INSTITUTE OF ENGINEERING & TECHNOLOGY

(Dr. Bhimrao Ambedkar University, Agra (Formerly- Agra University, Agra)

(B++ Grade, NAAC Accredited; AICTE Approved Institution)

Minutes of the meeting of Academic Committee held on 17.06.2019 at the Institute of Engineering & Technology, Agra

The following members of the Academic Committee for Department of Mechanical Engineering & Civil Engineering were present as per approval of the Hon'ble Vice-Chancellor dated 12.06.2019.

The members of Academic Committee are as follows:

1.	Prof. Sunder Lal	Subject Expert, Mathematics (EX - Vice Chancellor)
2.	Prof. Jai Prakash	Academic Mentor, NPIU, New Delhi
3.	Prof. D. Singhal	Subject Expert, Civil Engineering (DCRUST, Murthal)
4.	Prof. Suresh Verma	Subject Expert, Mechanical Engineering (DCRUST, Murthal)
5.	Prof. P.K. Tripathi	Subject Expert, Civil Engineering (HBTU, Kanpur)
6.	Prof. P.N. Asthana	Subject Expert, Management
7.	Dr. M.K. Upadhyay	Head, Deptt. of Mechanical Engineering
8.	Prof. D.K. Singh	Dean (Academics)
9.	Dr. V.K. Saraswat	Director/Convener

The committee has taken the following decisions unanimously:

1. The minutes of the previous Academic Committee held on 15.09.2018 were confirmed without any change.
2. The members of the Academic Committee (Subject Experts) approved the CBCS (Choice Based Credit System) as per AICTE Model Curriculum for the II, III & IV Year Bachelor of Engineering Degree Programme in All Branch running in the Institute w.e.f. Academic Year 2019-20.
3. The revised Syllabi to be effective from Academic Year 2019-20 of all the subjects for the I & II Year and Scheme for I, II, III & IV Year for B.E. (Mechanical Engineering & Civil Engineering) Degree Programme as per new curriculum were reviewed and approved after incorporating necessary changes.

Prof. P.N. Asthana
Subject Expert, Management

Prof. Sunder Lal
Subject Expert, Mathematics
(EX - Vice Chancellor)

Prof. D. Singhal
Expert, Civil Engineering
(DCRUST, Murthal) 17/6/19

17/6/19
Prof. Suresh Verma
Subject Expert, Mechanical Engineering
(DCRUST, Murthal)

Prof. P.K. Tripathi
Subject Expert, Civil Engineering
(HBTU, Kanpur)

17/6/19
Dr. M.K. Upadhyay
Head, Deptt. of
Mechanical Engineering, IET

Prof. Jai Prakash 17/6/19
Academic Mentor, TEQIP III
NPIU, New Delhi

17.06.2019
Prof. D.K. Singh
Dean (Academics)

Dr. V.K. Saraswat 6.2019
Director/Convener

Signature Not Verified
RAJEEV KUMAR
Digitally Signed By Registrar

Institute of Engineering & Technology
Dr. Bhimrao Ambedkar University
Khandari Campus, Agra

B.E I Year (Semester-I) CE/ME (Group - B)
Course Structure & Evaluation Scheme

S No.	Code	Subject	Periods			Sessional Marks			End Semester Marks			Credit
			L	T	P	CT	TA	Total	TE	PE	Total	
1	BSC - 103	Mathematics-I	3	1	0	30	10	40	60	-	100	4
2	BSC - 102	Chemistry	3	1	0	30	10	40	60	-	100	4
3	BHSM - 101	Professional English	2	0	0	30	10	40	60	-	100	2
4	BME - 102	Workshop Concepts	2	0	0	30	10	40	60	-	100	2
5	BME - 101	Fundamentals of Electrical Engineering	3	1	0	30	10	40	60	-	100	4
6	BSC - 152	Chemistry Lab	0	0	2	20	20	40	-	60	100	1
7	BHSM - 151	Professional English Lab	0	0	2	20	20	40	-	60	100	1
8	BME - 152	Workshop Concepts Lab	0	0	2	20	20	40	-	60	100	1
9	BME - 151	Fundamentals of Electrical Engineering Lab	0	0	2	20	20	40	-	60	100	1
		Total	13	3	8	230	130	360	300	240	900	20

Group B : CE & ME.

Dean (Academics) Director

Institute of Engineering & Technology

Dr. Bhimrao Ambedkar University

Khandari Campus, Agra

B.E I Year (Semester-II) CE/ME (Group - B)

Course Structure & Evaluation Scheme

S No.	Code	Subject	Periods			Sessional Marks			End Semester Marks			Credit
			L	T	P	CT	TA	Total	TE	PE	Total	
1	BSC - 203	Mathematics-II	3	1	0	30	10	40	60	-	100	4
2	BSC - 201	Physics	3	1	0	30	10	40	60	-	100	4
3	BCS - 201	Problem Solving and Computer Programming using "C"	3	1	0	30	10	40	60	-	100	4
4	BME - 201	Engineering Graphics and Design	2	0	0	30	10	40	60	-	100	2
5	BME - 203	Elements of Mechanical Engineering	2	0	0	30	10	40	60	-	100	2
6	BSC - 251	Physics Lab	0	0	2	20	20	40	-	60	100	1
7	BCS - 251	Problem Solving and Computer Programming using "C" Lab	0	0	2	20	20	40	-	60	100	1
8	BME - 251	Engineering Graphics and Design Lab	0	0	2	20	20	40	-	60	100	1
9	BEE - 253	Elements of Mechanical Engineering Lab	0	0	2	20	20	40	-	60	100	1
		Total	13	3	8	230	130	360	300	240	900	20

Group B : CE & ME.

Dean (Academics)

Director

Institute of Engineering & Technology
Dr. Bhimrao Ambedkar University
Khandari Campus, Agra

B.E I Year (Semester-I) CSE, ECE & EE (Group - A)
Course Structure & Evaluation Scheme

(Effective from academic year 2019-20)

S No.	Code	Subject	Periods			Sessional Marks			End Semester Marks			Credit
			L	T	P	CT	TA	Total	TE	PE	Total	
1	BSC - 103	Mathematics-I	3	1	0	30	10	40	60	-	100	4
2	BSC - 101	Physics	3	1	0	30	10	40	60	-	100	4
3	BCS - 101	Problem Solving and Computer Programming using "C"	3	1	0	30	10	40	60	-	100	4
4	BME - 101	Engineering Graphics and Design	2	0	0	30	10	40	60	-	100	2
5	BEE - 101	Basic Electronics Engineering	2	0	0	30	10	40	60	-	100	2
6	BSC - 151	Physics Lab	0	0	2	20	20	40	-	60	100	1
7	BCS - 151	Problem Solving and Computer Programming using "C" Lab	0	0	2	20	20	40	-	60	100	1
8	BME - 151	Engineering Graphics and Design Lab	0	0	2	20	20	40	-	60	100	1
9	BEE - 151	Basic Electronics Engineering Lab	0	0	2	20	20	40	-	60	100	1
		Total	13	3	8	230	130	360	300	240	900	20

Group A : CSE, ECE & EE.

Dean (Academics) Director

Institute of Engineering & Technology

Dr. Bhimrao Ambedkar University

Khandari Campus, Agra

B.E I Year (Semester-II) CSE, ECE & EE (Group - A)

Course Structure & Evaluation Scheme

S No.	Code	Subject	Periods			Sessional Marks			End Semester Marks			Credit
			L	T	P	CT	TA	Total	TE	PE	Total	
1	BSC - 203	Mathematics-II	3	1	0	30	10	40	60	-	100	4
2	BSC - 202	Chemistry	3	1	0	30	10	40	60	-	100	4
3	BHSM - 201	Professional English	2	0	0	30	10	40	60	-	100	2
4	BME - 202	Workshop Concepts	2	0	0	30	10	40	60	-	100	2
5	BEC - 201	Fundamentals of Electrical Engineering	3	1	0	30	10	40	60	-	100	4
6	BSC - 252	Chemistry Lab	0	0	2	20	20	40	-	60	100	1
7	BHSM - 251	Professional English Lab	0	0	2	20	20	40	-	60	100	1
8	BME - 252	Workshop Concepts Lab	0	0	2	20	20	40	-	60	100	1
9	BEC - 251	Fundamentals of Electrical Engineering Lab	0	0	2	20	20	40	-	60	100	1
		Total	13	3	8	230	130	360	300	240	900	20

Group A : CSE, ECE & EE.

Dean (Academics)

Director

BSC 101 – Physics (CSE/ECE/EE)

Subject Code	BSC 101					
Category	Basic Science Course					
Subject Name	Physics					
Branches	CSE/ECE/EE					
Scheme and Credits	L-T-P	Theory Marks	Sessional		Total	Credit
			Test	Assign/Att.		
	3-1-0	60	30	10	100	4
Pre- requisites (if any)	Knowledge of Intermediate Mathematics of UP Board or equivalent Board.					

Course Objectives:

- To introduce the modern perspectives of space time geometry and the foundation of general relativity
- To provide students with knowledge and proof of the validity of physical laws and nonexistence of the hypothetical stationary ether and significance of Michelson-Morley Experiment
- To introduce the physics of electricity, magnetism electromagnetism and electromagnetic waves
- To give a coherent introduction to the development of modern physical optics with particular attention to the wave properties of light and its applications and to introduced concept of polarization
- To extend the knowledge and experience of the students in the specialized area of Laser, Holography and Optical fibers
- To give student an opportunity to pursue his/her special interest in this area through individual study and presentation of his/her work.

Course Content:

Unit I Relativistic Mechanics:

Frame of reference. Inertial & non inertial frames, Michelson Morley experiment, Postulates of special theory of relativity, Lorentz transformations, Length contraction. Time dilation, Velocity addition theorem, Variation of mass with velocity, Einstein's mass energy relation.

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Unit II Electromagnetic Field Theory:

Continuity equation for current density, Displacement current, Maxwell's equations and their physical significance, Maxwell's equations in free space, conducting and non-conducting medium, Poynting vector and Poynting theorem.

Unit-III Quantum Mechanics:

Wave particle duality, Matter waves, Heisenberg uncertainty principle and its applications Time-dependent and time-independent Schrodinger wave equation. Born interpretation of wave function. Solution to stationary state Schrodinger wave equation for one dimentional particle in a box and three dimensional.

Unit-IV Wave Optics:

Coherent sources. Interference in thin films, Newton's Rings and its applications, diffraction, Fraunhoffer diffraction, Fraunhoffer diffraction at single slit, Diffraction grating, Dispersive power, Resolving power and Rayleigh's criterion of resolution, Resolving power of telescope, Polarization, Double Refraction, Nicol Prism, Optical Activity.

Unit-V Fiber Optics & Laser:

Fiber Optics: Introduction to fiber optics, Acceptance angle. Numerical aperture, Classification of fibers, applications of Optical fiber, Laser: Absorption of radiation, Spontaneous and stimulated emission of radiation, Population inversion, Laser applications, Basic principle of Holography.

Reference Books:

1. Concepts of Modem Physics - Aurthur Beiser (McGraw Hill)
2. Introduction to Special Theory of Relaiivity. Robert Resnick (Wiley)
3. Optics - Brijlal & Subramanian (S. Chand)
4. Engineering Physics: Theory and Practical- Katiyar and Pandey (Wiley India)
5. Applied Physics for Engineers- Necraj Mehra (PI II Learning, New Delhi)

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Course Outcome:

	Course Outcome (CO)	Bloom's Knowledge Level
At the end of this course, the students should be able to:		
CO 1	Establish the null results of michelson-morley experiment with interferometer of newtonian mechanics and lorentz transformation equations.	K1
CO 2	Explain time dilation, length contraction and also explain the true nature of newtonian mechanics and lorentz transformation equations	K2
CO 3	Understand the concept of constant relative motion of different bodies indifferent frames of reference	K3
CO 4	Explain and calculate the properties of waves including propagation, reflection, refraction, polarization, interference and diffraction by using the theory of waves.	K3
CO 5	The students will have sound knowledge of Maxwell's equations and the nature of electromagnetic waves and how this relates to everyday phenomenon.	
CO 6	On successful completion of this course, students will also be able to expound the basic physical principles applying to coherent light and its production with lasers.	
CO 7	Be able to relate the basic physical principle of holographic recording and reconstruction and able to make a hologram	
CO 8	Develop particular familiarity with some specialized aspect of lasers or holography, and be able to communicate this information to peers.	
CO 9	Be able to describe about optical fiber and its basic principle of propagation of light through it and also discuss its applications in different areas.	

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze,K5 – Evaluate, K6 – Create

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BSC 151/BSC 251 – Physics Lab

Subject Code	BSC 151 / BSC 251					
Category	Basic Science Course					
Subject Name	Physics Lab					
Branches	All Branches					
Scheme and Credits	L-T-P	External Practical	Sessional		Total	Credit
			Test	Record &Att.		
	0-0-2	30	15	05	50	1
Pre- requisites (if any)	Knowledge of Intermediate Mathematics of UP Board or equivalent Board.					

List of Experiments:

Experiment No.	Name of Experiment
1.	To find the wavelength of sodium light by Newton's ring experiment.
2.	To find the wavelength of sodium light by Fresnel's Biprism experiment
3.	To find the wavelength of various colors of white light with the help of a Plane Transmission Grating
4.	To find the refractive index and angle of prism by using Spectrometer.
5.	To determine the specific rotation of a cane sugar solution using a Polarimeter
6.	To verify Stefan's law by electrical method
7.	The measurement of wavelength of LASER (He-Ne) light using single slit diffraction
8.	The measurement of fiber attenuation and aperture of optical fiber.
9.	To determine the energy band gap of a given semiconductor diode
10.	To draw the I-V characteristics curve of a P-N junction diode.
11.	To determine the specific resistance of a given wire using Carey Foster's Bridge.
12.	To determine the moment of inertia of a flywheel.
13.	To determine the moment of inertia of an irregular body by using the inertia table.
14.	To draw hysteresis curve of a given sample of ferromagnetic material and from this – to determine magnetic susceptibility and permeability of the given specimen.

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15.	To find the frequency of A.C. mains using Sonometer
16.	To determine the ballistic constant of a ballistic galvanometer
17.	To study the Hall effect and determine the Hall coefficient, carrier density and mobility of a given semiconductor using Hall effect set up.
18.	To determine the value of "g" by Kater's reversible pendulum.
19.	To study the elastic forces and verify the Hook's law and also determine the spring constant.
20.	To determine the value of "g" by using the Bar pendulum.

Course Outcome:

On successful completion of this course, students should be able to

	Course Outcome (CO)	Bloom's Knowledge Level (KL)
CO 1	Analyze the physical principle involved in the various instrument	K1
CO 2	Do the various experiments in the areas of optics	K2
CO 3	Do the various experiments with semiconductor devices like P-N junction Diode	K3
CO 4	Do the various experiments in magnetism and magnetic materials	K3

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

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BSC 201 – Physics (CE/ME)

Subject Code	BSC 201					
Category	Basic Science Course					
Subject Name	Physics					
Branches	CE/ME					
Scheme and Credits	L-T-P	Theory Marks	Sessional		Total	Credit
			Test	Assig/Att.		
	3-1-0	60	30	10	100	4
Pre- requisites (if any)	Knowledge of Intermediate Mathematics of UP Board or equivalent Board.					

Course Objectives:

- To have basic understanding of vector mechanics.
- To introduce Newton's laws of motion, conservation of energy and linear momentum to solve advanced problems involving the dynamic motion of classical mechanics.
- To impart knowledge on rigid body mechanics.
- To widen the understanding about harmonic motion.
- To introduce the modern perspectives of space time geometry and the foundation of general relativity.
- To familiarize Maxwell's equations and their significance.

Course Content:

Unit I Vector mechanics of particles

Scalars, vectors, vector differentiation, gradient, divergence and curl, vector integration, Gauss Divergence theorem, Stokes theorem

Unit —II Mechanics of particles

Newton's laws and their applications, conservative and non-conservative forces, central force, work energy theorem, conservation of energy and linear momentum, collision, variable mass system (rocket), friction: limiting and non-limiting cases.

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Unit III Rigid body motion

Definition and motion of a rigid body, translational and rotational motion, angular momentum about a point of rigid body, moment of inertia, theorems on moment of inertia, periodic motion, simple harmonic motion and harmonic oscillator, forced, Damped oscillation.

Unit— IV Relativistic mechanics

Frame of reference, inertial and non-inertial frames, Michelson Morley experiment, postulates of special theory of relativity, Lorentz transformations, length contraction, time dilation, velocity addition theorem, variation of mass with velocity, Einstein's mass energy relation.

Unit—V Electromagnetic field theory

Continuity equation for current density, displacement current, Maxwell's equations and their physical significance, Maxwell's equations in vacuum and in non-conducting medium, Poynting vector and Poynting theorem.

Reference Books:

1. J.C. Upadhyaya, mechanics, Ram Prasad and sons.
2. Concept of modern physics, Aurthur Beiser,Mc Graw Hill.
3. Engineering physics : theory and practical, Katiyar and Pandey, wiley India.
4. Introduction to special theory of relativity, Robert Resnick , Wiley.
5. David Griffiths, introduction to electrodynamics, Pearson Publisher.

Course Outcomes:

	Course Outcome (CO)	Bloom's Knowledge Level
At the end of this course, Students will be familiar with:		
CO 1	Vector Algebra.	K1
CO 2	Newton's laws	K2
CO 3	Rigid body and its mechanism	K3
CO 4	Theory of relativity and frame of references	K3
CO 5	Success to analyze the different forms of Maxwell's equations in different mediums	

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

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BSC 102/BSC 202 – Chemistry

Subject Code	BSC 102 / BSC 202					
Category	Basic Science Course					
Subject Name	Chemistry					
Scheme and Credits	L-T-P	Theory Marks	Sessional		Total	Credit
			Test	Assig/Att.		
	3-1-0	60	30	10	100	4
Pre- requisites (if any)	Knowledge of Intermediate Mathematics of UP Board or equivalent Board.					

Course Objective:

1. To give students deep knowledge about atomic and molecular structure.
2. To enable engineering students to identify different chemical compounds using spectroscopic techniques observed in different part of electromagnetic spectrum.
3. To familiarize students about the hardness of water, water softening techniques and phase rule.
4. To introduce engineering students about fundamentally relevant topics such as electrochemistry, corrosion and lubricants.
5. To introduce engineering students about polymeric materials, their synthesis and applications.

Unit	Content	Hours
Unit-1	**Atomic and molecular structure** Schrodinger Wave equation. Particle in a box solutions and their applications for conjugated molecules and nanoparticles. Molecular orbitals of diatomic Molecules. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on the band structure.	12

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Unit-2	Spectroscopic Techniques and applications: Selection rules, Basic principle of UV – Visible spectroscopy and its applications. Basic principle of IR spectroscopy and its applications for identification of organic compounds. Basic principle of NMR spectroscopy and application of ^1H NMR for identification of organic compounds. Problem based on UV-VIS, IR & NMR.	8
Unit-3	(i) Hard water and its treatment: Hardness of water and its units. Disadvantages of hard water in boilers (scale and sludge formation). Water softening methods: Lime-soda, Zeolite, Ion exchange resin and Reverse osmosis. Problems based on hardness of water. (ii) Phase Rule and its application to water system.	8
Unit-4	(i) Electrochemistry: Galvanic cell, electrode potential and lead storage battery, Fuel Cell and Concentration Cell. (ii) Corrosion: Type, mechanism and causes of corrosion, prevention methods. (iii) Lubricants: Classification, mechanism and applications.	
Unit-5	Polymers: Basic concepts of polymer-Blend and composites, Conducting and biodegradable polymers. Preparation and application of some industrially important polymers (Buna-S, Buna-N, Neoprene, Nylon-6, nylon-6, 6 and Terylene). General methods of synthesis of organometallic compounds (Grignard reagent) and their applications	6

Textbook

1. Chemistry for Engineers, by S. Vairam and Suba Ramesh; Wiley India

Reference Books

1. Textbook of Engineering Chemistry by Dr. Gopal Krishna Bhatt, Acme Publishers
2. Chemistry (9th ed), by Raymond Chang, Tata McGraw-Hill
3. Engineering Chemistry Author: Abhijit Mallick, Viva Books
4. Text Book of Engineering Chemistry by Harsh Malhotra; Sonali Publications India
5. Spectrometric identification of organic compounds, R.M. Silverstein, G.C. Bassler, T. C. Morrill, 4th edition.
6. A Text book of Engineering Chemistry by Shashi Chawala

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Course Outcome:

	Course Outcome (CO)	Bloom's Knowledge Level
At the end of this course, the students should be able to:		
CO 1	Understand the basic and applied chemistry and its place in society.	K1
CO 2	The students will be unable to understand the wave equations, molecular orbital theory, crystal field theory and band structure of solids.	K2
CO 3	The students will learn about the structural analysis of compounds using spectroscopic techniques.	K3
CO 4	The students will be aware about the problems created by hard water in industry and its remedy.	K4
CO 5	The students will be updated with electrochemistry, corrosion and lubricants.	K5
CO 6	The students will learn about synthesis and application of polymers.	K6

K1 – Knowledge K2 – Understanding, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – create

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Neeru 26/9/18

BSC 152 / BSC 252 Chemistry Lab

Subject Code	BSC 152 / BSC 252					
Category	Basic Science Course					
Subject Name	Chemistry Lab					
Branches	All Branches					
Scheme and Credits	L-T-P	External Practical	Sessional		Total	Credit
			Test	Record &Att.		
	0-0-2	30	15	05	50	1
Pre- requisites (if any)	Knowledge of Intermediate with Mathematics of UP Board or equivalent Board.					

LIST OF EXPERIMENTS (Any 10)

1. Determination of alkalinity in the given water sample.
2. Determination of temporary and permanent hardness in water sample using EDTA.
3. Determination of available chlorine in bleaching powder.
4. Determination of chloride content in water sample.
5. Determination of iron content in the given solution by Mohr's method.
6. pH- metric titration.
7. Determination of Viscosity of given liquid by Ostwald viscometer.
8. Spectrophotometric determination of iron (III) using potassium thiocynate.
9. Element detection and functional group identification in organic compounds.
10. Preparation of Bakelite and Urea formaldehyde resin.
11. Thin layer chromatography.
12. Saponification/acid value of oil.
13. Chemical oscillations-Iodine clock reaction.
14. Determination of partition coefficient of a substance between two immiscible liquids.
15. Adsorption of acetic acid by charcoal.

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Course Outcome:

	Course Outcome (CO)	Bloom's Knowledge Level (KL)
At the end of this course, the students should be able to:		
CO 1	The students will gain knowledge of measure molecular/system properties such as viscosity, hardness, chloride and iron content in water	K1
CO 2	Use of different analytical instruments	K2
CO3	Measure hardness of water.	K3
CO4	Estimate the rate constant of reaction	K4

K1 – Remember, K2 – Understand, K3 – Apply,K4 – Analyze, K5 – Evaluate, K6 –Create

Subject Expert 26/9/18 HoD/Incharge Dean(Academics) 26.09.18 Director 26.9.2018

Neeru 26/9/18

BSC 103 – Mathematics I

Subject Code	BSC 103					
Category	Basic Science Course					
Subject Name	Mathematics-I					
Scheme and Credits	L-T-P	Theory Marks	Sessional		Total	Credit
			Test	Assig/Att.		
Pre- requisites (if any)	3-1-0	60	30	10	100	
	Knowledge of Intermediate Mathematics of UP Board or equivalent Board					

Course Objectives:

- To familiarize the undergraduate engineering students with techniques in calculus, multivariate analysis, vector calculus and linear algebra
- To equip the students with standard concepts and tools from intermediate to advanced level that will enable them to tackle more advanced level of mathematics and applications that they would find useful in their disciplines.
- To apply the knowledge of differential calculus in the field of engineering
- To deal with functions of several variables that are essential in optimizing the results of real life problems.
- To familiarize multiple integral tools to deal with engineering problems involving area, volume etc.
- To deal with vector calculus that is required in different branches of Engineering to graduate engineers
- The essential tools of matrices and linear algebra, Eigen values and diagonalization in a comprehensive manner are required.

Course Content:

1. Unit 1: Matrix and Linear Algebra

Introduction to matrices, elementary row/ column operations, Inverse and rank of matrices, Echelon form, Normal form, Linear dependence and independence, consistency of system of linear equations and their solutions, eigen values and eigen vectors, Cayley-Hamilton theorem, Diagonalisation of a Matrix,

Introduction to vector space, subspace, basis and dimensions, linear transformation and its matrix representations, Simple applications to engineering sciences.

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2. Unit 2: Differential Calculus- I

Brief introduction to limits, continuity and differentiability, Successive Differentiation (n^{th} order derivatives), Leibnitz theorem and mean value theorems, Expansion of functions, Taylor's and Maclaurin's series of single variable, Curve tracing: Cartesian and Polar co-ordinates

3. Unit 3: Differential Calculus-II

Partial differentiation, Total differentiation and approximation, Euler's Theorem, Jacobians, Taylor and Maclaurin's theorems for a function of several variables, Approximation of errors, Maxima and Minima of functions of several variables, Lagrange Method of Multipliers (Simple Application),

Multiple integration: Double integral, Triple integral, Change of order of integration, Change of variables, *Application:* Areas and volumes, Beta & Gamma Functions, Dirichlet's Integrals & its Applications.

4. Unit-4: Sequences and Series

Definition of sequence, monotonic, convergence and divergence sequence, Infinite series and their convergence, Tests for convergence of series (Ratio test, root test, higher ratio test, comparison test, Integral test). Absolute and conditional convergence

5. Unit 5: Vector Calculus

Point function, differentiation, Gradient, directional derivatives, Curl and Divergence of a vector and their physical interpretation, Tangent and Normal planes.

Integration, Line, Surface and Volume integral, Stoke's, Gauss's, and Green's theorem, (without proof) and their applications.

Reference Books:-

1. B. V. Ramana, Higher Engineering Mathematics, Tata McGraw-Hill Publishing Company Ltd., 2008.
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 2005.
3. R K. Jain & S R K. Iyenger , Advance Engineering Mathematics, Narosa Publishing House 2002
4. Maurice D. Weir, Joel Hass, Frank R. Giordano, Thomas, Calculus, Eleventh Edition, Pearson.
5. D. Poole, Linear Algebra : A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
6. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
7. Ray Wylie C and Louis C Barret, Advanced Engineering Mathematics, Tata Mc-Graw-Hill; Sixth Edition.

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Course Outcome:

	Course Outcome (CO)	Bloom's Knowledge Level
At the end of this course, the students will be able to:		
CO 1	Remember the concept of matrices and apply for solving linear simultaneous equations.	K1 & K3
CO 2	Understand the concept of limit, continuity and differentiability and apply in the study of Rolle,s , Lagrange,s and Cauchy mean value theorem and Leibnitz theorems .	K2 & K3
CO 3	Identify the application of partial differentiation and apply for evaluating maxima, minima, series and Jacobians.	K3 &K5
CO 4	Illustrate the working methods of multiple integral and apply for finding area, volume, center of mass and center of gravity.	K2 & K3
CO 5	Remember the concept of vector and apply for directional derivatives, tangent and normal planes. Also evaluate line, surface and volume integrals.	K2 & K5

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

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Subject Expert HoD/Incharge Dean (Academics) Director

BSC 203 – Mathematics II

Subject Code	BSC 203					
Category	Basic Science Course					
Subject Name	Mathematics-II					
Scheme and Credits	L-T-P	Theory Marks	Sessional		Total	Credit
			Test	Assign/Att.		
	3-1-0	60	30	10	100	4
Pre-requisites (if any)	Knowledge of Intermediate Mathematics of UP Board.					

Course Objectives:

- To familiarize the prospective engineers with techniques in sequences, ordinary differential equations and complex variables
- To equip the students with effective mathematical tools for the solutions of differential equations that model physical processes.
- The tool of Fourier series for learning advanced Engineering Mathematics
- The tools of differentiation of functions of a complex variables that are used in various techniques dealing with engineering problems

Course Content:

1. Unit-1: Ordinary Differential Equation ~~of Higher Order (10 hours)~~

Brief introduction to first order differential equations, Existence and uniqueness of solutions of initial value problems, Solution of higher order linear differential equations with constant coefficients, Cauchy- Euler equations, Solution of Second order linear differential equations by changing independent and dependent variables, methods of variations of parameters, method of undetermined coefficients, Systems of linear equations.

2. Unit-2: Series Solutions and Special Function

Ordinary and singular points of a differential equations, Power series solution, Frobenius method, Bessel's and Legendre equations, and their series solutions, Properties of Bessel function and Legendre polynomials, Generating functions, Fourier-Bessel expansion.

3. Unit -3 Laplace Transform

Laplace Transform, Existence conditions and ROC, Inverse Laplace transform, Operational properties, Convolution, unit step function, Dirac-Delta function, periodic functions, Applications to IVP and BVP, linear ordinary differential equations. Applications to control systems analysis.

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4. Unit – 4 Partial Differential Equations and Fourier Series

Development of partial differential equations and their solutions, Solution of first order partial differential equations, solutions of linear higher order partial differential equations with constant coefficients.

Orthogonal functions, Fourier series, existence conditions, Fourier series with arbitrary periods, change of intervals, Fourier series of even and odd functions, Fourier half range series, Harmonic Analysis.

5. Unit – 5 Modeling and Boundary Value Problems,

Modelling of heat flow and vibrating string; derivation of heat flow, wave and Laplace equations in rectangular coordinates, boundary value problems and their solutions by the methods of separation of variables, Non homogeneous equations and boundary conditions, Boundary value problems in polar, cylindrical and spherical coordinate systems and their solutions.

Reference Books:-

1. Dennis G, Zill & Michael R Cullen; Advanced Engineering Mathematics, 2nd Edition, Jones & Bartlett Publishers
2. E. Kreyszig, Advance Engineering Mathematics, John Wiley & Sons, 2005.
3. Peter V. O'Neil, Advance Engineering Mathematics, Thomson (Cengage) Learning, 2007.
4. Maurice D. Weir, Joel Hass, Frank R.Giordano, Thomas, Calculus, Eleventh Edition, Pearson.
5. G.B Thomas, R L Finney, Calculus and Analytical Geometry, Ninth Edition Pearson, 2002.
6. James Ward Brown and Ruel V Churchill, Fourier Series and Boundary Value Problems, 8th Edition-Tata McGraw-Hill
7. D. Poole , Linear Algebra : A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
8. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
9. B. V. Ramana, Higher Engineering Mathematics, Tata McGraw-Hill Publishing Company Ltd., 2008.
10. B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 2005.
11. R. K. Jain & S. R. K. Iyenger , Advance Engineering Mathematics , Narosa Publishing -House, 2002.

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30/8/18

BCS101/ BCS201 – Problem Solving and Computer Programming using "C"

Subject Code	BCS 101 / BCS 201					
Category	Basic Engineering Course					
Subject Name	Problem Solving and Computer Programming using "C"					
Scheme and Credits	L-T-P	Theory Marks	Sessional		Total	Credit
			Test	Assign/Att.		
	3-0-0	60	30	10	100	3
Pre- requisites (if any)	-					

Course Objectives:

- To make students understand basics of parts of computers and the programming.
- To give knowledge of basic constructs of computer programming.
- To make students understand Recursion.
- To impart knowledge of Basic Algorithms

Unit- 1	**Basics of programming:** Introduction to Problem Solving through Programs, Flow charts, Pseudo Codes. The compilation process, syntax and semantic errors, variable and data types. **Arithmetic expressions and conditional branching,** Arithmetic expressions and Relational operations, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associativity. Structure of C program, writing and executing the first C program, components of C language. Standard I/O in C.	9
Unit- 2	**Conditional program execution:** Applying if and switch statements, nesting if and else, use of break and default with switch, program loops and iterations: use of while, do while and for loops, multiple loop variables, use of break and continue statements, standard C preprocessors, defining and calling macros, conditional compilation, passing values to the compiler	8
Unit- 3	**Functions & Arrays:** Introduction, Need of "C" Functions, Prototypes of Functions, Types of functions, Nesting of functions, Recursion. Passing values to functions, recursive functions. Definition of Array, Declaring & Initializing Arrays, Array notation and representation, manipulating array elements. Multi dimensional arrays, Character and String arrays, String handling functions.	9

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Unit- 4	**Pointers:** Introduction to pointers, Declaration and Initialization of pointers, Accessing the address of the variables, Pointers operators, Pointer arithmetic. Dynamic memory allocation. **Structure:** Definition, defining structure, Declaration of Structure Variable, Accessing Structure members, Array of Structures. **Union:** Defining and Declaration of Union, Difference between union & structure.	9
Unit- 5	**File Handling:** Basis of the file handling. File pointers. Primary file handling functions (fopen, fscanf or fgetc, fprintf or fputs, fseek, rewind, fclose, EOF etc.)	5

Text & Reference Books:

- Schaum's Outline of Programming with C by Byron Gottfried , McGraw-Hill
- The C programming by Kernighan Brain W. and Ritchie Dennis M., Pearson Education.
- Computer Basics and C Programming by V.Rajaraman , PHI Learning Pvt. Limited, 2015.
- Computer Concepts and Programming in C, E Balaguruswami, McGraw Hill
- Computer Science- A Structured Programming Approach Using C, by Behrouz A. Forouzan, Richard F. Gilberg, Thomson, Third Edition , Cengage Learning - 2007.
- Let Us C By Yashwant P. Kanetkar
- Problem Solving and Program Design in C, by Jeri R. Hanly, Elliot B. offman, Pearson Addison-Wesley, 2006

Course Outcome:

Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course , the student will be able to understand		
CO 1	To develop the awareness about the Unix system, simple algorithms for arithmetic and logical problems.	K2, K3
CO 2	To translate the algorithms to programs & execution (in C language).	K3
CO 3	To implement conditional branching, iteration and recursion.	K3
CO 4	To decompose a problem into functions and synthesize a complete program using divide and conquer approach.	K4
CO 5	To use arrays, pointers and structures to develop algorithms and programs.	K2, K3

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

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BCS 151 / BCS 251 Computer Programming Laboratory

Subject Code	BCS 151 / BCS 251					
Category	Basic Engineering Course					
Subject Name	Computer Programming Lab					
Scheme and Credits	L-T-P	External Practical	Sessional		Total	Credit
			Test	Record &Att.		
	0-0-3	30	15	05	50	1.5
Pre- requisites (if any)	Knowledge of Intermediate Mathematics of UP Board or equivalent Board.					

List of Experiments

The laboratory should be preceded or followed by a tutorial to explain the approach or algorithm to be implemented for the problem given.

Lab 1: Problem solving using computers

Familiarization with programming environment

Lab 2: Variable types and type conversions

Simple computational problems using arithmetic expressions

Lab 3: Branching and logical expressions

Problems involving if-then-else structures

Lab 4: Loops, "while and for loops

Iterative problems e.g., sum of series

Lab 5: 1D Arrays: searching, sorting

ID Array manipulation

Lab 6: 20 arrays and Strings

Matrix problems, String operations

Lab 7: Functions, call by value

Simple functions

Lab 8: Numerical methods (roots finding, numerical differentiation, numerical integration)

Lab 9: Programming for solving Numerical methods problems

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Lab 10: Recursion, structure of recursive calls

Recursive functions

Lab 11: Pointers, structures and dynamic memory allocation

Pointers and structures

Lab 12: File handling

File operations

Course Outcomes:

1. To formulate the algorithms for simple problems.
2. To translate given algorithms to a working and correct program to be able to correct syntax errors as reported by the compilers.
3. To be able to identify and correct logical errors encountered at run time.
4. To be able to write iterative as well as recursive programs.
5. To be able to represent data in arrays, strings and structures and manipulate them through a program.
6. To be able to declare pointers of different types and use them in defining self-referential structures.
7. To be able to create, read and write to and from simple text files.

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BEE101/BEE201-Fundamentals of Electrical Engineering

Subject Code	BEE101/ BEE 201					
Category	Fundamentals of_Engineering Course					
Subject Name	Fundamentals of Electrical Engineering					
Scheme and Credits	L-T-P	Theory Marks	Sessional		Total	Credit
			Test	Assign/Att.		
	3-1-0	70	20	10	100	4
Pre- requisites (if any)	Knowledge of Intermediate Mathematics of UP Board or equivalent Board.					

Course Objective:

- To help the students understand and analyze dc and ac circuits.
- To help acquire thorough understanding of RLC circuits and to be able analyze the same.
- To impart basic knowledge of electric machines
- To provide elementary knowledge of electric installations

Course Content:

Unit-I Electrical Circuit Analysis: (8 hours)

Circuit Concepts: Active and Passive elements, Voltage and Current sources, Concepts of linearity and linear network, Unilateral and bilateral elements, Source transformation, Kirchoff's laws, Loop and Nodal Analysis, Star-Delta transformation

Network theory: Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem

Unit-II Steady State Analysis of AC Circuits: (8 hours)

AC Fundamentals: Sinusoidal waveform generation – Average and Effective values, Form and peak factors, Concepts of phasors, Behavior of R,L,C and their combinations, concepts of impedance, power, power factor, Analysis of series and parallel RLC circuits, Series and parallel resonance, band width, Q factor.

Three Phase AC Circuits: Necessity and advantages, Star Delta connections, Balanced supply and balanced load, Line and phase voltages / currents relation.

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Unit-III Magnetic Circuits & Transformers: (8 hours)

Magnetic Circuits: Analogy between electric and magnetic circuits, Magnetic leakage and fringing, Hysteresis, Eddy current losses, Self-induction, Mutual induction

Transformer: Single Phase Transformer - Principle of operation, Construction, EMF equation, equivalent circuits, Power losses, Efficiency, Open and Short Circuit tests, Voltage Regulation, Autotransformer, Three- phase transformer connections

Unit IV Electrical Machines (8 hours)

Generation of rotating magnetic fields, Construction and working of a three- phase induction motor, Significance of torque - slip characteristics, Loss component and efficiency, Starting and speed control of Induction motor. Single phase induction motor – Construction and working.

Unit V Electrical Measurements and Installations (8 hours)

Measurement of voltage and current using PMMC, MI meters, Measurement of power and energy Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of wire and cables, Earthing, Batteries – Important Characteristics - Types of batteries – Elementary calculations for energy consumption, Power Factor improvement and battery backup.

Text Books:

1. D.P. Kothari and I.J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
2. E Hughes, "Electrical and Electronics Engineering", Pearson 2010.
3. V Del Toro, "Principles of Electrical Engineering", Prentice Hall India, 1989.

Reference Books:

1. W.H. Hayt & J.E. Kemmerly, Engineering Circuit Analysis, TMH Publications.
2. B.L. Theraja, Electrical Technology Volume I and II, S Chand Publications.
3. D. C. Kulshreshtha, "Basic Electrical Engineering", Tata McGraw Hill, 2009.
4. A.K.Sawhney, "A course in Electronic Measurements and Instrumentation", Dhanpat Rai & Co.

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Course Outcome:

	Course Outcome	Bloom's Knowledge Level
At the successful completion of the course students will be		
CO 1	Able to understand and analyze basic electrical and magnetic circuits	K4
CO 2	Able to comprehend the phenomenon of resonance in electrical circuits	K2
CO 3	Able to comprehend the working principle of static and dynamic electrical machines	K2
CO 4	Able to measure basic electrical quantities	K3
CO 5	Familiar with components of low voltage electrical installations	K2

K1 – Remember, K2 – Understand, K3 – Apply,K4 – Analyze,K5 – Evaluate, K6 – Create

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Subject Expert **HoD/Incharge** **Dean (Academics)** **Director**

BEE151/BEE251 - Electrical Engineering Laboratory

Subject Code	BEE151 /BEE 251					
Category	Basic Engineering Course					
Subject Name	Electrical Engineering Lab					
Scheme and Credits	L-T-P	External Practical	Sessional		Total	Credit
			Test	Record &Att.		
	0-0-2	30	15	05	50	1
Pre- requisites (if any)	Knowledge of Intermediate Mathematics of UP Board or equivalent Board.					

List of Experiments

1. Verification of Kirchoff's Laws
2. Verification of Superposition Theorem
3. Verification of Maximum Power Transfer Theorem
4. Verification of Thevenin's Theorem
5. Determination of parameters of Single Phase AC Series circuit
6. Study of the phenomenon of Resonance in RLC Series Circuit
7. Open Circuit and Short Circuit Tests of a Single Phase Transformer
8. Polarity Test and Load Test of a Single Phase Transformer
9. Connection of a Fluorescent Lamp and Measurement of Power Consumed
10. Load test on Three phase Induction motor
11. Speed Control of Induction Motor
12. Study of Components of LT Switchgear

Course Outcome:

After course completion, the students shall be able to

- Demonstrate the concepts of Network Theory practically
- Measure voltage, Current, Power using appropriate electrical Measuring Instruments
- Conduct various tests on Single Phase Transformer
- Demonstrate the working and speed control of Induction motors
- Identify and comprehend the working of LT switchgear

Naman

Subject Expert **HoD/Incharge** **Dean (Academics)** 8.9.18 **Director** 28.9.2018

BME101/BME201- Engineering Graphics & Design

Subject Code	BME 101 / BME 201 and BME I5I / BME 251											
Category	Basic Engineering Course											
Subject Name	Engineering Graphics & Design											
Scheme and Credits	L-T-P	Theory Marks					Practical Marks					Credit
		Sessional			Ext.	Total				Ext.	Total	
		CT	TA	Tot.			CT	TA	Tot.			
	2-0-2	30	10	40	60	100	15		20			2
Pre-requisites (if any)	Knowledge of Intermediate Mathematics of UP Board or equivalent Board.											

Engineering Graphics & Design - (Theory & Lab)

Course objectives

- To enable students to acquire and use engineering drawing skills as a means of accurately and clearly communicating ideas, information and instructions.
- To enable students to acquire requisite knowledge, techniques and attitude required for advanced study of engineering drawing

Course Content

UNIT I

BASICS OF ENGINEERING GRAPHICS AND DRAWING – Drawing Papers, Mini-drafter, Pencils. Drawing Paper Layout, Title Block, Types of Lines, Lettering, Dimensioning, types of Projections; First and Third Angle systems of Orthographic Projections. Projection of Points in different Quadrants.

PROJECTIONS OF STRAIGHT LINES – Contained by both Reference Planes, contained by one and inclined to other Reference Plane, Contained by one and Parallel to other Reference Plane, Parallel to both Reference Plane, Perpendicular to one of the Reference Planes, inclined to one Plane but Parallel to the other Reference Planes, Inclined to both the Reference Planes, True Length of a Line and its Inclination with Reference Planes, Traces of a Line.

UNIT II

PROJECTIONS OF PLANES – Parallel to one Reference Plane, inclined to one Plane but Perpendicular to the other, Inclined to both Reference Planes.

PROJECTIONS OF POLYHEDRAL SOLIDS AND SOLIDS OF REVOLUTION- in simple positions with axis perpendicular to a Reference Plane, with axis parallel to both Reference Planes, with axis parallel to one

Reference Plane and inclined to the other Reference Plane, Projections of sections of Prisms, Pyramids, Cylinders and Cones. True Shape of Sections of Solids.

UNIT III

DEVELOPMENT - Development of Surfaces of various Solids objects.

FREE HAND SKETCHING - Orthographic Views from Isometric, Views of Simple Machine Components such as Brackets, Bearing Blocks, Guiding Blocks and Simple Couplings and Pipe Joints.

UNIT IV

ISOMETRIC PROJECTIONS - Introduction, Isometric Scale, Isometric Views and Drawing of various Plane and Solids objects. Perspective drawing and oblique view.

UNIT V

COMPUTER GRAPHICS – Introduction to computer technology that impact on graphical communication, Engineering Graphics software – spatial transformations, orthographic projections, model viewing, co-ordinate system, multi-view projection, exploded assembly, animation, solid modeling. Suggested

Textbook:

(i)Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House

(ii)Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education

Reference Books:

(i)Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication

(ii)Narayana, K. L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers

(iii)Corresponding set of) CAD Software Theory and User Manuals

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Course Outcomes:

Course Outcome (CO's) At the end of this course, the students should be able to:		Bloom's Knowledge Level (KL)
CO 1	Introduction to engineering design and its place in society	K1 and K2
CO 2	Exposure to engineering graphics standards	K2 and K3
CO 3	Exposure to solid modeling	K3 and K4
CO 4	Exposure to computer-aided geometric design	K3 and K5
CO 5	Exposure to creating working drawings	K6

K1-Remember, K2-Understand, K3-Apply, K4- Analyze, K5-Evaluate, K6-Create

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(Dr. Anand Kumar)

BME102/BME202- Workshop Concepts

Subject Code	BME 102 /BME 202					
Category	Basic Engineering Course					
Subject Name	Workshop Concepts					
Scheme and Credits	L-T-P	Theory Marks	Sessional		Total	Credit
			Test	Assig/Att.		
	2-0-0	60	30	10	100	2
Pre- requisites(if any)	Knowledge of Intermediate Mathematics of UP Board or equivalent Board.					

Why you need to study this course.

The course will help in understanding various operations of manufacturing processes

Course Objective:

- To become familiar with various manufacturing processes.
- To become familiar with usage of various manufacturing instruments.
- To become familiar with various operations.
- To learn to use instruments with safety precautions.

Sl. No.	Topics	Lec.
UNIT 1	Carpentry Shop • Basic concepts • Types of woods and their properties • Seasoning of wood • Carpentry tools • Carpentry Processes • Carpentry joints & their applications Fitting Bench Working Shop • Introduction • Vices • Fitting tools • Fitting Processes & their applications	6
UNIT 2	Welding Shop • Introduction to welding • Weldability and types of joints • Types of welding and its defects • Metallurgy of Weld • Arc Welding, Gas welding, Resistance Welding, Soldering & Brazing & their applications	4

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RAJEEV KUMAR
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UNIT 3	Sheet Metal Shop • Introduction to sheet metal shop • Metals used in sheet metal works • Hand tools and accessories e.g. different types of hammers, hard and soft mallet • Sheet Metal operation & their applications • Sheet Metal Joints Hems and Seams • Sheet metal allowance • Sheet Metal working machines Black Smithy Shop • Introduction • Forging Material • Hot working and Cold working process • Heating devices, Hand tools and Appliances • Smith Forging operations & their applications Forging Processes & its defects	6
UNIT 4	Foundry Shop • Introduction • Pattern Materials • Pattern making tools • Types of Pattern • Pattern Making allowances • Method of Constructing a pattern • Moulding sand & its types • Moulding sand size and shape • Sand additives • Moulding Processes & their applications • Cupola furnace	4
UNIT 5	Machine Shop • Introduction to machine tools and machining processes; • Types of cutting tools • Selection of cutting speeds and feed • Simple machining operations on Lathe, shaper, Milling machine, Drill machine, Planer & their applications Modern trends in manufacturing, Automation. Introduction to NC/CNC/DNC, FMS, CAD/CAM, CIM and factory of future, Additive manufacturing.	6

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Acts.

Text Books and References:

1. Workshop Technology by S. K. Garg University Science Press Publications.
2. Raghuwanshi,B S "Workshop Technology ; vol. I&II" Dhanpat Rai & Sons
3. Chaudhary, Hajra "Elements of Workshop Technology; vol. I&II" Media Promoters & Publishers.
4. Hajra Choudhury S. K., Hajra Choudhury A. K. and Nirjhar Roy S. K., "Elements of Workshop Technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.
5. Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGraw Hill House, 2017.

Course Outcome:

	Course Outcome (CO)	Bloom's Knowledge Level (KL)
At the end of this course, the students should be able to:		
CO 1	The students will gain knowledge of the different manufacturing processes which are commonly employed in the industries.	K2
CO 2	Fabricate components using different materials.	K3
CO 3	The students will be aware about new trends used in industries.	K3
CO 4	The attitudes, abilities, and skills required to adapt to rapidly Ahanging	K1

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – create

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BME 152 / BME 252 Workshop Concept Lab

Subject Code	BME 152 / BME 252					
Category	Basic Engineering Course					
Subject Name	Workshop Concept Lab					
Scheme and Credits	L-T-P	External Practical	Sessional		Total	Credit
			Test	Record &Att.		
	0-0-2	30	15	05	50	1
Pre- requisites(if any)	The subject requires basic knowledge of mathematics and measuring equipments					

LIST OF EXPERIMENTS

Ex. No.	Experiment	Objective	Expected Outcome
1	Carpentry Shop	• To understand different types of woods and their properties. • Study various tools & equipments used in carpentry. • To prepare half-lap corner joint, Mortise & tenon joints.	To perform different types of operations on woods (such as sawing, joint making etc).
2	Fitting Bench Working Shop	• Introduction to fitting tools, Study of tools & operations. • Simple exercises involving fitting work. To make perfect V slot. • Simple exercises involving drilling/tapping.	To get familiarized with various Fitting operations
3	Black Smithy Shop	• Introduction and demonstration of various black smithy operations. • To perform operation for making L- shaped nail	To be able to learn Forming operations (such as bending, upsetting and drawing).
4	Welding Shop	• Introduction to welding and welding equipment. • To learn operations of Gas welding & Arc welding. • To learn Simple butt and Lap welded joints. • To learn resistance spot welding and cutting.	To get familiarized with Electric arc welding and Oxyacetylene gas welding.
5	Sheet Metal Shop	• Introduction to tools and operations in sheet metal shop. • Fabrication of tool-box, tray, electric panel box etc. • Making Funnel complete with 'soldering'.	To be able to learn various sheet metal operations.

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6	Machine Shop	• Introduction to Lathe machine and its various operations. • To perform Plane turning, Step turning, Taper turning & Threading. • Introduction of Single point cutting tool grinding.	To get familiarized with Lathe machine and various machining operations.
7	Foundry Shop	• Introduction to foundry tools. • To study different types of molding sands. • Mould making with the use of a core and Casting.	To get familiarized with various Foundry techniques.

Text Books:

1. Raghuwanshi B.S., Workshop Technology Vol. I & II, Dhanpath Rai & Sons.
2. Kannaiah P. and Narayana K.L., Workshop Manual, 2nd Edn, Scitech publishers.
3. John K.C., Mechanical Workshop Practice. 2nd Edn. PHI 2010.
4. Jeyapoovan T.and Pranitha S., Engineering Practices Lab Manual, 3rd Edn. Vikas Pub.2008.

Course Outcome:

	Course Outcome (CO)	Bloom's Knowledge Level (KL)
At the end of this course, the students should be able to:		
CO 1	Study and practice on machine tools and their operations	K2
CO 2	Practice on manufacturing of components using workshop trades including fitting, carpentry and foundry.	K3
CO 3	Identify and apply suitable tools for machining processes including turning, facing, thread cutting and tapping	K4
CO 4	Welding and soldering operations	K3

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

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BME 103/ BME 203 Elements of Mechanical Engineering

Subject Code	BME 203					
Category	Basic Engineering Course					
Subject Name	Elements of Mechanical Engineering					
Branches	All Branches					
Scheme and Credits	L-T-P	Theory Marks	Sessional		Total	Credit
			Test	Assign/Att.		
	2-0-0	60	30	10	100	2
Pre- requisites (if any)	Knowledge of Intermediate Mathematics of UP Board or equivalent Board.					

Course Objectives:

- To strengthen the concepts of Force, Moment of Inertia etc.
- To introduce the basics of Thermodynamics
- To familiarize IC Engines

Course Content:

UNIT-I

Force System: Force, Parallelogram Law, Lami's theorem, Principle of Transmissibility of forces. Moment of a force, Couple, Varignon's theorem, Resolution of a force into a force and a couple. Resultant of coplanar force system. Equilibrium of coplanar force system, Free body diagrams.

UNIT-II:

Concept of Centre of Gravity and Centroid and Area Moment of Inertia, Perpendicular axis theorem and Parallel axis theorem.

Friction: Concepts of friction and its types, Dry friction, Laws of friction and their applications to wedge.

UNIT-III:

Plane Truss: Perfect and imperfect truss, Assumptions and Analysis of Plane Truss by Method of joints and Method of section.

Beams: Types of beams, Statically Determinate Beams, Shear force and bending moment in beams, Shear force and bending moment diagrams, Relationships between load, shear and bending moment.

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UNIT-IV:

Basic Concepts and Definitions of Thermodynamics: Introduction and definition of thermodynamics, Microscopic and Macroscopic approaches, System, surrounding and universe, Concept of continuum, Thermodynamic equilibrium, Thermodynamic properties, path, process and cycle, Quasi static process, Energy and its forms, Work and heat. Thermodynamic definition of work. Temperature and its measurement.

UNIT-V:

Introduction to I C Engine: Classification of I C Engines and their parts, working principle and comparison between Two stroke and Four stroke S.I. and C.I. engine, expression for the efficiency of Otto cycle and Diesel cycle.

Text Books:

1. Engineering Mechanics by R K Bansal, Laxmi Publications.
2. Engineering Mechanics by S. S. Bhavikatti, K. G. Rajashekarappa, New Age International.
3. Fundamentals of Mechanical Engineering by Sawhney, PHI.
4. Engineering Thermodynamics by P. K. Nag, McGraw Hill.

References Books:

1. Engineering Mechanics: Statics and Dynamics by R. C. Hibbler, Pearson.
2. Thermodynamics An Engineering Approach by Cengel & Boles, McGraw Hill.
3. Internal Combustion Engine by V Ganesan, McGraw Hill Pub.
4. An Introduction to Mechanical Engineering by Wickert & Lewis, Cengage Learning.
5. Basic Mechanical Engineering by Pravin Kumar, Pearson.
6. Elements of Mechanical Engineering by Singh, Anne Books Pvt Ltd.

Course Outcome:

After the completion of the course, the student will

- Have a thorough understanding of the concepts of Force, Moment of Inertia etc.
- Know, understand and be able to apply the concept of Thermodynamics
- Be familiar with the working of IC Engines

Subject Expert (Dr. Anand Kumar) HoD/Incharge 20/9/18 Dean (Academics) 26.9.18 Director 26.9.2018

BME 253: Elements of Mechanical Engineering Lab

Subject Code	BME 253					
Category	Basic Engineering Course					
Subject Name	Elements of Mechanical Engineering Lab					
Scheme and Credits	L-T-P	External Practical	Sessional		Total	Credit
			Test	Record &Att.		
	0-0-2	30	15	05	50	1
Pre- requisites (if any)	Knowledge of Intermediate Mathematics of UP Board or equivalent Board.					

List of Experiments:

Note: Any 6 experiments

1. Experiment on Statics equilibrium.
2. Experiment on truss/frame.
3. To verify the polygon law of force.
4. To determine the coefficient of friction on inclined surface.
5. Experiment on moment of inertia.
6. To Study and working of 2 stroke Diesel/Petrol engine.
7. To Study and working of 4 stroke Petrol/Diesel engine.

Course Outcome:

At the end of the Laboratory course, students will be

- Able to understand and experiment with the concepts of Force, Inertia, Friction etc
- Able to understand the working of 2 stroke / 4 stroke petrol/ diesel engine

EE/ ECE/CSE

BEC 101 - Basic Electronics Engineering

Subject Code	BEC 101/ BEC 201					
Category	Basic Engineering Course					
Subject Name	Basic Electronics Engineering					
Branches	All					
Scheme and Credits	L-T-P	Theory Marks	Sessional		Total	Credit
			Test	Assign/Att.		
	2-0-0	70	20	10	100	2
Pre- requisites (if any)	Knowledge of Intermediate Mathematics of UP Board or equivalent Board.					

Course Objective:

- To introduce Semiconductor Devices, Characteristics & Applications.
- To impart basic knowledge of Operational Amplifier.
- To help acquire thorough understanding of Number Systems and Logic Gates.
- To provide elementary knowledge of Communication Systems.

Course Content:

Unit -1
Semiconductor Diode: Ideal versus Practical, V-I characteristics, Diode Equivalent Circuits, Load Line Analysis, Diode Applications as a Switch, Half Wave and Full Wave Rectifiers. Zener Diode: Operation and Applications, Zener Diodes breakdown mechanism (Zener and Avalanche) Light-Emitting Diode, Photo Diode- Operation, Construction, Characteristics & Applications.
Unit -2
Bipolar Junction Transistor (BJT): Construction, Operation, Amplifying Action, Common Base, Common Emitter and Common Collector Configurations, Operating Point, Biasing of BJT.
Unit -3
Field Effect Transistor (FET): Construction, Characteristics of JFET, Transfer Characteristics, MOSFET-Depletion and Enhancement type, Transfer Characteristics, Introduction to CMOS circuits. Introduction to operational amplifier.

Subject Expert | HoD/Incharge | Dean (Academics) 26.09.18 | Director 26.9.2018

Unit -4
Number Systems: Decimal Number System, Binary Number System, Converting Decimal to Binary, Hexadecimal Number System: Converting Binary to Hexadecimal, Hexadecimal to Binary, Converting Hexadecimal to Decimal, Converting Decimal to Hexadecimal, Octal Numbers: Binary to Octal Conversion. Boolean Algebra Theorems, De Morgan's theorem. Digital Circuits: Logic gates, NOT Gate, AND Gate, OR Gate, Ex-OR Gate, NAND Gate, NOR Gate, Ex-NOR Gate, 1's, 2's & 10's Complement.
Unit -5
Basics of Communication Engineering: Block Diagram of a Communication System, Need of modulation, electromagnetic spectrum and typical applications, terminologies in communication systems, Basics of signal representation and analysis, Fundamentals of Modulation and Demodulation techniques.

Text / Reference Books

1. Robert L. Boylestad &Louis Nashelsky, "Electronic Devices and Circuit Theory", Pearson Education
2. Jacob Millman/ Christos C. Halkias/ Satyabrata Jit "Electronics Devices and Circuits", TMH
3. Salivahanan, N Suresh Kumar, Electronic Devices and circuits, McGraw Hill publications
4. M. Morris Mano and M. D. Ciletti, "Digital Design", Pearson Education
5. Simon Haykin,"Communication Systems", Wiley India Publication
6. B.P.Lathi,"Modern Digital and Analog Communication Systems", Oxford University Press

Course Outcome:

	Course Outcome	Bloom's Knowledge Level
At the successful completion of the course students will be		
CO 1	Able to understand the Characteristics and working of Semiconductor Devices.	K2
CO 2	Able to comprehend the working principle of operational amplifier and its applications.	K3
CO 3	Able to understand Number System and their conversion and Analyze Logic Gates.	K4
CO 4	Familiar with components of Communication Systems and their applications.	K2

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze,K5 – Evaluate, K6 – Create

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BEC 151 - Basic Electronics Engineering Lab

Subject Code	BEC 151/ BEC 251					
Category	Basic Engineering Course					
Subject Name	Basic Electronics Engineering Lab					
Scheme and Credits	L-T-P	External Practical	Sessional		Total	Credit
			Test	Record &Att.		
	0-0-2	30	15	05	50	1
Pre- requisites (if any)	Knowledge of Intermediate Mathematics of UP Board or equivalent Board.					

List of Experiments:

1. Study of Multi-meter
2. Study of Cathode Ray Oscilloscope
3. Study of electronic components
4. V-I Characteristics of PN junction diode
5. Zener Diode Characteristics
6. Half wave Rectifier
7. Bridge Rectifier
8. Common Emitter Characteristics
9. Verification of Truth Tables – AND, NAND, NOT, OR, NOR, XOR Gates
10. Op-Amp Characteristics
11. Op-Amp Applications

Course Outcome:

At the end of the Laboratory course, students will be

- Able to use Multi-meter and CRO for measurement
- Familiar with different components in Electronics Lab
- Able to understand the working of diodes and BJT
- Familiar with Op-Amp
- Familiar with Logic gates

Subject Expert HoD/Incharge Dean (Academics) Director

BHSM101/BHSM201 - Professional English

Subject Code	BHSM101 / BHSM201					
Category	Humanities					
Subject Name	Professional English					
Scheme and Credits	L-T-P	Theory Marks	Sessional		Total	Credit
			Test	Assign/Att.		
	2-0-0	60	30	10	100	2
Pre- requisites (if any)	Knowledge of Intermediate Mathematics of UP Board or equivalent Board.					

Course Objectives:

- The course intends to develop the English Language proficiency of the students by focusing on Listening, Speaking, Reading and Writing (LSRW) skills so that they can communicate effectively in real life situations (professional and social life).
- It aims to teach the students about appreciation of English Language, develop their evaluative capacity and critical understanding of any text by improving their reading comprehension skills through their exposure to scientific, creative and academic text.
- The course is designed to enable the students learn different components of effective writing and improve their technical writing skills.
- The students are expected to enrich their listening and speaking abilities through exposure to variety of listening and speaking drills subsequently resulting in an overall developed personality.

UNIT- I

Basics of Communication

- Importance of Technical Communication, Difference b/w Technical & General Communication
- Communication: Types or Levels
- Components and Process of Communication
- Flow of Communication: Vertical, Horizontal, Diagonal
- Verbal and Non Verbal Communication
- Communication Window/ Johari Window
- Barriers to Communication

Subject Expert HoD/Incharge Dean (Academics) Director

Unit- II

Listening and Speaking Skills

- Types of Listening: Appreciative, Empathetic, Comprehensive, Critical, Superficial
- Difference between Hearing and Listening; Barriers to listening
- Basic sounds of English: Vowels and Consonants
- Phonetic Transcription
- Stress: Word Stress, Sentence Stress, Intonation
- Group Discussion, Debate, Oral Presentation, Interview

Unit -III

Reading Skills and its Improvement

- Literary and Non-Literary Text
- Reading Comprehension: Skimming, Scanning, Non Verbal Signals, Author's Viewpoint, Vocabulary Building, Note Making
- Note-Making: Outline, Sentence and Mapping Method
- Reading Literary Text: a) The Rule of the Road by A.G. Gardiner
  b) The Old Man at the Bridge by Ernest Hemingway
  c) An Outline of Intellectual Rubbish by Bertrand Russell

Unit- IV

Writing Skills:

- Elements of Effective Writing
- Precis Writing and Paragraph Writing
- Essentials of Letter Writing: Formal and Informal
- Curriculum Vitae (with Cover Letter)
- Report Writing: News and Magazine Report
- Email and Social Media – Facebook, Twitter, Blog (Elementary Introduction)

Unit- V

Basics of Grammar and its common errors

- Parts of Speech
- Sentence Types: Simple, Compound and Complex
- Sentence: Phrase and Clause
- Voice: Active and Passive
- Vocabulary Enhancement: Synonyms, Antonyms, Idioms, One Word Substitution, Homophone, Homonym, Affixes, Contextual Word Meaning (Connotation and Denotation)
- Common Errors in English/ Correction of Sentences (Exercises)

Subject Expert **HoD/Incharge** **Dean (Academics)** **Director** 28.4.2022

Reference Books-

1. Technical Communication- By Meenakshi Raman, OUP.
2. Effective Technical Communication, Rizvi, TMH
3. Communication Skills for Engineers, Pearson Education
4. Effective Business Communication, Tat McGraw Hill
5. Practical English Grammar by Thomas Martinet, Oxford University Press
6. A textbook of English Phonetics for Indian students by T. Balasubramanian.
7. Wren & Martin's High School English Grammar & Composition
8. Sinha, R.P. Current English Grammar and Usage. OUP, 2017

Course Outcomes:

CO1	Speak fluently, effectively and clearly in a public forum to a variety of audiences and purposes	K3
CO2	Prepare and Deliver effective oral presentations, arguments, research paper writing, administrative Communication acceptable within the professional fields	K3
CO3	Critical, analytical and thorough readings of various texts to demonstrate in writing or speech of an enriched and comprehensive interpretation of those texts	K4
CO4	Acquaintance and familiarity with various dimensions of communication skills i.e. Listening, Speaking, Reading and Writing	K2
CO5	Evaluate and interpret text written in English, error free writing and speech by being well versed in English Grammar and cultivating good technical communication skills	K5
CO6	Developing personality, confidence and raising work ethics including those necessary for collaboration and cooperation with others	K6

K1: Remember K3: Apply K5: Evaluate

K2: Understand K4: Analyze K6: Create

Subject Expert HoD/Incharge Dean (Academics) Director

BHSM151/BHSM251: Professional English Laboratory

Subject Code	BHSM151/BHSM251					
Category	Humanities					
Subject Name	Professional English Laboratory					
Scheme and Credits	L-T-P	External Practical	Sessional		Total	Credit
			Test	Record &Att.		
	0-0-2	30	15	05	50	1
Pre- requisites (if any)	Knowledge of Intermediate Mathematics of UP Board or equivalent Board.					

Course Objectives: The objective of language lab is to involve and train students in variety of listening and speaking activities which would help students in building their confidence and personality by enhancing their communication skills. It will also prepare them for interviews and competitive examinations which would benefit them in achieving their career goals.

List of Experiments:

Oral Communication: (i) Listening Skills (ii) Speaking Skills
(This involves interactive practice sessions in Language Lab)

- Listening Comprehension
- Phonetic Symbols
- Pronunciation, Intonation, Stress and Rhythm
- Common Everyday Situations: Conversations and Dialogues (Telephonic and Face to face Communication)
- Formal Communication
    - Communication at Workplace
    - Interviews
    - Oral Presentations

Course Outcome:

The student will acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.

Subject Expert **HoD/Incharge** **Dean (Academics)** **Director**

Table: Structure of B.E. Program

S. No.	Courses		Credits							Actual Credits
		Total Credits	I&II	III	IV	V	VI	VII	VIII	
1.	Basic Science Courses (BSC)	20	17	4	-	-	-	-	-	21
2.	Engineering Science Courses (ESC)	30	19	4	9	-	-	-	-	32
3.	Humanities, Social Science and Management Courses (HSMC)	10	4	-	-	3	-	-	3	10
4.	Professional Core Courses (PCC)	60	-	12	13	14	14	7	1	61
5.	Professional Elective Courses (PEC)	18	-	-	-	3	4	6	4	17
6.	Open Elective Courses (OEC)	14	-	-	-	-	4	3	5	12
7.	Seminar	2	-	-	-	-	-	2	-	2
8.	Project	10	-	-	-	-	-	3	7	10
9.	Internships in industry	8	-	2	-	2	-	3	-	7
10.	Mandatory Courses (MC)	NC	-	-	-	-	-	-	-	-
	Total Credits	172	40	22	22	22	22	22	22	172

B.E II Year (Semester-III) Electrical Engineering
Course Structure & Evaluation Scheme

Sr. No.	Category	Course Code	Course Title	Contact Hours			Sessional Marks			End Semester Marks			Credits
				L	T	P	CT	TA	Total	TE	PE	Total	
1	BSC	BSC-301	Mathematics III	3	1	0	30	10	40	60	-	100	**4**
2	PCC	BEE-301	Network Analysis and Synthesis	3	1	0	30	10	40	60	-	100	**4**
3	PCC	BEE-302	Electrical Machines - I	3	1	0	30	10	40	60	-	100	**3**
4	PCC	BEE-303	Solid state Devices and Circuits	3	0	0	30	10	40	60	-	100	**3**
5	ESC	BEC-301	Digital Electronics	3	0	0	30	10	40	60	-	100	**3**
6	MC	MC-302	Human Values and Professional Ethics	2	0	0	30	10	40	60	-	100	**0**
7	ESC	BEC-351	Digital Electronics Lab	0	0	2	20	20	40	-	60	100	**1**
8	PCC	BEE-352	Electrical Machines Lab - I	0	0	2	20	20	40	-	60	100	**1**
9	PCC	BEE-353	Solid state Devices and Circuits Lab	0	0	2	20	20	40	-	60	100	**1**
10	Project/ Internship		Mini-project/ Internship Assessment	0	0	0	-	-	100	-	-	100	**2**
			Total	**17**	**3**	**6**	**240**	**120**	**460**	**360**	**180**	**1000**	**22**

B.E II Year (Semester-IV) Electrical Engineering
Course Structure & Evaluation Scheme

Sr. No.	Category	Course Code	Course Title	Contact Hours			Sessional			End semester Exam			Credit
				L	T	P	CT	TA	Total	TE	PE	Total	
1	PCC	BEE401	Electrical Measurements & Instruments	3	0	0	30	10	40	60	-	100	3
2	ESC	BEC402	Linear Integrated circuits	3	0	0	30	10	40	60	-	100	4
3	PCC	BEE402	Electrical Machines- II	3	1	0	30	10	40	60	-	100	4
4	PCC	BEE403	Electromagnetic Theory	3	1	0	30	10	40	60	-	100	4
5	ESC	BCS402	Data Structures and Algorithms	3	1	0	30	10	40	60	-	100	3
6	MC	MC401	Environment and Ecology	2	0	0	30	10	40	60	-	100	0
7	PCC	BEE451	Measurements & Instrumentation Lab	0	0	2	20	20	40	-	60	100	1
8	ESC	BEC452	Linear Integrated Circuits Lab	0	0	2	20	20	40	-	60	100	1
9	PCC	BEE452	Electrical Machines Lab-II	0	0	2	20	20	40	-	60	100	1
10	ESC	BCS452	Data Structures and Algorithms Lab	0	0	2	20	20	40	-	60	100	1
			Total	**17**	**3**	**8**	**260**	**140**	**400**	**360**	**240**	**1000**	**22**

B.E III Year (Semester-V) Electrical Engineering
Course Structure & Evaluation Scheme

Sl. No.	Category	Course Code	Course Title	Contact Hours			Sessional Marks			End Semester Marks			Credits
				L	T	P	CT	TA	Total	TE	PE	Total	
1	PCC	BEE501	Power Systems I	3	0	0	30	10	40	60	-	100	**3**
2	PCC	BEC502	Microprocessors and Microcontrollers	3	0	0	30	10	40	60	-	100	**2**
3	PCC	BEE502	Automatic Control Systems	3	0	0	30	10	40	60	-	100	**3**
4	OEC	OE- 501	Open Elective – I	3	0	0	30	10	40	60	-	100	**3**
5	PEC	DE-EE501	Program Elective – 1	3	0	0	30	10	40	60	-	100	**3**
6	HSMC	BHSM501	Economics for Industry	3	0	0	30	10	40	60	-	100	**3**
7	ESC	BEC552	Microprocessors, Microcontrollers Lab	0	0	2	30	10	40	-	60	100	**1**
8	PCC	BEE551	Power Systems I Lab	0	0	2	30	10	40	-	60	100	**1**
9	PCC	BEE552	Control Systems Lab	0	0	2	30	10	40	-	60	100	**1**
10	Project/Internship		Internship Assessment	0	0	0	0	0	100	0	0	100	**2**
			Total	**18**	**0**	**6**	**270**	**90**	**460**	**360**	**180**	**1000**	**22**

B.E III Year (Semester-VI) Electrical Engineering
Course Structure & Evaluation Scheme

Sr. No.	Category	Course Code	Course Title	Contact Hours			Sessional Marks			End Semester Marks			Credits
				L	T	P	CT	TA	Total	TE	PE	Total	
1	PCC	BEE601	Power Systems II	3	1	0	30	10	40	60	-	100	**4**
2	ESC	BEE602	Signals and Systems	3	1	0	30	10	40	60	-	100	**4**
3	PCC	BEE603	Power Electronics	3	0	0	30	10	40	60	-	100	**3**
4	PEC	DE-EE602	Program Elective – 2	3	1	0	30	10	40	60	-	100	**4**
5	OEC	OE-EE601	Open Elective -2	3	1	0	30	10	40	60	-	100	**4**
6	MC	MC601	Occupational Health and Safety	2	0	0	30	10	40	60	-	100	**0**
7	PCC	BEE651	Power Electronics Lab	0	0	2	20	20	40	-	60	100	**1**
8	PCC	BEE652	Electrical Machine Design Lab	0	0	2	20	20	40	-	60	100	**1**
9	PCC	BEE653	Power System II Lab	0	0	2	20	20	40	-	60	100	**1**
			Total						**360**	**360**	**180**	**900**	**22**

B.E IV Year (Semester-VII) Electrical Engineering
Course Structure & Evaluation Scheme

Sr. No.	Category	Course Code	Course Title	Contact Hours			Sessional Marks			End Semester Marks			Credits
				L	T	P	CT	TA	Total	TE	PE	Total	
1	PCC	BEE701	Power System Operation and Control	3	0	0	30	10	40	60	-	100	**3**
2	PCC	BEE751	Analog and Digital Communication	2	1	0	30	10	40	60	-	100	**3**
3	PEC	BEE703	Advanced Electrical Drives	3	0	0	30	10	40	60	-	100	**3**
4	PEC	DE-EE703	Program Elective -3	3	0	0	30	10	40	60	-	100	**3**
5	OEC	OE-EE702	Open Elective-3	3	0	0	30	10	40	60	-	100	**3**
6	PCC	BEE752	Electrical Drives Lab	0	0	2	20	20	40	-	60	100	**1**
7	Project/Internship	BEE753	Internship Assessment	0	0	0	20	20	40	-	60	100	**3**
8	Project/Internship	PROJEE1	Project Stage-I	0	0	-	-	-	100	-	-	100	**3**
			Total						**380**	**300**	**120**	**800**	**22**

B.E IV Year (Semester-VIII) Electrical Engineering
Course Structure & Evaluation Scheme

Sr. No.	Category	Course Code	Course Title	Contact Hours			Sessional Marks			End Semester Marks			Credits
				L	T	P	CT	TA	Total	TE	PE	Total	
1	PEC	DE-EE805	Program Elective -5	3	1	0	30	10	40	60	-	100	**4**
2	OEC	OE-EE803	Open Elective -3	3	0	0	30	10	40	60	-	100	**3**
3	OEC	OE-EE804	Open Elective -4	2	0	0	30	10	40	60	-	100	**2**
4	HSMC	BHSM804	Principles of Management	3	1	0	30	10	40	60	-	100	**3**
5	PCC	BEE851	Electronic Design and Fabrication Lab	0	0	2	20	20	40	-	60	100	**1**
6	Seminar	BEE852	Seminar on cutting end technology	0	0	0	-	-	100	-	-	100	**2**
7	Project/Internship	PROJEE2	Project Stage-II	0	0		-	-	50	-	50	100	**7**
			Total						**350**	**240**	**110**	**700**	**22**

*** Labview, MATLAB, Python, Xilix/Vivado/VHDL should be provided for Laboratory**

Program Electives – Department of Electrical Engineering (Study through MOOCs allowed)

Program Elective - 1

1. Electrical and Hybrid Vehicles
2. Transmission and Distribution
3. Electrical Engineering materials
4. Digital Integrated Circuits

Program Elective - 2:

1. Drives and Control for Industrial Automation
2. High Voltage Engineering
3. Utilization and Conservation of Electrical Energy
4. Industrial & Analytical Instruments

Program Elective - 3

1. Communication Systems
2. Power Quality and FACTS
3. Digital Signal Processing
4. Control System II

Program Elective - 4

1. VLSI Design and Architecture
2. Digital Control Systems
3. Embedded Automation Systems
4. Advances in Microprocessors & Microcontrollers

Program Elective - 5

1. Restructured Power Systems
2. Medical Instrumentation
3. Speech Processing
4. Artificial Intelligence

Open Electives (Study through MOOCs allowed)

Open Elective-1

1. Non- Conventional Energy Systems
2. Optoelectronics
3. Numerical methods
4. Robust Control

Open Elective-2

1. Python Programming (SWAYAM)
2. Machine Learning
3. Robotics
4. Process Control

Open Elective – 3

1. Neural Networks and fuzzy Systems
2. Computer Networks
3. MEMS
4. Soft Computing

Open Elective – 4

1. Internet of Things
2. Image Processing
3. Nanotechnology
4. Advanced Process Control
5. Operation Research

BCS-301 MATHEMATICS-III (L-T-P-C: 3-1-0-4)
III SEMESTER (ECE, CSE, EE, ME, CE)

L T P C
3 1 0 4

Course Details:

Unit – I:

Fourier Transform : (9 Hours)

Fourier integral, conditions of convergence, Fourier sine and cosine integrals, complex form, applications, Inversion formula for Fourier transform, operational properties. Discrete and Fast Fourier transform. Applications of Fourier transform to solve boundary value problems.

Unit- II:

Functions of a Complex Variable and Conformal mapping: (10 Hours)

Limit, Continuity, Differentiability and Analyticity of functions of a complex variable, Cauchy-Riemann equations, Harmonic functions, Complex functions as mappings, Linear Transformation, Inverse transformation, Bilinear Transformations, Conformal Mapping & applications.

Unit- III:

Integration of Complex Functions: (10 Hours)

Contour integrals and evaluations, Cauchy's Theorem, Cauchy's Integral Formulae, Liouville's theorem, Convergence of power series, Taylor series, Laurent series, Zeros and Singularities of a complex function, Residues and Residue theorem, Evaluation of definite and improper integrals.

Unit- IV:

Curve- Fitting & Probability: (8 Hours)

Curve-fitting: method of least- squares, Normal equations, Normal equation in case of straight line, Fitting a straight line, Polynomial, non-linear and exponential curves, Change of origin.

Probability: Basics of probability, random variables, Expectation, Baye's theorem and probability distributions, Binomial, Poisson and Normal distributions.

Unit- V:

Statistical Methods: (8 Hours)

Sampling Theory, Parameters of Statistics, Tests of hypothesis and significance, z-test, t-test, $\chi 2$- **test ,**Goodness of fit test**,** Time series analysis, Index numbers, Quality control chart and acceptance sampling, Introduction to design of experiments, Forecasting models.

Books Recommended:

1. R.K. Jain & S.R.K. Iyengar; Advanced Engineering Mathematics, Narosa Publishing House, 2002.
2. Erwin Kreyszig; Advanced Engineering Mathematics, John Wiley & Sons, 1962.
3. R.V. Churchill and J.L. Brown, Complex Variables and Applications, McGraw Hill, 1990.
4. B.S.Grewal, Higher Engineering Mathematics, Khanna Publisher, 2005.
5. J.H. Mathews and R.W. Howell, Complex analysis for Mathematics and

Engineering, 3rd Ed. Narosa, 1998.

BEE-301 NETWORK ANALYSIS AND SYNTHESIS (L-T-P-C: 3-1-0-4)

Unit – I: Graph Theory (8 Hours)

Graph of a network, Definitions, Tree, Co tree, Link, basic loop and basic cut set, Incidence matrix, Cut set matrix, Tie set matrix, Node and Mesh Analysis with dependent current and voltage sources. Mutual coupled circuits, Dot Convention in coupled circuits

Unit – II: Network Theorems - Applications to AC Networks (8 hours)

Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Reciprocity theorem, Millman's theorem, Compensation theorem, Concept of duality and dual networks

Unit – III: Network Transient and steady state analysis (10 Hours)

Solution of first and second order differential equations for Series and parallel R-L, R-C, R-L-C circuits, initial and final conditions in network elements, forced and free response, time constants, steady state and transient state response, Evaluation of time response both through classical and Laplace methods

Unit – IV Network Functions (8 Hours)

Concept of complex frequency, Transform impedances network functions of one port and two port networks, Concept of poles and zeros, Properties of driving point and transfer functions.

Two Port Networks- Characterization of LTI two port networks; Z, Y, ABCD, A'B'C'D', g and h parameters, Reciprocity and symmetry, Inter-relationships between the parameters, Interconnections of two port networks, Ladder and Lattice networks: T & Π representation

Unit – V Network Synthesis (6 Hours)

Positive real function; definition and properties, Properties of LC, RC and RL driving point functions, Synthesis of LC, RC and RL driving point immittance functions using Foster and Cauer first and second forms

Text Books:

1. M. E. Van Valkenburg, "Network Analysis", Prentice Hall of India
2. Alexander, Sadiku, "Fundamentals of Electric Circuits", McGraw Hill
3. D. Roy Choudhary, "Networks and Systems", Wiley Eastern Ltd.
4. C. L. Wadhwa, "Network Analysis and Synthesis", New Age International Publishers
5. A. Chakrabarti, "Circuit Theory", Dhanpat Rai & Co.

Reference Books:

1. Hayt, Kimmerly, Durbin, "Engineering Circuit Analysis", McGraw Hill
2. Donald E. Scott, "An Introduction to Circuit analysis: A System Approach", McGraw Hill
3. M. E. Van Valkenburg, "An Introduction to Modern Network Synthesis", Wiley Eastern Ltd.

4. T. S. K. V. Iyer, “Circuit Theory”, Tata McGraw Hill 5. Joseph A. Edminister, “ Theory & Problems of Electric Circuits”, McGraw Hill

BEE-302 ELECTRICAL MACHINES-I (L-T-P-C: 3-0-0-3)

Unit – I: Electro-Mechanical Energy Conversion (6 Hours)

Faraday's law and Lenz's law - time varying and rotational induced emfs – Energy balance, energy and coenergy – force and torque – singly and doubly excited systems – reluctance and mutual torques.

Unit – II: Basic Concepts in Electrical Machines (9 Hours)

Construction – Principle of operation - Windings: D.C Machine armature winding (lap and wave connection), field winding – MMF pattern of armature winding and field winding – Magnetic fields in rotating machinery - EMF and torque equations – losses in machines – armature reaction – commutation – Inter-poles and compensating windings

Unit – III: DC machine - motoring and generation (9 Hours)

Armature circuit equation for motoring and generation – methods of excitation, equivalent circuits and characteristics of generators and motors – testing and efficiency – starting - speed control, Ward-Leonard control - braking, Permanent Magnet DC Machines

Unit – IV: Transformers (8 Hours)

Principle, construction and operation of single-phase transformers, equivalent circuit, phasor diagram, voltage regulation, losses and efficiency Testing - open circuit and short circuit tests, polarity test, back-to-back test
Three-phase transformer - construction, types of connection and their comparative features, Parallel operation of single-phase and three-phase transformers

Unit – V: Special Purpose Transformers (8 Hours)

Autotransformers - construction, principle, applications and comparison with two winding transformer, Phase conversion - Scott connection, three-phase to six-phase conversion, Tap-changing transformers - No-load and on-load tap-changing of transformers, Three-winding transformers, Instrument Transformers.
Harmonics and switching transients in transformers, effect of transformer connections, inrush current, cooling of transformers

Text / References

1. I. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.
2. A. E. Fitzgerald and C. Kingsley, "Electric Machinery", New York, McGraw Hill Education, 2013.
3. A. E. Clayton and N. N. Hancock, "Performance and design of DC machines", CBS Publishers, 2004.
4. M. G. Say, "Performance and design of AC machines", CBS Publishers, 2002.
5. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.

BEE-303 SOLID STATE DEVICES AND CIRCUITS (L-T-P-C: 3-0-0-3)

Unit – I: PN junction Devices (7 Hours)

PN junction diode – structure, operation and V-I characteristic – current equation – drift current density and diffusion current density – diffusion and transient capacitance – Zener breakdown – zener reverse characteristic – zener as regulator; Optoelectronic devices - LED, LCD and LASER

Unit – II: BJT circuits (8 Hours)

Structure and I-V characteristics of a BJT; BJT as a switch, BJT as an amplifier: small-signal model, biasing circuits, current mirror; common-emitter, common-base and common-collector amplifiers; Small signal equivalent circuits, high-frequency equivalent circuits

Unit – III: MOSFET circuits (8 Hours)

MOSFET structure and I-V characteristics; MOSFET as a switch, MOSFET as an amplifier: small-signal model and biasing circuits, common-source, common-gate and common-drain amplifiers; small signal equivalent circuits - gain, input and output impedances, trans-conductance, high frequency equivalent circuit.

Unit – IV: Feed-back amplifiers and oscillators (9 Hours)

Principles of feedback in amplifiers advantages of negative feedback, Classification of feedback, voltage series, and voltage shunt, current series, Current – shunt effect of feedback on input and output impedance, Gain, stability, noise, distortion and band width Barkhausen criterion for sinusoidal oscillators. Phase shift oscillator. Wein-bridge oscillator, Hartley oscillator, Colpitts oscillator, crystal oscillator, frequency stability

Unit – V: Power Amplifiers (9 Hours)

Classification of Output stages A/B/AB, single-ended and Push-Pull Configuration, Power dissipation and Output Power conversion efficiencies, complimentary-symmetry Power Amplifier. Power BJTs, MOS Power Transistors, Temperature effects
Tuned Amplifiers:, Tuned Voltage Amplifier, single and double tuned amplifiers, Class-C Amplifier, RF Amplifiers.

Text/References:

1. S. Sedra and K. C. Smith, “Microelectronic Circuits”, New York, Oxford University Press, 1998.
2. David A. Bell, Electronic devices and circuits, Prentice Hall of India, 2004.
3. Rashid, Microelectronic circuits, Thomson publications, 1999
4. J. Millman and A. Grabel, “Microelectronics”, McGraw Hill Education, 1988.
5. Boylstad & Neshlshky/Electronics Devices & Circuits/PHI
6. P. Horowitz and W. Hill, “The Art of Electronics”, Cambridge University Press, 1989.

BEE-305 DIGITAL ELECTRONICS (L-T-P-C: 3-0-0-3)

Unit I : Digital Fundamentals (8 Hours)
Number Systems – Decimal, Binary, Octal, Hexadecimal, 1„s and 2„s complements, Codes – Binary, BCD, Excess 3, Gray, Alphanumeric codes, Boolean theorems, Logic gates, Universal gates, Sum of products and product of sums, Minterms and Maxterms, Karnaugh map Minimization and Quine-McCluskey method of minimization.

Unit II : Combinational Logic Design (8 Hours)
Design Examples: Arithmetic Circuits, BCD - to – 7 segment decoder, Code converters. Adders and their use as subtractor, look ahead carry, Digital Comparator, Parity generators/checkers, Multiplexers and their use in combinational logic designs, multiplexer , De-multiplexers and their use in combinational logic designs, Decoders, demultiplexer.

Unit III : Sequential Logic Design (9 Hours)
1 Bit Memory Cell, Clocked SR, JK, MS J-K flip flop, D and T flip-flops. Use of preset and clear terminals, Excitation Table for flip-flops, Conversion of flip flops, Application of Flip flops: Registers, Shift registers, Counters, Sequence Generators, ripple counters, up/down counters, synchronous counters. Basic design steps- State diagram, State table, State reduction, State assignment, Mealy and Moore machines representation, Implementation, finite state machine implementation

Unit IV : Digital Logic Families (8 Hours)
Classification of logic families, Characteristics of digital ICs-Speed of operation, power dissipation, figure of merit, fan in, fan out, current and voltage parameters, noise immunity, operating temperatures and power supply requirements. TTL logic. Operation of TTL NAND gate, active pull up, wired AND, open collector output. Tri-State logic. CMOS logic – CMOS inverter, NAND, NOR gates, wired logic , open drain output. Interfacing CMOS and TTL. Comparison table of Characteristics of TTL, CMOS, ECL, RTL, I2L, DCTL.

Unit V : Programmable Logic Devices and Semiconductor Memories (7 Hours)
Programmable logic devices: Detail architecture, Study of PROM, PAL, PLA, Designing combinational circuits using PLDs. General Architecture of FPGA and CPLD Semiconductor memories: memory organization and operation, expanding memory size, Classification and characteristics of memories, RAM,ROM,EPROM, EEPROM, NVRAM, SRAM,DRAM.

TextBooks:

1. R.P. Jain , “Modern digital electronics” , 3rd edition , 12threprint Tata McGraw Hill Publication, 2007.
2. M. Morris Mano, “Digital Logic and Computer Design” 4th edition, Prentice Hall of India, 2013.

Reference:

1. Anand Kumar, “Fundamentals of digital circuits” 1st edition, Prentice Hall of India, 2001
2.Tokheim, H. Roger L. /“Digital Electronics Principles & Application”/ Tata McGraw-Hill / 6th Ed.
3. NPTEL video lectures on Digital Circuits.

MC 302/MC 402 Human Values and Professional Ethics (L-T-P-C: 2-0-0-0)

UNIT-1

Course Introduction - Need, Basic Guidelines, Content and Process for Value Education Understanding the need, basic guidelines, content and process for Value Education, Self-Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facilities- the basic requirements for fulfilment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfill the above human aspirations.

UNIT-2

Understanding Harmony in the Human Being - Harmony in Myself Understanding human being as a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha, Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Swasthya.

UNIT-3

Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship Understanding harmony in the Family- the basic unit of human interaction, Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti (Mutual Happiness); Trust (Vishwas) and Respect (Samman) as the foundational values of relationship, Understanding the meaning of Vishwas; Difference between intention and competence, Understanding the meaning of Samman, Difference between respect and disrespect; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals, Visualizing a universal harmonious order in society.

UNIT-4

Understanding Harmony in the Nature and Existence - Whole existence as Co-existence Understanding the harmony in the Nature, Interconnectivity and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature, Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence.

UNIT-5

Implications of the Holistic Understanding of Harmony on Professional Ethics Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for

Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in Professional Ethics: a) Ability to utilize the professional competence for augmenting universal human order, b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, technologies and management models; Improving quality of work life at work place.

Text Books:

1. R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.

References:

1. A Nagraj, 1998, Jeevan Vidya Ek Parichay, Divya Path Sansthan, Amarkantak
2. R. Subramanian,2017, Professional Ethics,
3. P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
4. A N Tripathy, 2003, Human Values, New Age International Publishers.
5. SubhasPalekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) KrishiTantraShodh, Amravati.
6. E G Seebauer & Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers , Oxford University Press
7. M Govindrajran, S Natrajan & V.S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.
8. B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books.
9. B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.

BEE-401 ELECTRICAL MEASUREMENT AND INSTRUMENTS L-T-P-C: 3-0-0-3

Unit – I: Introduction to Measurement (8 Hours)

Measurement system, Methods of measurement, Classification of instrument systems, Characteristics of instruments, Unit, Dimensions, Standards, Scientific notations
Introduction to Error, Errors in Measurement & Measurement standards, Gross error, Systematic error, Absolute error, Relative error, Accuracy, Precision, Resolution, Measurement error combination

Unit – II: Transducers (8 Hours)

Transducers, Definition, Types of transducers, Selection of transducers, Advantages of transducers, Applications of transducers, Characteristics, Factors affecting the choice of transducers, Strain gauges, Resistance thermometer, Thermistors, Thermocouples, Linear variable differential transformer, Inductive transducers, Capacitive transducers, Piezoelectric transducers.

Unit – III: Measuring Instruments (8 Hours)

Electronic digital multimeter, Digital frequency meter system, Galvanometer, Voltmeter, Ammeter, Ohm meter, Energy meter, Q-meter

Measurement of Resistance: Resistance measurement, Measurement of low, medium and high resistances, Wheatstone bridge.

Measurement of Inductance And Capacitance: AC bridges for inductance measurement, AC bridges for capacitance measurement, Applications of bridges in measurement system.

Unit – IV: Display Devices (8 Hours)

Cathode Ray Oscilloscope (CRO): Circuit (Block diagram), Cathode Ray Tube (CRT) & its components, Applications of CRO in measurement, Measurement of voltage, frequency and phase by CRO, Types of CRO, Digital Storage Oscilloscope (DSO), Applications of Digital Storage Oscilloscope

Special Devices: Spectrum Analyzer, Logic Analyzer, Digital Multimeter as a standard instrument, Data Loggers, Digital Read Out Systems, Digital Input-Output devices.

Unit – V: Telemetry and Data Acquisition Systems (8 Hours)

Introduction to telemetry, Telemetry types, Landline telemetry, Radio telemetry, Telemetry applications. Introduction to Data acquisition systems, Data acquisition systems types, Analog Data acquisition systems and Digital Data acquisition systems, Data acquisition systems applications.

Text / Reference Books

1. A. K. Sawhney, “Advanced Measurements & Instrumentation”, Dhanpat Rai & Sons
2. Rajendra Prasad, “Electronic Measurement and Instrumentation Khanna Publisher
3. M.M.S. Anand, “Electronic Instruments and Instrumentation Technology” PHI Learning.
4. W. D. Cooper and A.P. Beltried, “Electronics Instrumentation and Measurement Techniques” Prentice Hall International
5. David A. Bell, “Electronic Instrumentation and Measurements”, Oxford University Press.

6. Oliver and Cage, "Electronic Measurements and Instrumentation", Tata McGraw Hill Publication.
7. Alan S. Morris, "Measurement and Instrumentation Principles", Elsevier (Butterworth Heinmann).

BEE-402 LINEAR INTEGRATED CIRCUITS L T P C 3 1 0 4

Unit I : OP-AMP Basics (9 Hours)

Introduction, , Differential Amplifier configurations, DC & AC analysis of all Differential amplifier configurations, Swamping resister, Constant current Bias, Current Mirror Circuits, Level Translator. Block diagram of OP-AMP. Op-amp internal circuit, Basic information of Op-amp, Op-amp charachteristics**,** Voltage series and voltage shunt feedback amplifier and its effect on Ri, Ro, bandwidth and voltage gain.

Unit II : Linear & Non-linear Applications of OP-AMP (9 Hours)

Inverting and Non-inverting amplifier, voltage follower. Summing, averaging, scaling amplifier, difference amplifier, Ideal integrator, practical integrator with frequency response, Ideal differentiator, practical differentiator with frequency response, Instrumentation amplifiers. Comparator, Schmitt trigger, clippers and clampers, voltage limiters, Square wave generator, triangular wave generator, peak detectors, sample and hold circuits.

Unit III : Filters & Oscillators (9 Hours)

Types of filter (LP,HP,BP, and Notch), first order & second order low-pass & High-pass filter. Oscillators principle, types and frequency stability, design of phase shift, wein bridge, Quadrature, voltage controlled oscillators.

Unit IV : Voltage Regulator & Converters (9 Hours)

Transistorized series-pass Regulator, overload short circuit protection, fixed & adjustable voltage regulators (LM317, 723 regulators), SMPS V-F, I-V and V-I converter, DAC: types of DAC, Weighted resister, R-2R ladder. ADC: types of ADC, Flash type, counter type, successive approximation resister.

Unit V : Signal generators and wave shaping circuits (9 Hours)

IC Timer-555, internal structure, pin diagram, monostable and astable operation. 565 Phase locked loop PLL, Block diagram of PLL and its function, VCO, Phase detector, applications of PLL, ICL 8038 function generator IC, isolation amplifiers, opto coupler, opto electronic ICs.

TEXT BOOKS:

1. Ramakant A.Gayakwad, Op-amps and Linear Integrated Circuits, IV edition, Pearson Education, 2009 / PHI.
2. D. Roy Choudhery, Sheil B. Jain, Linear Integrated Circuits, second edition, New Age publishers, 2010.

REFERENCES:

1. Robert F Coughlin, Fredrick, F. Driscold, Opamp and linear ICs, Pearson education, 4th edition, 2002.

2. David A Bell, Opamp and linear ICs, second edition, Prentice hall of India,1997.
David L Terrel, Opamps – design, applications and trouble shooting, Elsevier 2007.

BEE-307 ELECTRICAL MACHINES – II (L-T-P-C: 3-1-0-4)

UNIT-I Synchronous Generator (8 Hours)

Constructional details – Types of rotors –winding factors- emf equation – Synchronous reactance – Armature reaction – Phasor diagrams of non-salient pole synchronous generator connected to infinite bus–Synchronizing and parallel operation – Synchronizing torque - Change of excitation and mechanical input- Voltage regulation – EMF, MMF, ZPF and A.S.A methods – steady state power- angle characteristics– Two reaction theory –slip test -short circuit transients – Capability Curves

UNIT II Synchronous Motor (8 Hours)

Principle of operation – Torque equation – Operation on infinite bus bars – V and Inverted V curves – Power input and power developed equations – Starting methods – Current loci for constant power input, constant excitation and constant power developed-Hunting – natural frequency of oscillations – damper windings- synchronous condenser.

UNIT III Three Phase Induction Motor (8 Hours)

Constructional details – Types of rotors –- Principle of operation – Slip –cogging and crawling- Equivalent circuit – Torque-Slip characteristics – Condition for maximum torque – Losses and efficiency – Load test – No load and blocked rotor tests – Circle diagram – Separation of losses – Double cage induction motors –Induction generators – Synchronous induction motor.

Need for starting – Types of starters – DOL, Rotor resistance, Autotransformer and Star-delta starters – Speed control – Voltage control, Frequency control and pole changing – Cascaded connection-V/f control – Slip power recovery scheme-Braking of three phase induction motor: Plugging, dynamic braking and regenerative braking.

UNIT IV Single Phase Induction Motors (8 Hours)

Constructional details of single phase induction motor – Double field revolving theory and operation – Equivalent circuit – No load and blocked rotor test – Performance analysis – Starting methods of single-phase induction motors – Capacitor-start capacitor run Induction motor- Shaded pole induction motor

UNIT V Special Machines (8 Hours)

Linear induction motorRepulsion motor – Hysteresis motor – AC series motor – introduction to magnetic levitation systems – permanent magnet brushless DC motors - switched reluctance motors - Servo motors- Stepper motors

Text/References:

1. A. E. Fitzgerald and C. Kingsley, "Electric Machinery", McGraw Hill Education, 2013.
2. M. G. Say, "Performance and design of AC machines", CBS Publishers, 2002.
3. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.
4. I. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.
5. A. S. Langsdorf, "Alternating current machines", McGraw Hill Education, 1984.
6. P. C. Sen, "Principles of Electric Machines and Power Electronics", John Wiley & Sons, 2007.

BEE-308 ELECTROMAGNETIC THEORY (L-T-P-C: 3-1-0-4)

Unit 1: Review of Vector Calculus (8 Hours)

Vector algebra-addition, subtraction, components of vectors, scalar and vector multiplications, triple products, three orthogonal coordinate systems (rectangular, cylindrical and spherical). Vector calculus-differentiation, partial differentiation, integration, vector operator del, gradient, divergence and curl; integral theorems of vectors. Conversion of a vector from one coordinate system to another

Unit 2: Static Electric Field (8 Hours)

Coulomb's law, Electric field intensity, Electrical field due to point charges. Line, Surface and Volume charge distributions. Gauss law and its applications, Absolute Electric potential, Potential difference, Calculation of potential differences for different configurations, Electric dipole, Electrostatic Energy and Energy density

Conductors, Dielectrics and Capacitance Current and current density, Ohms Law in Point form, Continuity of current, Boundary conditions of perfect dielectric materials. Permittivity of dielectric materials, Capacitance Capacitance of a two wire line

Unit 3: Static Magnetic Fields (8 Hours)

Biot-Savart Law, Ampere Law, Magnetic flux and magnetic flux density, Scalar and Vector Magnetic potentials. Steady magnetic fields produced by current carrying conductors.

Magnetic Forces, Materials and Inductance (6 Hours) Force on a moving charge, Force on a differential current element, Force between differential current elements, Nature of magnetic materials, Magnetization and permeability, Magnetic boundary conditions, Magnetic circuits, inductances and mutual inductances.

Unit 4: Time Varying Fields and Maxwell's Equations (8 Hours)

Faraday's law for Electromagnetic induction, Displacement current, Point form of Maxwell's equation, Integral form of Maxwell's equations, Motional Electromotive forces, Boundary Conditions

Unit 5: Electromagnetic Waves (8 Hours)

Derivation of Wave Equation, Uniform Plane Waves, Maxwell's equation in Phasor form, Wave equation in Phasor form, Plane waves in free space and in a homogenous material. Wave equation for a conducting medium, Plane waves in lossy dielectrics, Propagation in good conductors, Skin effect. Poynting theorem.

Text / References:

1. M. N. O. Sadiku, "Elements of Electromagnetics", Oxford University Publication, 2014.
2. W. Hayt, "Engineering Electromagnetics", McGraw Hill Education, 2012.
3. A. Pramanik, "Electromagnetism - Theory and applications", PHI Learning Pvt. Ltd, New Delhi, 2009.
4. A. Pramanik, "Electromagnetism-Problems with solution", Prentice Hall India, 2012.
5. G.W. Carter, "The electromagnetic field in its engineering aspects", Longmans, 1954. W.J. Duffin, "Electricity and Magnetism", McGraw Hill Publication, 1980.
6. W.J. Duffin, "Advanced Electricity and Magnetism", McGraw Hill, 1968.
7. E.G. Cullwick, "The Fundamentals of Electromagnetism", Cambridge University Press, 1966.

8. B. D. Popovic, "Introductory Engineering Electromagnetics", Addison-Wesley Educational Publishers, International Edition, 1971.

BEE-308 DATA STRUCTURES AND ALGORITHMS (L-T-P-C: 3-0-0-3)

Unit 1 (8 Hours)

Introduction: Basic concepts and notations, Mathematical background, Revision of arrays and pointers, Recursion and implementation of Recursion, Time and Space Complexity, Asymptotic notations: Big Oh, Big Theta and Big Omega, Time-Space trade-off.

Searching: linear search and binary search techniques.

Unit 2 (8 Hours)

Stacks and Queues: Sequential representation of stacks and queues, Primitive Stack operations: Push & Pop, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression,conversion of infix to postfix.

Lists: List representation techniques, Dynamics Storage allocation, Representation of stacks and queues using linked list, Operations on a Linked List: Insertion, Deletion, Traversal, Introduction to Doubly linked list, introduction to circularly linked list.

Unit 3 (8 Hours)

Sorting Algorithms and hashing: Insertion sort, Bubble sort, Quick sort, Merge sort, Heap sort, Shell sort, Time and Space complexity of sorting algorithms, hashing.

Unit 4 (8 Hours)

Trees: Definition and basic concepts, Linked tree representations, Binary tree traversal algorithms,(Preorder, Inorder, Postorder), Binary search tree, Insertion and Deletion in Binary search tree, Multiway search trees, B trees, B+ tree and their applications.

Unit 5 (8 Hours)

Graphs: Introduction to Graphs, Data Structure for Graph Representations: Adjacency Matrices, Adjacency List, Graph Traversal: Depth First Search and Breadth First Search, Shortest Path algorithm: Warshal Algorithm and Dijikstra Algorithm.

Text Books and References:

1. Y. Langsam, M.J. Augenstein and A.M. Tenenbaum, Data Structure Using C and C++. Second Edition, Prentice Hall of India, 1997.
2. Seymour Lipschutz, Data Structures , Schaum's Outlines, Tata McGraw Hill , New Delhi, 2006
3. Lafore – Data structure & Algorithms in java, (BPB Publication)
4. Sartaj Sahni – Data structure, Algorithms & application in C++ (McGraw Hill)

MC 301/ MC 401 ENVIRONMENT AND ECOLOGY (L-T-P-C: 2-0-0-0)

UNIT-I: Nature of Environment Introduction to Environmental Science - Definition and scope and need for public awareness Ecosystems Concept, structure and functions, restoration of damaged ecosystems Biodiversity – Definition, description at national and global level, threats and conservation Natural Resources - Renewable and non-renewable and their equitable use for sustainability, Material cycles – carbon, nitrogen and sulphur cycle. Conventional and Non-conventional Energy Sources – fossil fuel-based, hydroelectric, wind, - nuclear and solar energy, biomass, biodiesel, hydrogen as an alternative fuel

UNIT-II: Impact of Human Activity on Environment Human Population and Environment – Population growth, population explosion and migration; Impact of farming, housing, mining, transportation and industrial growth Social Issues Related to Environment– Sustainable development, urban problems (related to water and energy conservation and waste management), resettlement and rehabilitation Environmental ethics

UNIT-III: Environmental Changes and Human Health Environmental Pollution–Definition, causes and effects, control measures for water, air, soil, marine, land, noise, thermal pollution, Climate change– Greenhouse effect and global warming, acid rain, ozone layer formation and depletion Impact on human health – water and air borne diseases, diseases induced by residual impurities in drinking water (fluoride and arsenic); Toxic wastes and carcinogens; Nuclear hazards

UNIT- IV: Environmental Protection through Assessment and Education Indicators and Impact Assessment – Bio-indicators, Natural disasters and disaster management, Impact assessment through inventorying and monitoring Environmental Protection– Role of individuals, organizations and government in pollution control Laws, Conventions and Treaties–National legislation, issues in the enforcement of environmental legislation, initiatives by non- governmental organizations, global efforts in environmental protection Environmental education–women and value education Recommended

Textbook: Environmental Studies, J Krishnawamy , R J Ranjit Daniels, Wiley India.

Recommended Reference Books:

1. Environmental Science, Bernard J. Nebel, Richard T. Right, 9780132854467, Prentice Hall Professional 1993.
2. Environment and Ecology, R K Khandal, 978-81-265-4277-2, Wiley India.
3. Environmental Science, 8th Ed ISV, Botkin and Keller, 9788126534142, Wiley India.
4. Environmental Studies, R Rajagopalan, 978-0195673937, Oxford University Press
5. Textbook of Environmental Science and Technology, M.Anjireddy, BS Publications
6. Environmental Studies, Soli. J Arceivala, Shyam, R Asolekar, 9781259006050, McGrawHill India, 2012.
7. Environmental Studies, D.L. Manjunath, 9788131709122 Pearson Education India, 2007
8. Textbook of Environment Ecology, Singh, Acme Learning
9. Perspective in Environmental Studies, Kaushik, New Age International
10. Environmental Studies, B. Joseph, 2nd Ed, 978-0070648134, Tata McGraw Hill

BEC-351 **Digital Electronics Lab** **(L-T-P-C: 0-0-2-1)**

List of experiment

1.To study about logic gate and verify their Truth table.

2.To design and implement half adder and full adder.

3.To design and implement half subtractor and full subtractor

4.To design and implement 8:1 MUX.

5.To design and implement 1:8 DEMUX.

6.To design and implement Encoder.

7.To design and implement Decoder.

8.To design and implement R-S flip flop and J K flip flop

9.To design and implement D & T flip flop

10.To design and implement Master -Slave flip flop

11.To design and implement SISO AND SIPO.

12.To design and implement PISO and PIPO.

13.To design and implement DECAD counter

BEE-351 Electrical Machines Lab –I (L-T-P-C: 0-0-2-1)

List of Experiments:

1. Determination of circuit parameters and loss in single phase transformer by OC test
2. Determination of circuit parameters in single phase transformer by SC test
3. Measurement of efficiency ad Voltage Regulation of transformer
4. Magnetization characteristic of DC shunt generator
5. Load Test on DC shunt generator
6. Load Test on DC series generator
7. Load Test on DC compound generator
8. Speed control of dc shunt motor by field control method
9. Speed control of dc shunt motor by armature control method
10. Hopkinson's test on DC shunt machines
11. Characteristics of DC shunt generator using digital simulation
12. Load test on DC shunt generator using digital simulation
13. Speed control techniques of DC motor using programmable logic controller and Lab VIEW

BEE-352 SOLID-STATE DEVICE & CIRCUIT LAB (L-T-P-C: 0-0-2-1)

List of Experiments:

1. Study of Lab Equipment and Components: CRO, Multimeter, and Function Generator, Power supply-Active, Passive Components and Bread Board.

2. P-N Junction diode: Characteristics of PN Junction diode - Static and dynamic resistance measurement from graph.

3. Applications of PN Junction diode: Half & Full wave rectifier- Measurement of Vrms, Vdc, and ripple factor.

4. Characteristics of Zener diode: V-I characteristics of Zener diode, Graphical measurement of forward and reverse resistance.

5. Application of Zener diode: Zener diode as voltage regulator. Measurement of percentage regulation by varying load resistor.

6. Characteristic of BJT: BJT in CE configuration- Graphical measurement of h-parameters from input and output characteristics. Measurement of Av, AI, Ro and Ri of CE amplifier with potential divider biasing.

7. Field Effect Transistors: Single stage Common source FET amplifier –plot of gain in dB Vs frequency, Measurement of, bandwidth, input impedance, maximum signal handling capacity (MSHC) of an amplifier.

10. Oscillators: Sinusoidal Oscillators

    a. Wein bridge oscillator

    b. phase shift oscillator.

11. Simulation of Amplifier circuits studied in the lab using any available simulation software.

BEE-451 MEASUREMENTS AND INSTRUMENS LAB (L-T-P-C: 0-0-2-1)

List of Experiments:

1. Study & observe the characteristics of Load Cell Sensor.
2. Study & observe the characteristics of LVDT.
3. Study & observe the characteristics of RTD Sensor.
4. Study & observe the characteristics of NTC Temperature Sensor.
5. Study & observe the characteristics of Temperature LM35 Sensor.
6. Study & observe the characteristics of Photovoltaic Cell.
7. Study & observe the characteristics of Photoconductive Cell.
8. Study & observe the characteristics of Photo Transistor.
9. Study & observe the characteristics of Photo Diode.
10. Study & observe the characteristics of Strain Gauge Sensor.
11. Study & observe the characteristics of IR Sensor.
12. Study & observe the characteristics of Ultrasonic Sensor.
13. Study & observe the characteristics of Smoke Sensor.
14. Study & observe the application of FPGA Trainer Kit.

BEC-453 LINEAR INTEGRATED CIRCUITS LAB (L-T-P-C: 0-0-2-1)

List of Experiments:

1. To design and implement an inverting amplifier circuit.
2. To design and implement a non-inverting amplifier circuit.
3. To design and implement a voltage follower circuit.
4. To design and implement a summing amplifier circuit.
5. To design and implement a difference amplifier circuit
6. To design and implement a Differentiator circuit
7. To design and implement an integrator circuit
8. To design and implement an Instrumentation Amplifier circuit
9. To design and implement Precision Rectifier circuit implement
10. To design and implement RC oscillator.
11. To design and implement LC oscillator.
12. To implement monostable, bistable, astable multivibrators using Opamp 741.
13. To implement Phase Locked Loop.
14. To implement Frequency Multiplier.
15. To implement A/D Converters & D/A Converters.
16. To implement Second Order Active Filter- High Pass & Low Pass Realization.

BEE-452 ELECTRICAL MACHINES LAB –II (L-T-P-C: 0-0-2-1)

1. No Load and Blocked Rotor Test on a 3- ϕ Induction Motor
2. Equivalent Circuit of a Single-Phase Induction Motor
3. Brake Test on 3- ϕ Squirrel Cage Induction Motor
4. Starting of Slip Ring Induction Motor by Rotor Resistance Method
5. Star-Delta Starter
6. Determination of X_d And X_q of Salient Pole Synchronous Motor
7. V' and 'Inverted V' Curves of Synchronous Motor
8. Voltage Regulation of Alternator by synchronous Impedance Method
9. Sumpner's Test on a Transformer
10. Scott Connection of Transformers
11. Parallel Operation of Transformers
12. Separation of Hysteresis and Eddy Current Losses in a Transformer
13. Brushless DC Motor – Load Characteristics and speed control
14. Single phase Induction motor

BCS-452 DATA STRUCTURES AND ALGORITHMS (L-T-P-C: 0-0-2-1)

Course Detail: Write Program in C / C++ for following:

1. To implement stack using array
2. To implement queue using array
3. To implement circular queue using array
4. To implement various operations on linked list:

   (a)insert (b)delete (c) display
5. To implement stack using linked list
6. To implement queue using linked list
7. To implement linear search
8. To implement binary search
9. To implement bubble sort
10. To implement insertion sort
11. To implement merge sort
12. To implement quick sort
13. Program to find the factorial of a number using recursion
14. To implement Heap sort
15. Implementation of graph menu driven program

Institute of Engineering & Technology

Dr. Bhim Rao Ambedkar University, Agra

Khandari Campus, Agra

Class : B.E. (Electrical Engineering)

Session 2021-2022 | **2nd Year** | **Batch : 2020-2024**

S.No.	College No.	Roll No.	Enroll No.	Cat.	Gen.	Candidate Name	Father's Name
1	20EE02	2009005611003	A-20006111	OBC	M	ADARSH VERMA	RAJESH VERMA
2	20EE03	2009005611004	A-20006112	GEN	M	ADITYA	UDAY PRATAP PAL
3	20EE04	2009005611005	A-20006113	OBC	M	AJIT KUMAR	CHANDRA PRAKASH
4	20EE05	2009005611006	A-20006114	GEN	F	AKANKSHA VERMA	KRISHNA DUTT VERMA
5	20EE06	2009005611007	A-20006115	SC	M	AKASH KUMAR	GIR PRASAD
6	20EE07	2009005611008	A-20006116	OBC	M	AKASH PAL	PAPPU PAL
7	20EE08	2009005611009	A-20006117	GEN-EWS	M	AMAN PRATAP PANDEY	SHESHMANI PANDEY
8	20EE10	2009005611010	A-20006118	OBC	M	ANMOL KATIYAR	GYAN PRAKASH KATIYAR
9	20EE11	2009005611011	A-20006119	GEN-EWS	M	ARPIT DIXIT	JITENDRA KUMAR DIXIT
10	20EE12	2009005611012	A-20006120	GEN	M	ARYAN SINGH VATS	VIJAY KUMAR SINGH
11	20EE13	2009005611013	A-20006121	GEN-EWS	M	ASHISH DUBEY	RAMASHANKAR DUBEY
12	20EE14	2009005611018	A-20006126	OBC	F	BANDANA YADAV	AJAD SINGH YADAV
13	20EE15	2009005611015	A-20006123	GEN	M	CHETAN TIWARI	NARESH TIWARI
14	20EE16	2009005611016	A-20006124	GEN-EWS	M	HARSHVARDHAN SINGH	GULAB SINGH
15	20EE17	2009005611017	A-20006125	GEN	M	HEMANT PRATAP SINGH	SUSHIL KUMAR SINGH
16	20EE18	2009005611019	A-20006127	OBC	M	MAHENDRA KUMAR	RADHE SHYAM
17	20EE19	2009005611021	A-20006129	OBC	M	MILAN KUMAR	PRADEEP KUMAR
18	20EE20	2009005611023	A-20006131	SC	M	NAMAN KUMAR	ANAND PARKASH
19	20EE21	2009005611024	A-20006132	OBC	M	NAVNIT KUMAR SHARMA	OMPRAKASH SHARMA
20	20EE22	2009005611028	A-20006136	OBC	M	PRABHAKAR YADAV	RAVINDRA NATH SINGH YADAV
21	20EE23	2009005611029	A-20006137	SC	M	PRADEEP KUMAR	SHYAM SUNDER
22	20EE24	2009005611030	A-20006138	GEN	M	PRANJAL KISHORE	KAUSHAL KUMAR
23	20EE25	2009005611031	A-20006139	SC	M	PRASHANT GAUTAM	RAJESH KUMAR
24	20EE26	2009005611032	A-20006140	GEN	M	PRASHANT KUMAR SRIVASTAVA	MITHILESH KUMAR SRIVASTAVA
25	20EE27	2009005611036	A-20006144	OBC	M	PRIYANSHU GUPTA	MAHENDRA PRASAD GUPTA
26	20EE28	2009005611035	A-20006143	OBC	M	PRIYANSHU GUPTA	RAM NATH GUPTA
27	20EE29	2009005611037	A-20006145	GEN	M	RAHISH USMANI	LATE RAMJAN USMANI
28	20EE30	2009005611038	A-20006146	GEN	M	RAMDHANI YADAV	KANHAIYA YADAV
29	20EE31			SC	M	RANJEET KUMAR RAJAK	MUKESH KUMAR RAJAK
30	20EE32			SC	M	RAVI GAUTAM	YOGENDRA PRASAD
31	20EE33			GEN	F	RUCHIJA SRIVASTAVA	AMIT SRIVASTAVA
32	20EE34	2009005611040	A-20006148	GEN	M	SAHARSH SRIVASTAVA	MAN MOHAN SRIVASTAVA
33	20EE35	2009005611041	A-20006149	OBC	M	SANJEET KUMAR VERMA	SHIVJEE VERMA
34	20EE36	2009005611042	A-20006150	OBC	M	SATYAM MAURYA	UMA SHANKAR MAURYA
35	20EE37	2009005611043	A-20006151	OBC	M	SHASHANK SINGH	MAUJILAL SINGH
36	20EE38	2009005611045	A-20006153	OBC	M	SHIV RAJ PATEL	HARI SHANKAR PATEL
37	20EE39	2009005611044	A-20006152	SC	M	SHIVAM GOND	GANESH PRASAD
38	20EE40	2009005611046	A-20006154	GEN	M	SHRI KANT PANDEY	AJAY KUMAR PANDEY
39	20EE41	2009005611047	A-20006155	OBC	M	SIKANDAR CHAURSIYA	BUDHI RAM
40	20EE42	2009005611048	A-20006156	OBC	M	SUJIT PRAJAPATI	PRAKASH PRAJAPATI
41	20EE43	2009005611049	A-20006157	GEN-EWS	F	SWATI PANDEY	VIJAY KUMAR PANDEY
42	20EE44	2009005611050	A-20006158	SC	M	TUSHAR CHAUDHARY	DINESH KUMAR
43	20EE45	2009005611051	A-20006159	OBC	M	VIKASH GUPTA	RAMESH CHANDRA GUPTA
44	20EE46	2009005611052	A-20006160	SC	M	VIRENDRA PRATAP BHARTI	DILRAJ
45	20EE47	2009005611054	A-20006162	SC	M	YASH KUMAR	SANJEEV KUMAR
46	20EE48	2009005611055	A-20006163	OBC	M	YOGENDRA SINGH	SURESH KUMAR SINGH
47	20EE49	2009005611056	A-20006164	SC	M	YOGESH PRABHAKAR	SUNIL KUMAR
48	20EE50	2009005611057	A-20006165	SC	M	YUVRAJ NIGAM	SANTOSH NIGAM
49	20EE51	2009005611001	A-20006109	OBC	M	ABHISHEK CHAUHAN	MURLIDHAR CHAUHAN
50	20EE52	2009005611002	A-20006110	OBC	M	ABHISHEK KUMAR	SANJAY
51	20EE53	2009005611020	A-20006128	SC	M	MANISH PRATAP SINGH	RAM AVTAR SINGH
52	20EE54	2009005611025	A-20006133	OBC	M	NEERAJ KUMAR YADAV	RAMAKANT

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RAJEEV KUMAR
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53	20EE55	2009005611026	A-20006134	GEN	M	NIRAJ TIWARI	MOHAN TIWARI
54	20EE56	2009005611027	A-20006135	GEN	M	PIYUSH SRIVASTAVA	BRAJESH KUMAR SRIVASTAVA
55	20EE57	2009005611034	A-20006142	OBC	M	PRAVEEN KUMAR	HARI SINGH
56	20EE58	2009005611058	A-20006166	OBC	F	ANVESHA YADAV	VINOD YADAV
57	20EE59	2009005611014	A-20006122	OBC	M	AYUSHMAN YADAV	VIPENDRA YADAV
58	20EE60	2009005611033	A-20006141	SC	M	PRATEEK KUMAR	VIPIN KUMAR
59	20EE61	2009005611039	A-20006147	SC	M	ROHIT KUMAR SONI	MUKESH KUMAR
60	20EE62	2009005611022	A-20006130	GEN	F	MINAKSHI SINGH	GIRENDRA KUMAR SINGH
61	20EE63	2009005611053	A-20006161	SC	M	VISHAL KUMAR	RAJ KUMAR
62	20EED64	2109005614002		OBC	M	ASHWANI NISHAD	RAM BHARAT NISHAD
63	20EED65	2109005614004		OBC	M	GAUTAM PATEL	MAHENDAR PATEL
64	20EED66	2109005614005		GEN	M	HARSHIT MISHRA	BRIJESH MISHRA
65	20EED67	2109005614006		OBC	M	LAKSHMI NARAYAN	RAM KISHAN
66	20EED68	2109005614008		SC	M	PINTU	HARIOM
67	20EED69	2109005614009		SC	F	RATI KUMARI	SATYA PAL SINGH
68	20EED70			SC	M	ROHIT KUMAR	SATYENDRA PAL
69	20EED71	2109005614001		OBC	M	ABHISHEK KASHYAP	PUSHPENDRA SINGH
70	20EED72	2109005614003		OBC	M	AVANISH KUMAR MAURYA	VIJAY BAHADUR MAURYA
71	20EED73	2109005614007		SC	M	MOHIT VERMA	SUBHASH CHANDRA VERMA

Incharge

Director

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RAJEEV KUMAR
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