHANICS		Introduction to Fluid Mechanics & Fluid Mechines (2nd Edition) by S.K. Som & G. Biswas
1.	Properties & Classification of Fluids – ideal & real fluids, Newton's law of viscosity, Newtonian & Non Newtonian Fluids, Compressible & Incompressible fluids	3	Art : 1.1, 1.2, 1.3, 1.4, 1..4.1 to 1.4.9 Exercises : 1.1, 1.2, 1.3, 1.4, 1.5, 1.6 Solved Examples (relevant)
2.	Fluid Statics : Pressure at a point, Pascal's law.	3	
3.	Measurement of Pressure : Use of manometers : U-tube, inclined tube, micro-manometers.	3	Art : 2.1, 2.2, 2.3, 2.4, 2.5, 2.6 Exercises : 2.1, 2.2, 2.3, 2.4, 2.5 Solved Examples (relevant)
4.	Fluid Kinematics : Steady & unsteady flow. Uniform & non-uniform flow. Stream line, path line, streak line. Continuity equation.	4	Art : 3.1, 3.2, 3.3, 3.3.1 to 3.3.3, 4.1, 4.2, 4.2.1 Exercises : 3.1, 3.2, 3.3, 3.4, 3.5 Solved Examples 3.1, 3.2, 3.3, 3.4, 3.5
5.	Dynamics of ideal fluids : Bernoulli's equation, total head, velocity head, pressure head. Application of Bernoulli's equation	3	Art : 4.5, 4.6, 4.6.1, 4.6.2 Exercises : 4.1 Solved Examples : 4.9, 4.10, 4.11
	Measurement of flow rate : Venturimeter, pitot tube, orificemeter.		Art : 5.7, 5.8, 5.8.1 Exercises : 5.1, 5.11 to 5.15
		Total = 16	Solved Examples: 5.7, 5.8, 5.11, 5.12

Total = 42

The students should attempt solving the problems as indicated against each topic of the Recommended Books.

Reference:

Mechanical Science 2 (TMH WBUT Series), P.K.Nag, S.Pati & T.K.Jana,TMH

Fundamentals of Mechanical Sciences, Bhattacharya & Mukhopadhyay,Pearson Education.

ME 192   :   WORKSHOP PRACTICAL(First Semester)
Contacts   :   3P
Credits :   2
Assuming 12 weeks : 12 x 3 = 36 Periods

1. Carpentry (Wood Working)
Timber, Seasoning and Preservation, Plywood and Plyboards, Carpentry Tools, Engineering applications. Different Joints

2. Metal Joining

Definitions of welding, brazing and soldering processes, and their applications. Oxy-acetylene gas welding process, equipment and techniques. Types of flames and their applications. Manual metal arc welding technique and equipment.
AC and DC welding, electrodes, constituents and functions of electrodes. Welding positions. Types of weld joint. Common welding defects such as cracks, slag inclusion and porosity.

3. Bench work and Fitting

Tools for laying out, chisels, files, hammers, hand hacksaw, their specifications and uses.

4. Jobs to be made in the Workshop

Group A

T-Lap joints and Bridle joint   (Carpentry Shop)   12P

Group B

1a. Gas Welding practice on mild steel flat/sheet upto 3mm thick
1b. Lap joint by Gas Welding (upto 3mm thick)
1c. Manual Metal Arc Welding practice (upto 5mm thick)   15P
1d. Square butt joint by MMA Welding
1e. Lap joint by MMA Welding

Group C

Laying out (bench work); Sawing and Finishing by Filing.   9P

36P

 # Before practice, background lectures will be delivered on the topics. Tool specifications and their materials will be described. Brief reports on the work done will be submitted by the students and evaluation will be made on the basis of examination of the report and viva, conducted by the teachers.

Recommended Books
1. M.L. Begeman and B.H. Amstead, "Manufacturing Process" John Wiley, 1968
2. W.A.J. Chapman and E.Arnold, "Workshop Technology" Vol. 1, 2 & 3
3. B.S. Rghuwanshi, "Workshop Technology" Vol. 1 & 2 – Dhanpt Rai and Sons.
4. S.K.Hajra Choudhury, "Elements of Workshop Technology" Media Promoters of Publishers
5. Khanna, O.P. "Workshop Technology" Dhanpat Rai Publications
6. S.Crawford "Basic Engineering Processes" Hodder & Stoughton

ME 292   :   WORKSHOP PRACTICAL(Second Semester)
Contacts   :   3P
Credits :   2
Assuming 14 weeks : 14 x 3 = 42 Periods

1. Metal Cutting

Introduction to machining and common machining operations. Cutting tool materials, geometry of cutting tool, cutting fluid. Definition of machine tools, specification and block diagram of lathe, shaper, milling, drilling machine and grinder. Common lathe operations such as turning, facing and chamfering and parting. Difference between drilling and boring. Use of measuring instruments like micrometer / vernier caliper.

2. Tin Smithy – Surface development,
Shearing and Bending of sheets, Making simple products by Tin Smithy practice.

3. Brazing – Basic Process of Brazing

4. Jobs to be made in the Workshop

Group A

1) Jobs on lathe with turning, facing, chamfering and parting
   operations   15P
2) Job on shaper and milling machine for finishing two sides of a job   12P
3) Drilling of holes of size 5 and 12 mm diameters on the jobs /
   External threads making by dies, Tap size drill hole/ hand tapping
   operations   3P

Group B

Demonstration of brazing   3P

Group C
Tin Smithy - making simple products on sheet metal   9P

                                                                    42P

Before practice, background lectures will be delivered. Brief Reports on the work done will be submitted by the student. Evaluation will be done on the basis of reports and viva-voce examinations conducted by the teachers.

Recommended Books
1. M.L. Begeman and B.H. Amstead, "Manufacturing Process" John Wiley, 1968
2. W.A.J. Chapman and E.Arnold, "Workshop Technology" Vol. 1, 2 & 3
3. B.S. Rghuwanshi, "Workshop Technology" Vol. 1 & 2 – Dhanpt Rai and Sons.
4. S.K.Hajra Choudhury, "Elements of Workshop Technology" Media Promoters of Publishers
5. Khanna, O.P. "Workshop Technology" Dhanpat Rai Publications
6. S.Crawford "Basic Engineering Processes" Hodder & Stoughton

ME 101   :   Mechanical Sciences
Contact   :   3L + 1T = 4
Credit   :   4

Introduction to Statics: Fundamental idealization: Particle and Rigid body concept; Types of forces (collinear, concurrent, parallel, concentrated, distributed), Vector and scalar quantities, Transmissibility of a force (sliding vector); Lami's Theorem.

Introduction to Vector Algebra, Vector Operations, Parallelogram law, Free vector, Bound Vector; representation of Forces and Moments in terms of i,j,k; Cross product and Dot product and their applications.

Two and three dimensional force systems; Moment and Couple, Varignon's theorem, Resultants, Free body concept. Resolution of a coplanar force by its equivalent Force-couple system. Concept of Equilibrium in Two and Three dimensions. Equations of Equilibrium.

Concept of Friction; Laws of Coulomb friction, Angle of Repose.

Distributed Force: Centroid and Centre of Gravity, Moments of inertia of plane figures : M.I. of plane figures : MI of plane figure with respect to an axis in its plane; MI of plane figure with respect to an axis perpendicular to the plane of the figure, Parallel axis theorem; Mass moment of inertia of symmetrical bodies, e.g. cylinder, sphere, rod.

Principle of virtual work with simple application.

Concept of simple stresses and strains: Normal stress, Shear stress, Bearing stress, Normal strain, Shearing strain, Hooke's law, Poisson's ratio, Examples.

Stress and strains under axial loading stress-strain diagram of ductile materials, Working stress, Factor of safety, Proportional limit, Elastic Limit, Ultimate stress, Yielding, Modulus of elasticity, Definitions of malleability, ductility, toughness and resilience. Concept of thermal stress.

Introduction to Dynamics: Kinematics and Kinetics; Rectilinear motion of particles; determination of position velocity and acceleration – under uniform rectilinear motion (uniform and nonuniform accelerated rectilinear motion), Relative motion, construction of x-t, v-t and a-t graphs (simple problems).

Plane curvilinear motion of particles: Rectangular components (Projectile motion), Normal and Tangential components, Radial and Transverse components, simple problems.

Plane kinematics of Rigid bodies: Translation and Rotation.

Kinetics of particles : Rectilinear motion of particles; Plane kinetics of Rigid bodies : Rectilinear motion. Equation of motion, D.Alembert's principle.

Principle of work and energy applied to particle and rigid bodies, Principle of conservation of energy, Power and efficiency, simple examples.

Principle of Linear Impulse and Momentum .

Books Recommended

1. Engineering Mechanics [Vol-I & Vol-II] by Mariam & Kraige
2. Elements of Strength of Materials by Timo Shenko & Young
3. Strength of Materials by S. Ramamruthan
4. Mechanics for Engineering by Beer, F.P. and Johnston
5. Mechanics of Engineers (Statics) by Ferdinand P.Beer & E. Russel Johnston Jr.
6. Mechanics of Engineers (Dynamics) by Ferdinand P.Beer & E. Russel Johnston Jr.
7. Mechanics for Materials by Ferdinand P.Beer & E. Russel Johnston Jr.
8. Engineering Mechanics by Irvin L. Shames
9. Engineering Mechanics by Timo Shenko & Young

ME 201   :   Mechanical Sciences
Contact   :   3L
Credit   :   3

A. THERMODYNAMICS

Introduction to Thermodynamics, Concepts of systems, control volume, state, properties, equilibrium, quasi-static process, reversible & irreversible process, cycles.

Zeroeth Law and Temperature, Ideal Gas.

Heat and Work.

Real gases, Equations of State, Processes of Ideal Gases. Law of Corresponding States.

1st Law of Thermodynamics for closed & open systems. Non Flow Energy Equation. Steady State, Steady Flow Energy Equation.

2nd Law of Thermodynamics – Statements, Equivalence of two statements, Definition of Heat Engines, Heat pumps, Refrigerators.

Carnot Cycle; Carnot efficiency, Concept of absolute temperature, Thermodynamic scale of temperature.

Clausius inequality, Entropy and irreversibility.

Properties of Pure Substances – Use of Steam Tables and Mollier Charts.

Air Standard cycles – Otto and Diesel cycle and their efficiencies.

Steam Power Cycle – Rakine cycle, p-v & T-S plots, Rankine efficiency.

Vapur compression refrigeration cycle.

B. FLUID MECHANICS

Properties & Classification of Fluids – ideal & real fluids, Newton's law of viscosity, Newtonian and non-Newtonian fluids, Compressible and Incompressible fluids.

Fluid Statics : Pressure at a point, Pascal's law.

Measurement of Pressure : Use of manometers : U-tube, inclined tube, micro-manometers.

Fluid Kinematics : Steady and unsteady flow. Uniform & non-uniform flow. Stream line, path line, streak line. Continuity equation.

Dynamics of ideal fluids : Bernoulli's equation, total head, velocity head, pressure head. Application of Bernoulli's equation.

Measurement of flow rate : Venturimeter, pitot tube, orificemeter.

Books Recommended

1. Engineering Thermodynamics by P K Nag.
2. Thermodynamics by C P Arora.
3. Fundamentals of Classical Thermodynamics by G J Van Wyle and R E Santag
4. Introduction to Fluid Mechanics and Fluid Machines by S.K.Som and G.Biswas.
5. Fluid Mechanics by V L Streeter and E B Wylie.
6. Fluid Mechanics and Hydraulic Machines by R K Bansal.
7. Fluid Mechanics by A.K.Jain.

ME 191   :   ENGINEERING GRAPHICS
Contacts   :   3P
Credits   :   2
Assuming 12 weeks : 12 x 3 = 36 Periods

	Periods [Inclusive Lecture]
1. LINES, LETTERING, DIMENSIONING, COPYING FIG.	6(1L)
2. SCALES	6(2L)
Plain scales, Diagonal scales, Comparative scales, Vernier scales	
3. GEOMETRICAL CONSTRUCTION AND CURVES	6(2L)
Dividing of lines and angles in equal sectors, Construction of polygons, Polygons inscribed in circles, Parabola, Hyparabola, Ellipse, Cycloid, Involute, Archemedian spiral	
4. PROJECTION OF POINTS, LINES, SURFACES	9(3L)
Orthographic Projection – First angle and third angle projection More no. of problems should be practiced in first angle projection. Projection of lines inclined to the planes	

Projection of surfaces
Pentagon, Hexagon

5. PROJECTION OF SOLIDS   9(2L)
Cube, Pyramid, Prism, Cylinder, Cone, Frustums

                                                36P

Home Assignments to be given to the student to supplement the sessional work. Students should attempt to solve the problems given in the question bank (Problem Sheet). Evaluation will be made on the basis of drawing sheets submitted and viva-voce examination conducted by the teacher.

Recommended Books

1. Narayana, K.L. and Kannaiah, P "Engineering Graphics" Tata Mcgraw Hill
2. Bhatt, N.D. "Elementary Engineering Drawing" Charotar book stall, Anand 1998
3. Lakshminaarayanan, V and Vaish Wanar, R.S. "Engineering Graphics" Jain Brothers, New Delhi
4. Chandra, A.M. and Chandra Satish, "Engineering Graphics" Narosa, 1998

ME 291   :   ENGINEERING GRAPHICS

Contacts   :   3P
Credits   :   2
Assuming 14 weeks : 14 x 3 = 42 Periods

                                                                Periods
                                                        [Inclusive of Lectures]

1. ISOMETRIC VIEW AND ISOMETRIC PROJECTION   6(2L)
(Prism, Pyramid, Cylinder, Cone and examples of simple solid
objects / models).

2. SECTIONAL VIEWS OF SOLIDS, TRUE SHAPE OF A SECTION   6(1L)
Home assignments will be given.

3. RIVET HEADS, RIVETED JOINTS   3(1L)
(Rivet heads, types, lap-joint, butt joint - single / double cover)

4. THREADS, NUT-BOLT   6(2L)
(BSW and Metric threads, hexagonal and square headed bolts/nuts.)

5. DEVELOPMENT OF SURFACES   3(1L)
(Cube, Prism, Cylinder, Truncated Cone)
Home assignment will be given to the student.

6. INTERPENETRATION OF SURFACES   6(2L)
(Intersecting cylinders, Intersection of Cone and cylinder,
Intersection of two prisms)

7. MACHINE PARTS   6P

8. COMPUTER AIDED DRAFTING   6(2L)

(AutoCAD)
Introduction : Cartesian and Polar Co-ordinate system, Absolute
And Relative Co-ordinates; Basic editing Commands : Line, Point,
Trace, Rectangle, Polygon, Circle, Arc, Ellipse, Polyline; Basic
editing Commands : Basic Object Selection Methods, Window and
Crossing Window, Erase, Move, Copy, Offset, Fillet, Chamfer, Trim,
Extend, Mirror ; Display Commands : Zoom, Pan, Redraw, Regenerate;
Simple dimensioning and text, Simple exercises.

                                                                42P

Sessional work should be completed in the class. Problems sheet will be provided.
Home assignments will be given. Evaluation will be made on the basis of sessional work and viva-voce
examination.

Recommended Books :

1. Engineering Graphics (TMH WBUT Series), Jolhe, TMH
2. Bhatt N.D. "Elementary Engineering Drawing", Anand'98
3. French and Vireck, "The Fundamental of Engineering Drawing and Graphic Technology", McGraw Hill, 4th Ed.,1978
4. 'IS:696 (1972) Code of Practice for General Engineering Drawing", ISI New Delhi
5. P.S. Gill, "A Text Book of Machine Drawing", Katson Publishing House
6. Giesecke, Mitchell, Spener, Hill and Dygon, "Technical Drawing", McMillan & Co., 7th Ed. 1980
7. George Omura, "Mastering AUTOCAD", B.P.B. Publication, New Delhi, 1994
8. Venugopal K. : Engineering Drawing & Graphics + Auto CAD, New Age International
9. Venugopal K. : Engineering Graphics, New Age International

ME 192   :   WORKSHOP PRACTICAL
Contacts   :   3P
Credits   :   2
Assuming 12 weeks : 12 x 3 = 36 Periods

1. Carpentry (Wood Working)
Timber, Seasoning and Preservation, Plywood and Plyboards, Carpentry Tools, Engineering applications.
Different Joints

2. Metal Joining
Definitions of welding, brazing and soldering processes, and their applications. Oxy-acetylene gas welding
process, equipment and techniques. Types of flames and their applications. Manual metal arc welding
technique and equipment.
AC and DC welding, electrodes, constituents and functions of electrodes. Welding positions. Types of weld
joint. Common welding defects such as cracks, slag inclusion and porosity.

3. Bench work and Fitting
Tools for laying out, chisels, files, hammers, hand hacksaw, their specifications and uses.

4. Jobs to be made in the Workshop

Group A

T-Lap joints and Bridle joint   (Carpentry Shop)   12P

Group B

1a. Gas Welding practice on mild steel flat/sheet upto 3mm thick
1b. Lap joint by Gas Welding (upto 3mm thick)
1c. Manual Metal Arc Welding practice (upto 5mm thick)   15P
1d. Square butt joint by MMA Welding
1e. Lap joint by MMA Welding

Group C

Laying out (bench work); Sawing and Finishing by Filing.   9P

36P

 # Before practice, background lectures will be delivered on the topics. Tool specifications and their materials will be described. Brief reports on the work done will be submitted by the students and evaluation will be made on the basis of examination of the report and viva, conducted by the teachers.

Recommended Books
6. M.L. Begeman and B.H. Amstead, "Manufacturing Process" John Wiley, 1968
7. W.A.J. Chapman and E.Arnold, "Workshop Technology" Vol. 1, 2 & 3
8. B.S. Rghuwanshi, "Workshop Technology" Vol. 1 & 2 – Dhanpt Rai and Sons.
9. S.K.Hajra Choudhury, "Elements of Workshop Technology" Media Promoters of Publishers
10. Khanna, O.P. "Workshop Technology" Dhanpat Rai Publications
6. S.Crawford "Basic Engineering Processes" Hodder & Stoughton

ME 292   :   WORKSHOP PRACTICAL
Contacts   :   3P
Credits   :   2
Assuming 14 weeks : 14 x 3 = 42 Periods

1. Metal Cutting

Introduction to machining and common machining operations. Cutting tool materials, geometry of cutting tool, cutting fluid. Definition of machine tools, specification and block diagram of lathe, shaper, milling, drilling machine and grinder. Common lathe operations such as turning, facing and chamfering and parting. Difference between drilling and boring. Use of measuring instruments like micrometer / vernier caliper.

2. Tin Smithy – Surface development,
Shearing and Bending of sheets, Making simple products by Tin Smithy practice.

3. Brazing – Basic Process of Brazing

West Bengal University of Technology
BF-142, Salt Lake City, Kolkata-700064
Syllabus of First Year B.E/B.Tech
(ME,CE,BT,FT,CHE,PE,IT,CSE,BME,Marine,LT,TT,Ceramic,AUE)from 2007

4. Jobs to be made in the Workshop

Group A

1) Jobs on lathe with turning, facing, chamfering and parting
   operations   15P
2) Job on shaper and milling machine for finishing two sides of a job   12P
3) Drilling of holes of size 5 and 12 mm diameters on the jobs /
   External threads making by dies, Tap size drill hole/ hand tapping
   operations   3P

Group B

Demonstration of brazing   3P

Group C

Tin Smithy - making simple products on sheet metal   9P

                                                                          42P

Before practice, background lectures will be delivered. Brief Reports on the work done will be submitted by the student. Evaluation will be done on the basis of reports and viva-voce examinations conducted by the teachers.

Recommended Books
7. M.L. Begeman and B.H. Amstead, "Manufacturing Process" John Wiley, 1968
8. W.A.J. Chapman and E.Arnold, "Workshop Technology" Vol. 1, 2 & 3
9. B.S. Rghuwanshi, "Workshop Technology" Vol. 1 & 2 – Dhanpt Rai and Sons.
10. S.K.Hajra Choudhury, "Elements of Workshop Technology" Media Promoters of Publishers
11. Khanna, O.P. "Workshop Technology" Dhanpat Rai Publications
12. S.Crawford "Basic Engineering Processes" Hodder & Stoughton