FACULTY OF ENGINEERING

Scheme of Instruction & Examination

(AICTE Model Curriculum for the Academic Year 2020-2024)

and

Syllabi

B.E. I to VIII Semesters

of

Four Year Degree Programme

in

B.E. (Mechanical Engineering)

(With effect from the Academic Year 2020– 2021)
(As approved in the Faculty Meeting held on 04 Jan, 2021)

Issued by
Dean, Faculty of Engineering
Osmania University, Hyderabad
30.01.2021

Osmania University, Hyderabad

Vision

The Vision of the University is to generate and disseminate knowledge through a harmonious blend of ancient and modern wisdom, and to serve the society by developing in students heightened intellectual, cultural, ethical, and humane sensitivities; to foster a scientific temper, and to promote professional and technological expertise. Central to this vision is a commitment to regional and national development in consonance with our culture, heritage, and environment.

Mission

- To achieve excellence in teaching and research.
- To generate, disseminate and preserve knowledge.
- To meet the challenges of a complex, and modern society through informed social outreach.
- To empower through knowledge and information.
- To develop a responsible and productive citizenry.
- To develop, enhance, and improve the quality of human resources.
- To cultivate resolute moral and ethical values.
- To meet contemporary regional and national needs and anticipate future social and economic development.
- To preserve and promote cultural heritage, humanistic and spiritual values.

Program Educational Objectives (BE Mechanical Engineering)

- **Objective 1**

  To provide the requisite fundamentals of varied subjects related to Mechanical Engineering to conceive, plan, model, design, construct, maintain and improve systems to enhance human comfort.

- **Objective 2**

  To provide knowledge of experimental, computational, analytical, simulation tools and techniques require to address the challenges in Mechanical Engineering and other allied fields.

- **Objective 3**

  To provide knowledge for applying Mechanical Engineering Fundamentals to design and implement cost effective systems in manufacturing.

- **Objective 4**

  To provide effective communication skills, creative methods, ethics and continuous learning techniques to fulfill their professional requirements and societal needs.

POs	Engineering Graduates will be able to:
PO1	**Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an mechanical engineering to the solution of complex engineering problems.
PO2	**Problem Analysis:** Identify, formulate, review research literature, and analyze complex engineering problems related to mechanical engineering and allied fields reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**Conduct investigations of complex problems:** Use research based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the Mechanical engineering practice.
PO7	**Environment and sustainability:** Understand the impact of the Mechanical engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the mechanical engineering practice.
PO9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project management and finance:** Demonstrate knowledge and understanding of the mechanical engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Lifelong learning:** Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.
PS01	Apply the principles of collaborative and multi disciplinary approach for solving problems
PS02	Able to interact with industry and R&D institutions leading to start-ups/ budding entrepreneurs.

For the academic years 2020-2024

SCHEME OF INSTRUCTION & EXAMINATION
AICTE Model Curriculum
B. E. I – Semester (MECHANICAL ENGINEERING)
(Proposed for the Academic year 2020-2021)

S. No.	Course Code	Course Title	Scheme of Instructions				Scheme of Examination			Credits
			L	T	P/D	Contact Hours/Week	CIE	SEE	Duration in Hours	
Three Week Induction Programme										
Theory Course										
1	MC801PO	Indian Constitution	2	-	-	2	30	70	3	-
2	BS201MT	Mathematics-I	3	1	-	4	30	70	3	4
3	BS202PH	Engineering Physics	3	1	-	4	30	70	3	4
4	ES301EE	Basic Electrical Engineering	3	1	-	4	30	70	3	4
Practical / Laboratory Course										
5	BS251PH	Physics Lab	-	-	3	3	25	50	3	1.5
6	ES354EE	Basic Electrical Engineering Lab	-	-	2	2	25	50	3	1
7	ES353CE	Engineering Graphics	-	-	6	6	50	50	3	3
Total										**17.5**

MC: Mandatory Course **BS**: Basic Science **ES:** Engineering Science
L: Lecture **T**: Tutorial **P**: Practical **D**: Drawing
CIE: Continuous Internal Evaluation **SEE:** Semester End Examination (Univ. Exam)

Note:

1. Each contact hour is a clock hour
2. The duration of the practical class is two hours, however it can be extended wherever necessary, to enable the student to complete the experiment.

For the academic years 2020-2024

SCHEME OF INSTRUCTION & EXAMINATION
AICTE Model Curriculum
B. E. II – Semester (MECHANICAL ENGINEERING)
(Proposed for the Academic year 2020-2021)

S. No.	Course Code	Course Title	Scheme of Instructions				Scheme of Examination			Credits
			L	T	P/D	Contact Hours/Week	CIE	SEE	Duration in Hours	
Theory Course										
1	MC802CE	Environmental Science	2	-	-	2	30	70	3	-
2	MC803PY	Essence of Indian Traditional Knowledge	2	-	-	2	30	70	3	-
3	HS101EG	English	2	-	-	2	30	70	3	2
4	BS203MT	Mathematics-II	3	1	-	4	30	70	3	4
5	BS204CH	Engineering Chemistry	3	1	-	4	30	70	3	4
6	ES302CS	Programming for Problem Solving	3	-	-	3	30	70	3	3
Practical / Laboratory Course										
7	HS151EG	English Lab			2	2	25	50	3	1
8	BS252CH	Chemistry Lab			3	3	25	50	3	1.5
9	ES351CS	Programming for Problem Solving Lab			2	2	25	50	3	1
10	ES352ME	Workshop Practice	-	-	6	6	50	50	3	3
Total										**19.5**

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For the academic years 2020-2024

SCHEME OF INSTRUCTION & EXAMINATION
AICTE Model Curriculum
B. E. III – Semester (MECHANICAL ENGINEERING)
(Proposed for the Academic year 2020-2021)

S. No.	Course Code	Course Title	Scheme of Instructions				Scheme of Examination			Credits
			L	T	P/D	Contact Hours/Week	CIE	SEE	Duration in Hours	
Theory Course										
1	HS102EG	Effective Technical Communication in English	2	-	-	2	30	70	3	2
2	HS103CM	Finance and Accounting	3	-	-	3	30	70	3	3
3	BS205MT	Mathematics-III	3	-	-	3	30	70	3	3
4	ES303ME	Engineering Mechanic-I	3	-	-	3	30	70	3	3
5	ES304EC	Basic Electronics	3	-	-	3	30	70	3	3
6	PC401ME	Metallurgy and Material Science	3	-	-	3	30	70	3	3
7	PC402ME	Thermodynamics	3	-	-	3	30	70	3	3
Practical / Laboratory Course										
8	PC451ME	Metallurgy and Material Testing Lab	-	-	2	2	25	50	3	1
9	PC452ME	Machine Drawing and Modeling Lab	-	-	2	2	25	50	3	1
Total										**22**

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Note:

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For the academic years 2020-2024

SCHEME OF INSTRUCTION & EXAMINATION
AICTE Model Curriculum
B. E. IV – Semester (MECHANICAL ENGINEERING)
(Proposed for the Academic year 2020-2021)

S. No.	Course Code	Course Title	Scheme of Instructions				Scheme of Examination			Credits
			L	T	P/D	Contact Hours/Week	CIE	SEE	Duration in Hours	
Theory Course										
1	ES304ME	Engineering Mechanic-II	3	-	-	3	30	70	3	3
2	PC403ME	Fluid Mechanics	3	-	-	3	30	70	3	3
3	ES305ME	Energy Sciences and Engineering	2	-	-	2	30	70	3	2
4	PC404ME	Mechanics of Materials	3	-	-	3	30	70	3	3
5	PC405ME	Applied Thermodynamics	3	-	-	3	30	70	3	3
6	PC406ME	Kinematics of Machinery	3	-	-	3	30	70	3	3
7	PC407ME	Manufacturing Processes	3	-	-	3	30	70	3	3
Practical / Laboratory Course										
7	PC453ME	Thermal Engineering Lab -I	-	-	2	2	25	50	3	1
8	PC454ME	Manufacturing Processes Lab	-	-	2	2	25	50	3	1
Total										**22**

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CIE: Continuous Internal Evaluation **SEE:** Semester End Examination (Univ. Exam)

Note:

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SCHEME OF INSTRUCTION & EXAMINATION
AICTE Model Curriculum
B. E. V – Semester (MECHANICAL ENGINEERING)
(Proposed for the Academic year 2020-2021)

S. No.	Course Code	Course Title	Scheme of Instructions				Scheme of Examination			Credits
			L	T	P/D	Contact Hours/Week	CIE	SEE	Duration in Hours	
Theory Course										
1	PC408ME	Hydraulic Machines	3	-	-	3	30	70	3	3
2	PC409ME	Design of Machine Elements	3	-	-	3	30	70	3	3
3	PC410ME	Dynamics of Machines	3	-	-	3	30	70	3	3
4	PC411ME	Metrology and Instrumentation	3	-	-	3	30	70	3	3
5	PC412ME	Heat Transfer	3	-	-	3	30	70	3	3
6	PE51ME	Professional Elective-I	3	-	-	3	30	70	3	3
Practical / Laboratory Course										
7	PC455ME	Thermal Engineering Lab-2	-	-	2	2	25	50	3	1
8	PC456ME	Dynamics of Machines Lab	-	-	2	2	25	50	3	1
9	PC457ME	Fluid Mechanics and Hydraulics Machinery Lab	-	-	2	2	25	50	3	1
Total										**21**

Professional Elective-I		
S. No.	**Course Code**	**Course Title**
1	PE511ME	CAD/CAM
2	PE512ME	Automobile Engineering
3	PE513ME	Industrial Engineering

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SCHEME OF INSTRUCTION & EXAMINATION
AICTE Model Curriculum
B. E. VI – Semester (MECHANICAL ENGINEERING)
(Proposed for the Academic year 2020-2021)

S. No.	Course Code	Course Title	Scheme of Instructions				Scheme of Examination			Credits
			L	T	P/D	Contact Hours/Week	CIE	SEE	Duration in Hours	
Theory Course										
1	PC413ME	Machine Design	3	-	-	3	30	70	3	3
2	PC414ME	Metal Cutting and Machine Tools	3	-	-	3	30	70	3	3
3	PC415ME	Finite Element Analysis	3	-	-	3	30	70	3	3
4	PE52ME	Professional Elective-II	3	-	-	3	30	70	3	3
5	PE53ME	Professional Elective-III	3	-	-	3	30	70	3	3
6	OE61	Open Elective-I	3	-	-	3	30	70	3	3
Practical / Laboratory Course										
7	PC458ME	Metrology and Machine Tools Lab	-	-	2	2	25	50	3	1
8	PC459ME	Computer Aided Engineering Lab	-	-	2	2	25	50	3	1
9	PW701ME	Summer Internship*						50		2
Total										**22**

Professional Elective-II			**Professional Elective-III**		
S. No.	**Course Code**	**Course Title**	**S. No.**	**Course Code**	**Course Title**
1.	PE521ME	Thermal Turbo Machines	1.	PE531ME	Composite Materials
2.	PE522ME	Production and Operations management	2.	PE532ME	Product Design And Process Planning
3.	PE523ME	Design For Manufacture	3.	PE533ME	Power Plant Engineering

Open Elective-I		
S. No.	**Course Code**	**Course Title**
1	OE611ME	Industrial Robotics (Not for Mech. Engg. students)

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Note: 1. Each contact hour is a clock hour

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* ***At the end of VI semester students should undergo Summer Internship. Credits for Summer Internship will be awarded in VII semester.***

SCHEME OF INSTRUCTION & EXAMINATION
AICTE Model Curriculum
B. E. VII – Semester (MECHANICAL ENGINEERING)
(Proposed for the Academic year 2020-2021)

S. No.	Course Code	Course Title	Scheme of Instructions				Scheme of Examination			Credits
			L	T	P/D	Contact Hours/Week	CIE	SEE	Duration in Hours	
Theory Course										
1	HS104ME	Operations Research	3	-	-	3	30	70	3	3
2	PC416ME	Automation in Manufacturing	3	-	-	3	30	70	3	3
3	PE54ME	Professional Elective-IV	3	-	-	3	30	70	3	3
4	PE55ME	Professional Elective-V	3	-	-	3	30	70	3	3
5	OE62	Open Elective-II	3	-	-	3	30	70	3	3
Practical / Laboratory Course										
6	PW702ME	Project -I	-	-	6	6	50			3
Total										**18**

Professional Elective-IV			**Professional Elective-V**		
S. No.	**Course Code**	**Course Title**	**S. No.**	**Course Code**	**Course Title**
1	PE541ME	3D Printing Technology	1	PE551ME	Non- Destructive Testing
2	PE542ME	Robotics Engineering	2	PE552ME	Mechanical Vibrations
3	PE543ME	Refrigeration & Air Conditioning	3	PE553ME	Total Quality Management
4	PE544ME	Tool Design			

Open Elective-II		
S. No.	**Course Code**	**Course Title**
1	OE621ME	Entrepreneurship (Not for Mech. Engg. students)

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Note:

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2. The duration of the practical class is two hours, however it can be extended wherever necessary, to enable the student to complete the experiment.

For the academic years 2020-2024

SCHEME OF INSTRUCTION & EXAMINATION
AICTE Model Curriculum
B. E. VIII – Semester (MECHANICAL ENGINEERING)
(Proposed for the Academic year 2020-2021)

S. No	Course Code	Course Title	Scheme of Instructions				Scheme of Examination			Credits
			L	T	P/D	Contact Hours/Week	CIE	SEE	Duration in Hours	
Theory Course										
1	PE56ME	Professional Elective-VI	3	-	-	3	30	70	3	3
2	OE63	Open Elective-III	3	-	-	3	30	70	3	3
Practical / Laboratory Course										
3	PW703ME	Project-II	-	-	16	16	50	150		8
Total										**14**

Professional Elective-VI		
S. No.	**Course Code**	**Course Title**
1	PE561ME	Energy Conversation & Management
2	PE562ME	Entrepreneurship Development
3	PE563ME	Control Systems Theory
4	PE564ME	Cryogenics

Open Elective-III		
S. No.	**Course Code**	**Course Title**
1.	OE631ME	Mechatronics (Not for Mech Engg students)

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Note:
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2. The duration of the practical class is two hours, however it can be extended wherever necessary, to enable the student to complete the experiment.

For the academic years 2020-2024

SCHEME OF INSTRUCTION & EXAMINATION
AICTE Model Curriculum
B. E. I – Semester (MECHANICAL ENGINEERING)
(Proposed for the Academic year 2020-2021)

S. No.	Course Code	Course Title	Scheme of Instructions				Scheme of Examination			Credits
			L	T	P/D	Contact Hours/Week	CIE	SEE	Duration in Hours	
Three Week Induction Programme										
Theory Course										
1	MC801PO	Indian Constitution	2	-	-	2	30	70	3	-
2	BS201MT	Mathematics-I	3	1	-	4	30	70	3	4
3	BS202PH	Engineering Physics	3	1	-	4	30	70	3	4
4	ES301EE	Basic Electrical Engineering	3	1	-	4	30	70	3	4
Practical / Laboratory Course										
5	BS251PH	Physics Lab	-	-	3	3	25	50	3	1.5
6	ES354EE	Basic Electrical Engineering Lab	-	-	2	2	25	50	3	1
7	ES353CE	Engineering Graphics	-	-	6	5	50	50	3	3
Total										**17.5**

MC: Mandatory Course **BS**: Basic Science **ES:** Engineering Science
L: Lecture **T**: Tutorial **P**: Practical **D**: Drawing
CIE: Continuous Internal Evaluation **SEE:** Semester End Examination (Univ. Exam)

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INDIAN CONSTITUTION

MC801PO

Instruction: 2 periods per week *Duration of SEE: 3 hours*
CIE: 30 marks *SEE: 70 marks*
Credits: Nil

Objectives:

1. To create awareness among students about the Indian Constitution.
2. To acquaint the working conditions of union, state, local levels, their powers and functions.
3. To create consciousness in the students on democratic values and principles articulated in the constitution.
4. To expose the students on the relations between federal and provincial units.
5. To divulge the students about the statutory institutions

Outcomes:

After completing this course, the student will
1. Know the background of the present constitution of India.
2. Understand the working of the union, state and local levels.
3. Gain consciousness on the fundamental rights and duties.
4. Be able to understand the functioning and distribution of financial resources between the centre and states.
5. Be exposed to the reality of hierarchical Indian social structure and the ways the grievances of the deprived sections can be addressed to raise human dignity in a democratic way.

UNIT – I
Evolution of the Indian Constitution: 1909 Act, 1919 Act and 1935 Act. Constituent Assembly: Composition and Functions; Fundamental features of the Indian Constitution.
UNIT – II
Union Government: Executive-President, Prime Minister, Council of Minister ***State Government:*** Executive: Governor, Chief Minister, Council of Minister ***Local Government*****:** Panchayat Raj Institutions, Urban Government
UNIT – III
Rights and Duties: Fundamental Rights, Directive principles, Fundamental Duties
UNIT – IV
Relation between Federal and Provincial units**:** Union-State relations, Administrative, legislative and Financial, Inter State council, NITI Ayog, Finance Commission of India
UNIT – V
Statutory Institutions**:** Elections-Election Commission of India, National Human Rights Commission, National Commission for Women

Suggested Reading:

1	D.D. Basu, "*Introduction to the constitution of India"*, Lexis Nexis, New Delhi
2	Subhash Kashyap, "*Our Parliament"*, National Book Trust, New Delhi
3	Peu Ghosh, "*Indian Government &Politics"*, Prentice Hall of India, New Delhi
4	B.Z. Fadia & Kuldeep Fadia, "*Indian Government &Politics"*, Lexis Nexis, New Delhi

MATHEMATICS - I

BS201MT

Instruction: 3+1 periods per week *Duration of SEE: 3 hours*
CIE: 30 marks *SEE: 70 marks*
Credits: 4

Objectives:

1. To introduce the concepts of sequences, series and their properties
2. To introduce the concepts of functions of several variables and multiple integrals
3. To study vector differential and integral calculus

Outcomes:

The students will able to
1. Find the nature of sequences and series
2. Evaluate multiple integrals
3. Apply this knowledge to solve the curriculum problems

Unit-I
Sequences and Series: Sequences, Series, General properties of series, Series of positive terms, Comparison tests, tests of Convergence D'Alembert's ratio test, Cauchy's n^{th} root test, Raabe's test, Logarithmic test, Alternating series, Series of positive and negative terms, Absolute convergence and Conditional convergence.
Unit-II:
Calculus of one Variable: Rolle's theorem, Lagrange's, Cauchy's mean value theorems, Taylor's series, Curvature, Radius of curvature, Circle of curvature, Envelope of a family of curves, Evolutes and Involutes.
Unit-III
Multivariable Calculus (Differentiation): Functions of two variables, Limits and continuity, Partial derivatives, Total differential and differentiability, Derivatives of composite and implicit functions (Chain rule), Change of variables, Jacobian, Higher order partial derivatives, Taylor's series of functions of two variables, Maximum and minimum values of functions of two variables, Lagrange's method of undetermined multipliers
Unit-IV
Multivariable Calculus (Integration): Double integrals, Change of order of integration, Change of Variables from Cartesian to plane polar coordinates, Triple integrals.
Unit-V
Vector Calculus: Scalar and vector fields, Gradient of a scalar field, Directional derivative, Divergence and Curl of a vector field, Line, Surface and Volume integrals, Green's theorem in a plane, Gauss's divergence theorem, Stoke's theorem (without proofs) and their verification.

Suggested Reading:

1	R.K. Jain & S.R.K Iyengar, "*Advanced Engineering Mathematics"*, Narosa Publications, 2014.
2	Erwin Kreyszig, "*Advanced Engineering Mathematics"*, John Wiley, 9^{th} Edition, 2012.
3	B.S. Grewal, "*Higher Engineering Mathematics"*, Khanna Publications, 43^{rd} Edition, 2014
4	G.B. Thomas, Maurice Weir and Joel Hass, "*Thomas' Calculus"*, Peterson, 12^{th} Edition,2010.
5	B.V. Ramana, "*Higher Engineering Mathematics"*, 23^{rd} reprint, 2015.

ENGINEERING PHYSICS

BS202PH

Instruction: 3+1 periods per week *Duration of SEE: 3 hours*
CIE: 30 marks *SEE: 70 marks*
Credits: 4

Objectives:

1. Aware of limits of classical free electron free theory and to apply band theory of solids
2. Acquire knowledge on various properties of semiconductors.
3. Grasp the intricacies in semiconductor-optical interaction

Outcomes:

1. Distinguish materials based on band theory of solids
2. Classify semiconductors on the basis doping and to estimate conductivity and learn transport phenomenon in semiconductors
3. Appreciate use of optical absorption by semiconductors.

Unit-I
Crystallography: Introduction, Types of crystal systems, Bravais lattices, Lattiee planes and Miller Indices (Cubic system), Inter planar spacing (Cubic system), Bragg's law, Powder diffraction method. ***Crystal Defects*****:** Classification of point defects, Concentration of Schottky defects in metals and ionic crystals, Concentration of Frankel defects, Line defects, Screw and Edge dislocations, Burger's vector**.**
Unit-II:
Band Theory of Solids & Semiconductors**:** Classical free electron theory (qualitative), Kronig Penney model (qualitative treatment), Energy band formation in solids, Intrinsic and Extrinsic semiconductors, Concept of a hole, Carrier concentration and conductivity in intrinsic semiconductors, Formation of P-N junction diode and its I – V characteristics, Thermistor and its characteristics, Hall effect and its applications. ***Dielectric Materials*****:** Dielectrics, Types of polarizations, Electronic, Ionic, Orientational and Space charge polarizations, Expression for Electronic polarizability, Frequency and temperature dependence of dielectric polarizations, Determination of dielectric constant by capacitance Bridge method, Ferro electricity, Barium titanate, Applications of Ferroelectrics.
Unit-III
Wave Mechanics: Matter waves –de-Broglie wavelength, properties of wave function, Physical significance, Schrodinger time dependent and time in-dependent wave equation. Particle in a 1-D box. ***Electromagnetic theory:*** Basic laws of electricity and magnetism, Maxwell's equations in integral and differential forms, Conduction and displacement current, Relation between D, E and P – ***Electromagnetic waves*****:** Equation of plane wave in free space, Poynting theorem.
Unit-IV
Magnetic Materials: Classification of magnetic materials: dia, para, ferro, antiferro and ferrimagnetic materials, Weiss molecular field theory of ferromagnetism, Magnetic domains, Hysteresis curve, soft and hard magnetic materials, Ferrites: Applications of ferrites. ***Superconductivity:*** Introduction, General properties of super conductors, Meissner effect, Type I and Type II superconductors, BCS theory (qualitative), Introduction to High T_c superconductors, Applications of superconductors

Unit-V
Lasers: Characteristics of Lasers, spontaneous and stimulated emission of radiation, Einstein's Coefficients, population inversion, Ruby Laser, Helium Neon Laser, Semi-Conductor Laser and applications of lasers. ***Fiber Optics:*** Introduction, Propagation of light through an optical fiber, Acceptance angle, Numerical aperture (NA), Types of Optical fibers and Refractive index profiles, Fiber drawing process (double Crucible Method), Losses in optical fibers, applications of optical fibers.

Suggested Reading:

1. B.K. Pandey and S. Chaturvedi "*Engineering Physics"* Cengage Learning 2012
2. A.K. Bhandhopadhya, "*Nano Materials"*, New Age International, 1st Edition, 2007
3. M.S. Avadhanulu and P.G. Kshirusagar, "*Engg. Physics"*, S. Chand & Co. 1st Edition, 1992.
4. C.M. Srivastava and C. Srinivasan – "*Science of Engg Materials"*, New Age International.
5. R.K Gaur and S.L Gupta- "*Engineering Physics"*, Dhanpathrai Publications, New edition.
6. Sanjay D Jain & Girish G Sahasrabudhe –"*Engineering Physics"*, University Press

BASIC ELECTRICAL ENGINEERING

ES301EE

Instruction: 3+1 periods per week *Duration of SEE: 3 hours*
CIE: 30 marks *SEE: 70 marks*
Credits: 4

Objectives:

1. To provide an understanding of basics in Electrical circuits.
2. To explain the working principles of Electrical Machines and single phase transformers.

Outcomes:

1. To analyze Electrical circuits to compute and measure the parameters of Electrical Energy.
2. To comprehend the working principles of Electrical DC Machines.
3. To Identify and test various Electrical switchgear, single phase transformers and assess the ratings needed in given application.
4. To comprehend the working principles of electrical AC machines.

Unit-I
***DC Circuits*:** Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems.
Unit-II:
***AC Circuits*:** Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, and RL, RC, RLC combinations (series only). Three phase balanced circuits, voltage and current relations in star and delta connections.
Unit-III
Transformers and 3-ph Induction Motors: Transformers: Electromagnetic induction, Faradays laws, statically induced emf, Lenz law, BH characteristics, ideal and practical transformer, losses and efficiency, Auto-transformer and three-phase transformer connections. ***Three Phase Induction motor:*** Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, squirrel cage IM, slip-ring IM, Applications.
Unit-IV
Single-phase induction motor & DC Machines: Single-phase induction motor: Construction and principle of operation, Capacitor start & capacitor run motor, applications ***DC Generators*:** Dynamically induced emf, Flemming's Right hand and Left hand rules, Construction and principle of operation of DC generator, EMF equation, Types of DC Generators, OCC characteristics, applications ***DC Motors*:** principle of operation of DC Motor, Types of DC motors, applications.
Unit-V
***Electrical Installations*:** Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

Suggested Reading:

1. N.K. De, "*Basic Electrical Engineering*", Universities Press, 2015.
2. J.B. Gupta, "*Fundamentals of Electrical Engineering and Electronics*" S.K. Kataria

& Sons Publications, 2002
3. J.B. Gupta, "*Utilization of Electric Power and Electric Traction*" S.K. Kataria & Sons Publications, 2010
4. Abhijit Chakrabarti, Sudipta Nath, Chandan Kumar Chanda, "*Basic Elactrical Engineering"* Tata McGraw Hill, Publications,2009
5. Hughes, "*Electrical Technology"*, VII Edition, International Student -on, Addison Welsey Longman Inc., 1995.

PHYSICS LAB

BS251PH

Instruction: 3 periods per week *Duration of SEE: 3 hours*
CIE: 25 marks *SEE: 50 marks*
Credits: 1.5

Objectives:

1. Make precise measurements using basic physical principles and acquire skills to handle the instruments.
2. Relates the theoretical Knowledge to the behavior of Practical Physical world.
3. Analyze errors in the experimental data.
4. Plot graphs between various physical parameters.

Outcomes:

1. Conduct experiments, take measurements independently.
2. Write appropriate laboratory reports.
3. Compute and compare the experimental results and draw relevant conclusions.
4. Use the graphical representation of data and estimate results from graphs.

List of Experiments:
1. To determine the Dielectric constant and Phase transition temperature of Lead Zirconium Titanate (PZT).
2. To draw the I - V Characteristics of P-N Junction diode and to evaluate the resistance.
3. To find the values of Electrical conductivity and energy gap of Ge crystal.
4. Determination of rigidity of modulus of Torsion pendulum.
5. Determination of carrier concentration, Mobility and Hall Coefficient of Ge crystal using Hall Effect Experiment.
6. To determine the constants of A, B and α using Thermistor characteristics.
7. To draw the curve between the magnetizing field and the intensity of magnetization of the specimen (soft iron rod) and to find out i) Coercivity ii) Retentivity and iii) Hysteresis loss.
8. To draw the I - V Characteristics of a solar cell and to calculate the i) Fill factor Efficiency and ii) Series resistance.
9. To Determine the Numerical aperture (NA) of Optical fiber.
10. To determine the wave length of the given Laser source.

Note: Minimum eight experiments should be conducted in the semester

Suggested Reading:

1. Textbook of Engineering Physics Practical Dr. Ruby Das ,C. S. Robinson ,Rajesh Kumar ,Prashant Kumar Sahu , First Edition,2010.
2. Engineering Physics : Theory and Experiments by S.K. Srivastava, 8th Edition, 2011.
3. Engineering Practical Physics by Kakani S.L.,2007.
4. Engineering Physics Practicals by Dr. B. Srinivasa Rao, V. K. V. Krishna, K. S. Rudramamba Laxmi Publications.

BASIC ELECTRICAL ENGINEERING LAB

ES354EE

Instruction: 2 periods per week *Duration of SEE: 3 hours*
CIE: 25 marks *SEE: 50 marks*
Credits: 1

Objectives:

1. To impart the practical knowledge on testing of DC and AC Machines and the usage of common electrical measuring instruments

Outcomes:

1. Get an exposure to common electrical components and their ratings.
2. Analyze the performance of DC and AC Machines.
3. Comprehend the usage of common electrical measuring instruments.
4. Test the basic characteristics of transformers and electrical machines.

Suggested List of Laboratory Experiments/Demonstrations:
Dem1. Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.
Exp 1. Verification of KVL and KCL, superposition theorem (with DC excitation)
Exp 2 Verification of Thevinens and Nortons theorems (with DC excitation)
Exp 3. Sinusoidal steady state response of R-L, and R-C circuits – impedance calculation and verification. Observation of phase differences between current and voltage. Power factor calculation
Exp 4. Transformers: Observation of the no-load current waveform on an oscilloscope (nonsinusoidal wave-shape due to B-H curve nonlinearity should be shown along with a discussion about harmonics).
Exp 5. Loading of a transformer: measurement of primary and secondary voltages and currents, and power.
Exp 6. Three-phase transformers: Star and Delta connections. Voltage and Current relationships (line- line voltage, phase-to-neutral voltage, line and phase currents).
Exp 7. Measurement of phase voltage/current, line voltage/current and power in a balanced three-phase circuit connected in star and delta
Dem2. Demonstration of cut-out sections of machines: dc machine (commutator-brush arrangement), induction machine (squirrel cage rotor), synchronous machine (field winging - slip ring arrangement) and single-phase induction machine.
Exp 8. OCC characteristics of DC Generator
Exp 9. Synchronous speed of two and four-pole, three-phase induction motors. Direction reversal by change of phase-sequence of connections.
Exp 10. Power factor improvement of Induction Motor using static capacitors
Exp 11. Load Test of DC Motor

Note - 1:

(i) List of Experiments and Demonstrations suggested above are already available in the Laboratory of the electrical department. No need to purchase any extra equipment except Demonstration2 equipments

(ii) Procurement of Demonstration 2 equipments can be done during the course work of that semester. It can be included in the laboratory.

Note - 2:

(i) Experiments 9, 10 and Demonstration 3 can be incorporated in the Lab syllabus if the topics concerned to the above experiments are considered in new BEE syllabus.

Suggested Reading:

1. J.B. Gupta, "*Fundamentals of Electrical Engineering and Electronics"* S.K. Kataria & Sons Publications, 2002.
2. J.B. Gupta, "*Utilization of Electric Power and Electric Traction*" S.K. Kataria & Sons Publications,2010
3. Abhijit Chakrabarti, Sudipta Nath, Chandan Kumar Chanda, "*Basic Elactrical Engineering"* Tata McGraw Hill, Publications,2009
4. Hughes, "*Electrical Technology*", VII Edition, International Student -on, Addison Welsey Longman Inc., 1995.

ENGINEERING GRAPHICS

ES353CE

Instruction:2X3 periods per week *Duration of SEE: 3 hours*
CIE: 50 marks *SEE: 50 marks*
Credits: 3

Objectives:

1. To prepare you to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
2. To prepare you to communicate effectively
3. To prepare you to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Outcomes:

The students will able to
1. Introduction to engineering design and its place in society
2. Exposure to the visual aspects of engineering design
3. Exposure to engineering graphics standards
4. Exposure to solid modeling
5. Exposure to computer-aided geometric design
6. Exposure to creating working drawings
7. Exposure to engineering communication

Sheet No	Description of the Topic	Contact Hours	
		Lecture	Drawing
1	Principles of Engineering Graphics and their significance, usage of drawing instruments.	1	
2	***Conic Sections – I*** Construction of ellipse, parabola and hyperbola given focus and eccentricity.	1	2
3	***Conic Sections – II*** Construction of ellipse (given major and minor axis), parabola (given base and height), rectangular hyperbola.		2
4	***Cycloids*** (cycloid & epicycloid)	1	2
5	***Involutes*** (involute of triangle, square & circle)		2
6	***Scales*** (plain & diagonal scales)	1	2 + 2
7	***Introduction to AutoCAD*** Basic commands and simple drawings.		2 + 2
8	***Orthographic Projection*** Projections of points situated in different quadrants.	1	2
9	***Projections of straight lines – I*** Line parallel to both the reference planes, line perpendicular or inclined to one reference plane.	1	2
10	***Projections of straight lines – II*** Line inclined to both the reference planes.	1	2
11	***Projections of planes – I*** Perpendicular planes	1	2
12	***Projections of planes – II*** Oblique planes		2

13	***Projections of solids – I*** Polyhedra and solids of revolution, Projections of solids in simple position.	1	2
14	***Projection of solids – II*** Projections of solids when the axes inclined to one or both the reference planes.	1	2 + 2
15	***Section of solids – I*** When the sectional plane is parallel or perpendicular to one reference plane.	1	2
16	***Section of solids – II*** When the sectional plane is inclined to one reference plane.		2
17	***Development of surfaces – I*** Prisms and Cylinders	1	2
18	***Development of surfaces – II*** Pyramids and Cones		2
19	***Intersection of surfaces – I*** Intersection of cylinder and cylinder	1	2
20	***Intersection of surfaces – II*** Intersection of cylinder and cone		2
21	***Isometric projection – I*** planes and simple solids	1	2
22	***Isometric projection – II*** combination of two or three solids		2
23	Conversion of Isometric Views to Orthographic Views	1	2
24	***Floor plans*** of 2 or 3 rooms including windows, doors, and fixtures such as WC, bath, sink, shower, etc.	1	2

Suggested Reading:

1. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), "*Engineering Drawing"*, Charotar Publishing House
2. Shah, M.B. & Rana B.C. (2008), "*Engineering Drawing and Computer Graphics"*, Pearson Education
3. S.N Lal, "*Engineering Drawing with Introduction to Auto CAD"*, Cengage Learning India Pvt Lid, New Delhi, 2018.
4. Agrawal B. & Agrawal C. M. (2012), "*Engineering Graphics"*, TMH Publication
5. Narayana, K.L. & P Kannaiah (2008), Text book on "*Engineering Drawing"*, Scitech Publishers
6. (Corresponding set of) CAD Software Theory and User Manuals

NOTE:

1. At least 20 sheets must be covered.
2. Sheet number 1 to 6 (Graph sheets / drawing sheets)
3. Sheet number 7 to 24 (AutoCAD drawings)