

With effect from 02/08/2016

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**B.Tech COURSE STRUCTURE (2016-17)**  
(Common for EEE, ECE, CSE, EIE, BME, IT, ETE, ECM, ICE)

**I YEAR I SEMESTER**

S. No	Course Code	Course Title	L	T	P	Credits
1	MA101BS	Mathematics-I	3	1	0	3
2	CH102BS	Engineering Chemistry	4	0	0	4
3	PH103BS	Engineering Physics-I	3	0	0	3
4	EN104HS	Professional Communication in English	3	0	0	3
5	ME105ES	Engineering Mechanics	3	0	0	3
6	EE106ES	Basic Electrical and Electronics Engineering	4	0	0	4
7	EN107HS	English Language Communication Skills Lab	0	0	3	2
8	ME108ES	Engineering Workshop	0	0	3	2
9	*EA109MC	NSS	0	0	0	0
		<b>Total Credits</b>	<b>20</b>	<b>1</b>	<b>6</b>	<b>24</b>

**I YEAR II SEMESTER**

S. No	Course Code	Course Title	L	T	P	Credits
1	PH201BS	Engineering Physics-II	3	0	0	3
2	MA202BS	Mathematics-II	4	1	0	4
3	MA203BS	Mathematics-III	4	1	0	4
4	CS204ES	Computer Programming in C	3	0	0	3
5	ME205ES	Engineering Graphics	2	0	4	4
6	CH206BS	Engineering Chemistry Lab	0	0	3	2
7	PH207BS	Engineering Physics Lab	0	0	3	2
8	CS208ES	Computer Programming in C Lab	0	0	3	2
9	*EA209MC	NCC/NSO	0	0	0	0
		<b>Total Credits</b>	<b>16</b>	<b>2</b>	<b>13</b>	<b>24</b>

\* Mandatory Course.

**MATHEMATICS- I**  
**(Linear Algebra and Differential Equations )**

**B.Tech. I Year I Sem.**  
Course Code: MA101BS

**L T/P/D C**  
**3 1/0/0 3**

**Prerequisites:** Foundation course (No prerequisites).

**Course Objectives:**

To learn

- types of matrices and their properties
- the concept of rank of a matrix and applying the same to understand the consistency
- solving the linear systems
- the concepts of eigen values and eigen vectors and reducing the quadratic forms into their canonical forms
- partial differentiation, concept of total derivative
- finding maxima and minima of functions of two variables
- methods of solving the linear differential equations of first and higher order
- the applications of the differential equations
- formation of the partial differential equations and solving the first order equations.

**Course Outcomes:**

After learning the contents of this paper the student must be able to

- write the matrix representation of a set of linear equations and to analyze the solution of the system of equations
- find the Eigen values and Eigen vectors which come across under linear transformations
- find the extreme values of functions of two variables with/ without constraints.
- identify whether the given first order DE is exact or not
- solve higher order DE's and apply them for solving some real world problems

**UNIT-I**

**Initial Value Problems and Applications**

Exact differential equations - Reducible to exact.

Linear differential equations of higher order with constant coefficients: Non homogeneous terms with RHS term of the type  $e^{ax}$ ,  $\sin ax$ ,  $\cos ax$ , polynomials in  $x$ ,  $e^{ax}V(x)$ ,  $xV(x)$ - Operator form of the differential equation, finding particular integral using inverse operator, Wronskian of functions, method of variation of parameters.

Applications: Newton's law of cooling, law of natural growth and decay, Orthogonal trajectories, Electrical circuits.

**UNIT-II**

**Linear Systems of Equations**

Types of real matrices and complex matrices, rank, echelon form, normal form, consistency and solution of linear systems (homogeneous and Non-homogeneous) - Gauss elimination, Gauss Jordan and LU decomposition methods- Applications: Finding current in the electrical circuits.

### **UNIT-III**

#### **Eigen values, Eigen Vectors and Quadratic Forms**

Eigen values, Eigen vectors and their properties, Cayley - Hamilton theorem (without proof), Inverse and powers of a matrix using Cayley - Hamilton theorem, Diagonalization, Quadratic forms, Reduction of Quadratic forms into their canonical form, rank and nature of the Quadratic forms – Index and signature.

### **UNIT-IV**

#### **Partial Differentiation**

Introduction of partial differentiation, homogeneous function, Euler's theorem, total derivative, Chain rule, Taylor's and McLaurin's series expansion of functions of two variables, functional dependence, Jacobian.

Applications: maxima and minima of functions of two variables without constraints and Lagrange's method (with constraints)

### **UNIT-V**

#### **First Order Partial Differential Equations**

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions, Lagrange's method to solve the first order linear equations and the standard type methods to solve the non linear equations.

#### **Text Books:**

1. A first course in differential equations with modeling applications by Dennis G. Zill, Cengage Learning publishers.
2. Higher Engineering Mathematics by Dr. B. S. Grewal, Khanna Publishers.

#### **References:**

1. Advanced Engineering Mathematics by E. Kreyszig, John Wiley and Sons Publisher.
2. Engineering Mathematics by N. P. Bali, Lakshmi Publications.

## ENGINEERING CHEMISTRY

B.Tech. I Year I Sem.  
Course Code: CH102BS/CH202BS

L T/P/D C  
4 0/0/0 4

### Course Objectives:

- 1) To bring adaptability to new developments in Engineering Chemistry and to acquire the skills required to become a perfect engineer.
- 2) To include the importance of water in industrial usage, significance of corrosion control to protect the structures, polymers and their controlled usage.
- 3) To acquire knowledge of engineering materials and about fuels and batteries.
- 4) To acquire required knowledge about engineering materials like cement, refractories and composites.

### Course Outcomes:

Students will gain the basic knowledge of electrochemical procedures related to corrosion and its control. They can understand the basic properties of water and its usage in domestic and industrial purposes. They learn the use of fundamental principles to make predictions about the general properties of materials. They can predict potential applications of chemistry and practical utility in order to become good engineers and entrepreneurs.

### UNIT-I

**Water and its treatment:** Introduction – hardness of water – causes of hardness – types of hardness: temporary and permanent – expression and units of hardness – Estimation of hardness of water by complexometric method. Numerical problems. Potable water and its specifications- Steps involved in the treatment of potable water - Disinfection of potable water by chlorination and Ozonization. Defluoridation – Nalgonda technique - Determination of  $F^-$  ion by ion- selective electrode method.

#### Boiler troubles:

sludges, scales and Caustic embrittlement. Internal treatment of Boiler feed water – Calgon conditioning – Phosphate conditioning - Colloidal conditioning – Softening of water by ion-exchange processes. Desalination of water – Reverse osmosis. Numerical problems – Sewage water - Steps involved in treatment of sewage.

### UNIT-II

#### Electrochemistry and Batteries:

**Electrochemistry:** Electrode- electrode potential, standard electrode potential, types of electrodes – Construction and functioning of Standard hydrogen electrode, calomel and glass electrode. Nernst equation - electrochemical series and its applications. Electrochemical cells: Daniel cell – cell notation, cell reaction and cell emf – Concept of concentration cells – Electrolyte concentration cell – Numerical problems.

**Batteries:** Cell and battery - Primary battery (dry cell, alkaline cell and Lithium cell) and Secondary battery (lead acid, Ni-Cd and lithium ion cell),

**Fuel cells:** Hydrogen – oxygen and methanol-oxygen fuel cells – Applications.

### UNIT-III

**Polymers:** Definition – Classification of polymers with examples – Types of polymerization – addition (free radical addition) and condensation polymerization with examples.

**Plastics:** Definition and characteristics- thermoplastic and thermosetting plastics, compounding and fabrication of plastics (compression and injection moulding). Preparation, Properties and engineering applications of PVC and Bakelite.

**Fibers:** Characteristics of fibers – preparation, properties and applications of Nylon-6, 6 and Dacron. Fiber reinforced plastics (FRP) – Applications.

**Rubbers:** Natural rubber and its vulcanization - compounding of rubber.

**Elastomers:** Characteristics –preparation – properties and applications of Buna-S, Butyl and Thiokol rubber.

**Conducting polymers:** Characteristics and Classification with examples-mechanism of conduction in trans-polyacetylene and applications of conducting polymers.

**Biodegradable polymers:** Concept and advantages - Polylactic acid and poly vinyl alcohol and their applications.

### UNIT-IV

**Fuels and Combustion:** Classification- solid fuels: coal – analysis of coal – proximate and ultimate analysis and their significance. Liquid fuels – petroleum and its refining, cracking – types – moving bed catalytic cracking. Knocking – octane and cetane rating, synthetic petrol - Fischer-Tropsch's process; Gaseous fuels – composition and uses of natural gas, LPG and CNG.

**Combustion:** Definition, Calorific value of fuel – HCV, LCV; Calculation of air quantity required for combustion of a fuel.

### UNIT-V

#### **Cement, Refractories, Lubricants and Composites:**

**Cement:** Portland cement, its composition, setting and hardening of Portland cement.

**Special cements:** White cement, water proof cement, High alumina cement and Acid resistant cement.

**Refractories:** Classification, characteristics of good refractories, Refractoriness, refractoriness under load, porosity and chemical inertness – applications of refractories.

**Lubricants:** Classification of lubricants with examples-characteristics of a good lubricants - mechanism of lubrication (thick film, thin film and extreme pressure)- properties of lubricants: viscosity, cloud point, pour point, flash point and fire point.

**Composites:** Introduction- Constituents of composites – advantages, classification and constituents of composites. Applications of composites.

#### **Text books:**

- 1) Engineering Chemistry by P.C. Jain and M. Jain, Dhanpatrai Publishing Company, New Delhi (2010)
- 2) Engineering Chemistry by Rama Devi, Venkata Ramana Reddy and Rath, Cengage learning, New Delhi. (2016)

**Reference Books:**

- 1) Engineering Chemistry by Shikha Agarwal, Cambridge University Press, Delhi (2015)
- 2) Engineering Chemistry by Shashi Chawla, Dhanpatrai and Company (P) Ltd. Delhi (2011)
- 3) Engineering Chemistry by Thirumala Chary and Laxminarayana, Scitech Publishers, Chennai (2016).

## ENGINEERING PHYSICS/ENGINEERING PHYSICS - I

B.Tech. I Year I Sem.  
Course Code: PH103BS

L T/P/D C  
3 0/0/0 3

### Course Objectives:

- To understand interaction of light with matter through interference, diffraction and polarization.
- To able to distinguish ordinary light with a laser light and to realize propagation of light through optical fibers.
- To understand various crystal systems and there structures elaborately.
- To study various crystal imperfections and probing methods like X-RD.

**Course outcomes:** after completion of this course the student is able to

- Realize the importance of light phenomena in thin films and resolution.
- Learn principle, working of various laser systems and light propagation through optical fibers.
- Distinguish various crystal systems and understand atomic packing factor.
- Know the various defects in crystals.

### UNIT-I

**Interference:** Coherence, division of amplitude and division of wave front, interference in thin films (transmitted and reflected light), Newton's rings experiment.

**Diffraction:** Distinction between Fresnel and Fraunhofer diffraction, diffraction due to single slit, N-slits, Diffraction grating experiment.

### UNIT-II

**Polarization:** Introduction, Malus's law, double refraction, Nicol prism, Quarter wave and half wave plates.

**Lasers:** Characteristics of lasers, spontaneous and stimulated emission of radiation, Einstein coefficients, population inversion, ruby laser, helium – neon laser, semi conductor laser, applications of lasers

### UNIT-III

**Fiber Optics:** Principle of optical fiber, construction of fiber, acceptance angle and acceptance cone, numerical aperture, types of optical fibers: step index and graded index fibers, attenuation in optical fibers, applications of optical fibers in medicine and sensors.

### UNIT-IV

**Crystallography:** Space lattice, unit cell and lattice parameters, crystal systems, Bravais lattices, atomic radius, co-ordination number and packing factor of SC, BCC, FCC, HCP and diamond, Miller indices, crystal planes and directions, inter planar spacing of orthogonal crystal systems.

### UNIT-V

**X-ray Diffraction and Defects in Crystals:** Bragg's law, X-ray diffraction methods: Laue method, powder method; point defects: vacancies, substitutional, interstitial, Frenkel and

Schottky defects, line defects (qualitative) and Burger's vector, surface defects: stacking faults, twin, tilt and grain boundaries.

**Text Books:**

1. Physics Vol. 2, Halliday, Resnick and Kramer John wiley and Sons, Edition 4.
2. Modern Engineering Physics, K. Vijaya Kumar and S. Chandra Lingam, S. Chand and Co. Pvt. Ltd.
3. Introduction to Solid State Physics, Charles Kittel, Wiley Student edition.

**Reference Books:**

1. X-Ray Crystallography, Phillips, John Wiley publishers.
2. Waves, Frank S Crawford Jr, Berkeley Physics course, Volume 3.
3. Solid State Physics, AJ Dekker, MacMilan Publishers.
4. Introduction to Crystallography, Phillips, John Wiley publishers.



**PROFESSIONAL COMMUNICATION IN ENGLISH**

**B.Tech. I Year I Sem.**  
**Course Code: EN104HS/EN204HS**

**L T/P/D C**  
**3 0/0/0 3**

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## ENGINEERING MECHANICS

**B.Tech. I Year I Sem.**  
Course Code: ME105ES

**L T/P/D C**  
**3 0/0/0 3**

**Pre Requisites:** None

### **Course Objectives:**

- To understand the resolving forces and moments for a given force system
- To analyze the types of friction for moving bodies and problems related to friction.
- To determine the centroid and second moment of area

### **UNIT-I**

**Introduction to Mechanics:** Basic Concepts, system of Forces Coplanar Concurrent Forces - Components in Space Resultant -Moment of Forces and its Application - Couples and Resultant of Force Systems. Equilibrium of system of Forces: Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems.

### **UNIT-II**

**Friction:** Types of friction -Limiting friction -Laws of Friction -static and Dynamic Frictions - Motion of Bodies –Wedge Screw, Screw-jack and differential screw –jack.

### **UNIT-III**

**Centroid and Center of Gravity:** Introduction – Centroids of lines – Centroids of area - Centroids of Composite figures - Theorem of Pappus -Centre of Gravity of Bodies – Centroids of Volumes – Center of gravity of composite bodies.

**Area moments of Inertia:** Introduction – Definition of Moment of Inertia -Polar Moment of Inertia – Radius of gyration. Transfer Theorem for moment of inertia – Moments of inertia by integration - Moments of Inertia of Composite Figures, Product of Inertia, Transfer Formula for Product of Inertia.

### **UNIT-IV**

**Mass Moment of Inertia:** Introduction - Moment of Inertia of Masses – Radius of gyration - Transfer Formula for Mass Moments of Inertia – Mass moments of inertia by integration - Mass moment of inertia of composite bodies.

**Virtual Work:** Theory of virtual work-Application.

### **UNIT-V**

**Kinetics:** Kinetics of a particle-D'Alemberts principle-Motion in a curved path – work, energy and power. Principle of conservation of energy- Kinetics of rigid body in translation, rotation-work done-Principle of work-energy-Impulse-momentum.

**Mechanical Vibrations:** Definitions, Concepts-Simple Harmonic motion- free vibrations-Simple and compound pendulums

### **Text Books:**

1. Singer's Engineering Mechanics Statics and Dynamics/ K. Vijaya Kumar Reddy, J. Suresh Kumar/ BSP
2. Engineering Mechanics/ Irving Shames, G. Krishna Mohan Rao / Prentice Hall

3. Foundations and applications of Engineering Mechanics by HD Ram and AK Chouhan, Cambridge publications.

**References:**

1. A Text of Engineering Mechanics /YVD Rao/ K. Govinda Rajulu/ M. Manzoor Hussain / Academic Publishing Company
2. Engineering Mechanics / Bhattacharyya/ Oxford.

## BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

B.Tech. I Year I Sem.

Course Code: EE106ES/EE205ES:

L T/P/D C  
4 0/0/0 4

Pre-requisite: None

**Objectives:** Objectives of this course are

- To introduce the concept of electrical circuits and its components
- To introduce the concepts of diodes and transistors, and
- To impart the knowledge of various configurations, characteristics and applications.

**OUTCOMES:** After this course, the student will be able

- To analyze and solve problems of electrical circuits using network laws and theorems.
- To identify and characterize diodes and various types of transistors.

### UNIT- I

**Electrical Circuits:** R-L-C Parameters, Voltage and Current, Independent and Dependent Sources, Source Transformation – V-I relationship for passive elements, Kirchoff's Laws, Network reduction techniques – series, parallel, series-parallel, star-to-delta, delta-to-star transformation, Nodal Analysis,

**Single Phase AC Circuits:** R.M.S. and Average values, Form Factor, steady state analysis of series, parallel and series-parallel combinations of R, L and C with sinusoidal excitation, concept of reactance, impedance, susceptance and admittance – phase and phase difference, Concept of power factor, j-notation, complex and polar forms of representation.

### UNIT-II

**Resonance:** Series resonance and Parallel resonance circuits, concept of bandwidth and Q factor, Locus Diagrams for RL, RC and RLC Combinations for Various Parameters.

**Network Theorems:** Thevenin's, Norton's, Maximum Power Transfer, Superposition, Reciprocity, Tellegen's, Millman's and Compensation theorems for DC and AC excitations.

### UNIT- III

**P-N Junction Diode:** Diode equation, Energy Band diagram, Volt-Ampere characteristics, Temperature dependence, Ideal versus practical, Static and dynamic resistances, Equivalent circuit, Load line analysis, Diffusion and Transition Capacitances.

**Rectifiers and Filters:** P-N junction as a rectifier - Half Wave Rectifier, Ripple Factor - Full Wave Rectifier, Bridge Rectifier, Harmonic components in Rectifier Circuits, Filters – Inductor Filters, Capacitor Filters, L- section Filters,  $\pi$ - section Filters.

### UNIT- IV

**Bipolar Junction Transistor (BJT):** Construction, Principle of Operation, Symbol, Amplifying Action, Common Emitter, Common Base and Common Collector configurations.

Transistor Biasing And Stabilization - Operating point, DC and AC load lines, Biasing - Fixed Bias, Emitter Feedback Bias, Collector to Emitter feedback bias, Voltage divider bias, Bias

stability, Stabilization against variations in  $V_{BE}$  and  $\beta$ , Bias Compensation using Diodes and Transistors.

**Transistor Configurations:** BJT modeling, Hybrid model, Determination of h-parameters from transistor characteristics, Analysis of CE, CB and CC configurations using h-parameters, Comparison of CE, CB and CC configurations.

#### UNIT- V

**Junction Field Effect Transistor:** Construction, Principle of Operation, Symbol, Pinch-Off Voltage, Volt-Ampere Characteristic, Comparison of BJT and FET, Small Signal Model, Biasing FET.

**Special Purpose Devices:** Breakdown Mechanisms in Semi-Conductor Diodes, Zener diode characteristics, Use of Zener diode as simple regulator, Principle of operation and Characteristics of Tunnel Diode (With help of Energy band diagram) and Varactor Diode, Principle of Operation of SCR.

#### Text books:

- 1) Basic Electrical and electronics Engineering –M S Sukija TK Nagasarkar Oxford University
- 2) Basic Electrical and electronics Engineering-D P Kothari. I J Nagarath Mc Graw Hill Education

#### References:

- 1) Electronic Devices and Circuits – R.L. Boylestad and Louis Nashelsky, PEI/PHI, 9<sup>th</sup> Ed, 2006.
- 2) Millman's Electronic Devices and Circuits – J. Millman and C. C. Halkias, Satyabratajit, TMH, 2/e, 1998.
- 3) Engineering circuit analysis- by William Hayt and Jack E. Kemmerly, Mc Graw Hill Company, 6<sup>th</sup> edition.
- 4) Linear circuit analysis (time domain phasor and Laplace transform approaches)- 2<sup>nd</sup> edition by Raymond A. DeCarlo and Pen-Min-Lin, Oxford University Press-2004.
- 5) Network Theory by N. C. Jagan and C. Lakshminarayana, B.S. Publications.
- 6) Network Theory by Sudhakar, Shyam Mohan Palli, TMH.

**ENGLISH LANGUAGE COMMUNICATION SKILLS (ELCS) LAB**

**B.Tech. I Year I Sem.**

Course Code: EN107HS/EN207HS

**L T/P/D C**

**0 0/3/0 2**

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## ENGINEERING WORKSHOP

**B.Tech. I Year I Sem.**  
Course Code: ME108ES/ME208ES

**L T/P/D C**  
**0 0/3/0 2**

**Pre-requisites:** Practical skill

### **Course Objective:**

- To Study of different hand operated power tools, uses and their demonstration.
- To gain a good basic working knowledge required for the production of various engineering products.
- To provide hands on experience about use of different engineering materials, tools, equipments and processes those are common in the engineering field.
- To develop a right attitude, team working, precision and safety at work place.
- It explains the construction, function, use and application of different working tools, equipment and machines.
- To study commonly used carpentry joints.
- To have practical exposure to various welding and joining processes.
- Identify and use marking out tools, hand tools, measuring equipment and to work to prescribed tolerances.

**Course Outcomes:** At the end of the course, the student will be able to:

- Study and practice on machine tools and their operations
- Practice on manufacturing of components using workshop trades including plumbing, fitting, carpentry, foundry, house wiring and welding.
- Identify and apply suitable tools for different trades of Engineering processes including drilling, material removing, measuring, chiseling.
- Apply basic electrical engineering knowledge for house wiring practice.

### **1. TRADES FOR EXERCISES:**

**At least two exercises from each trade:**

- 1) Carpentry
- 2) Fitting
- 3) Tin-Smithy and Development of jobs carried out and soldering.
- 4) Black Smithy
- 5) House-wiring
- 6) Foundry
- 7) Welding
- 8) Power tools in construction, wood working, electrical engineering and mechanical Engineering.

### **2. TRADES FOR DEMONSTRATION and EXPOSURE:**

- Plumbing, Machine Shop, Metal Cutting (Water Plasma)

### **Text books:**

- 1) Workshop Practice /B. L. Juneja / Cengage
- 2) Workshop Manual / K.Venugopal / Anuradha.

### **Reference books:**

- 1) Work shop Manual - P.Kannaiah/ K.L.Narayana/ Scitech
- 2) Workshop Manual / Venkat Reddy/ BSP

