Scheme of Instruction, Evaluation and

Syllabi

of

B.E. ELECTRICAL AND ELECTRONICS ENGINEERING

With effect from Academic Year 2022-23

Estd. 1917

Estd. 1929

DEPARTMENT OF ELECTRICAL ENGINEERING

UNIVERSITY COLLEGE OF ENGINEERING

(Autonomous)

Osmania University

Hyderabad – 500 007, TS, INDIA

UNIVERSITY COLLEGE OF ENGINEERING

The University College of Engineering (UCE) has the distinction of being the oldest and the biggest among the Engineering Colleges of the State of Andhra Pradesh. Established in the year 1929, eleven years after the formation of Osmania University, it was the 6th Engineering College to be established in the whole of British India. The College moved to its present permanent building in the year 1947. Today it is the biggest among the campus colleges of Osmania University. The Golden Jubilee of the College was celebrated in 1979, the Diamond Jubilee in 1989 and the Platinum Jubilee in 2004. The College was made autonomous in 1994.

The College offers four-year engineering degree courses leading to the award of Bachelor of Engineering (B.E.) in Biomedical Engineering, Civil Engineering, Computer Science and Engineering, Electrical and Electronics Engineering, Electronics and Communications Engineering and Mechanical Engineering. The College also offers courses leading to Master of Computer

Applications, Master of Science by Research and also Ph.D., in the various branches of Engineering. Part-time courses are offered both at undergraduate and postgraduate levels.

Vision

The Vision of the institute is to generate and disseminate knowledge through harmonious blending of science, engineering and technology. To serve the society by developing a modern technology in students' heightened intellectual, cultural, ethical and humane sensitivities, fostering a scientific temper and promoting professional and technological expertise.

Mission

- To achieve excellence in Teaching and Research
- To generate, disseminate and preserve knowledge
- To enable empowerment through knowledge and information
- Advancement of knowledge in Engineering, Science and Technology
- Promote learning in free thinking and innovative environment
- Cultivate skills, attitudes to promote knowledge creation
- Rendering socially relevant technical services to the community
- To impart new skills of technology development
- To inculcate entrepreneurial talents and technology appreciation programmes
- Technology transfer and incubation

DEPARTMENT OF ELECTRICAL ENGINEERING

The Department of Electrical Engineering started in 1949 to offer B.E in Electrical Engineering. Presently, the Department is offering B.E. in Electrical & Electronics Engineering. Continuing Education for employed diploma holders was started in 1963 through the four-year Part-Time Degree course in Electrical Engineering; The Post-graduate course in Electrical Machines was started in 1966. Later, in the year 1987, B.E in Instrumentation was offered.

With a view to provide diversity and industrial orientation to the Post Graduate program, currently the Department is offering M.E. courses in Industrial Drives & Control and Power Systems, which were introduced in 1971. Department also offers part time PG courses in Industrial Drives & Control and Power Systems for the working academicians and engineers. A new PG program in Power Electronic Systems is introduced in the year 2008. The Part-Time Ph.D. program in Electrical Engineering is being offered since 1972.

The Department has eighteen regular faculty members who are highly experienced and actively involved in research activities. The Department is also equipped with state-of-art equipment and well qualified technical staff. The department is accredited by NBA for 5 years from the year 2013 and reaccredited for 3 years from the year 2019 and further in 2022 for BE(EEE) program. PG Programs in Industrial Drives & Control and Power Systems are accredited by NBA for 3 years from the year 2021.

Vision

To strive for excellence in education and research; meet the requirement of industry in the field of electrical engineering to serve the nation.

Mission

- To provide knowledge-based technology and serve to meet the needs of society in electrical and allied industries.
- To help in building national capabilities for excellent energy management and to explore non-conventional energy sources.
- To create research-oriented culture and to provide competent consultancy.
- To create and sustain environment of learning in which students acquire knowledge and learn to apply it professionally with due consideration of ethical and economic issues.
- To be accountable through self-evaluation and continuous improvement.

Programme Educational Objectives (PEO):

PEO1: To provide students with a solid foundation in Mathematics, Sciences and Electrical Engineering which prepares students for further studies and hence research in Electrical Engineering and for a wide range of career opportunities in Industries and academics.

PEO2: To train the students with good engineering breadth so as to comprehend, analyze, innovate and design new products in electrical domain, to provide technical solutions to real life problems and to render technical services to the needs of the society.

PEO3: To inculcate professional and ethical attitude, creative, effective communication and presentation skills and enhanced ability to work in teams to pursue complex, open-ended investigations and research in electrical engineering for effective knowledge transfer.

PEO4: To provide students with an academic environment aware of excellence, proactiveness, leadership positions in multidisciplinary teams, entrepreneurial talent and lifelong learning for successful professional career.

PROGRAM OUTCOMES (POs)

POs	Engineering Graduates will be able to:
PO1	**Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem Analysis:** Identify, formulate, review research literature, and analyze complex engineering problems 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 professional engineering practice.
PO7	**Environment and sustainability:** Understand the impact of the professional 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 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 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.
	PROGRAM SPECIFIC OUTCOMES (PSOs)
PSO1	Find solutions for effective operations and control of power systems to achieve quality and reliable power supply
PSO2	Provide solutions for effective and intelligent control of electric drives and renewable energy systems with electronic circuits for domestic and industrial applications

SCHEME OF INSTRUCTION AND EVALUATION

B.E. (Electrical and Electronics Engineering) w.e.f. 2022-23

I – Semester

S.No.	Code	Course Title	Scheme of Instruction			Contact Hrs/Wk	Scheme of Evaluation			Credits
			L	T	P		Hrs	CIE	SEE	
Theory										
1	MC 100 HS	Induction Program	3 weeks							
2	BS 101 MT	Engineering Mathematics-I	3	-	-	3	3	40	60	3
3	BS 101 PH	Applied Physics	3	-	-	3	3	40	60	3
4	ES 101 CS	Programming for Problem Solving	3	-	-	3	3	40	60	3
5	PC 101 EE	Electrical Wiring Estimation and Automation	3	-	-	3	3	40	60	3
6	PC 102 EE	Electrical and Electronics Engineering Materials	3	-	-	3	3	40	60	3
Practicals										
7	BS 151 PH	Applied Physics Lab	-	-	3	3	3	25	50	1.5
8	ES 151 CS	Programming for Problem Solving Lab	-	-	2	2	3	25	50	1
9	ES 151 CE	Engineering Graphics	2	-	4	4	3	25	50	4
		Total	**17**	**0**	**9**	**24**	**24**	**275**	**510**	**21.5**

Interdisciplinary Courses Offered to Other Departments in B.E. Semester – I (ECE, CSE, AIML)

S.No.	Code	Course Title	Scheme of Instruction			Contact Hrs/Wk	Scheme of Evaluation			Credits
			L	T	P		Hrs	CIE	SEE	
Theory										
1	ES 101 EE	Basic Electrical Engineering	3	-	-	3	3	40	60	3

Practicals										
2	ES 151 EE	Basic Electrical Engineering Lab	-	-	2	2	3	25	50	1

SCHEME OF INSTRUCTION AND EVALUATION

B.E. (Electrical and Electronics Engineering) w.e.f. 2022-23

II – Semester

S No	Code	Course Title	Scheme of Instruction			Contact Hrs/Wk	Scheme of Evaluation			Credits
			L	T	P		Hrs	CIE	SEE	
Theory										
1	BS 201 MT	Engineering Mathematics-II	3	-	-	3	3	40	60	3
2	BS 105 CH	Engineering Chemistry	3	-	-	3	3	40	60	3
3	HS 101 EG	Communicative English	3	-	-	3	3	40	60	3
4	PC 201 EE	Digital Electronics and Logic Design	3	-	-	3	3	40	60	3
Practicals										
5	BS 151 CH	Engineering Chemistry Lab	-	-	2	2	3	25	50	1
6	HS 151 EG	Communicative English Lab	-	-	2	2	3	25	50	1
7	ES 152 ME	Workshop Practice	-	-	4	4	3	25	50	2
8	ES 151 EE	Computer Aided Electrical Drawing lab	-	-	2	2	3	25	50	1
		Total	**12**	**0**	**10**	**22**	**24**	**260**	**440**	**17**

Interdisciplinary Courses Offered to Other Departments in B.E. Semester – II

S.No.	Code	Course Title	Scheme of Instruction			Contact Hrs/Wk	Scheme of Evaluation			Credits
			L	T	P		Hrs	CIE	SEE	
Theory (BME, CE, MINING, ME)										
1	ES 101 EE	Basic Electrical Engineering	3	-	-	3	3	40	60	3
Practicals (BME, ME)										
2	ES 251 EE	Basic Electrical Engineering Lab	-	-	2	2	3	25	50	1

SCHEME OF INSTRUCTION AND EVALUATION

B.E. (Electrical and Electronics Engineering) w.e.f. 2022-23

III – Semester

S.No.	Code	Course Title	Scheme of Instruction			Contact Hrs/Wk	Scheme of Evaluation			Credits
			L	T	P		Hrs	CIE	SEE	
Theory										
1	PC 301 EE	Electrical Circuits – I	3	1	-	4	3	40	60	4
2	PC 302 EE	Electrical Machines – I	3	-	-	3	3	40	60	3
3	PC 303EE	Power Systems - I	3	-	-	3	3	40	60	3
4	PC 304 EE	Electromagnetic Fields	3	1	-	4	3	40	60	4
5	PC 305 EE	Measurements and Instrumentation	3	-	-	3	3	40	60	3
6	PC 306 EE	Analog Electronics	3	-	-	3	3	40	60	3
Practicals										
7	PC 351 EE	Digital Electronics and Logic Design Laboratory	-	-	3	3	3	25	50	1.5
8	PC 352 EE	Analog Electronics Laboratory	-	-	3	3	3	25	50	1.5
9	PC 353 EE	Electrical Circuits Laboratory	-	-	3	3	3	25	50	1.5
		Total	**18**	**2**	**9**	**29**	**27**	**315**	**510**	**24.5**

SCHEME OF INSTRUCTION AND EVALUATION

B.E. (Electrical and Electronics Engineering) w.e.f. 2022-23

IV – Semester

S.No.	Code	Course Title	Scheme of Instruction			Contact Hrs/Wk	Scheme of Evaluation			Credits
			L	T	P		Hrs	CIE	SEE	
Theory										
1	PC 401 EE	Electrical Circuits - II	3	1	-	3	3	40	60	3
2	PC 402 EE	Electrical Machines II	3	1	-	4	3	40	60	4
3	PC 403 EE	Power Systems – II	3	1	-	4	3	40	60	4
4	PC 404 EE	Linear Control Systems	3	-	-	3	3	40	60	3
5	PC 405 EE	Linear Integrated Circuits	3	-	-	3	3	40	60	3
6	**Professional Elective – I**		3	-	-	3	3	40	60	3
	PE 411 EE	Electric Distribution System								
	PE 412 EE	Renewable Energy								
	PE 413 EE	Hybrid Electric Vehicles								
	PE 414 EE	Power System Reliability								
Practicals										
7	PC 451 EE	Electrical Measurements Lab	-	-	3	3	3	25	50	1.5
8	PC 452 EE	Electrical Machines Laboratory – I	-	-	3	3	3	25	50	1.5
9	PC 453 EE	Linear Integrated Circuits Lab	-	-	3	3	3	25	50	1.5
		Total	**18**	**3**	**9**	**29**	**27**	**315**	**510**	**24.5**

SCHEME OF INSTRUCTION AND EVALUATION

B.E. (Electrical and Electronics Engineering) w.e.f. 2022-23

V – Semester

SNo	Code	Course Title	Scheme of Instruction			Contact Hrs/Wk	Scheme of Evaluation			Credits
			L	T	P		Hrs	CIE	SEE	
Theory										
1	PC 501 EE	Electrical Machines-III	3	1	-	3	3	40	60	3
2	PC 502 EE	Switchgear and Protection	3	0	-	3	3	40	60	3
3	PC 503 EE	Power Electronics	3	1	-	3	3	40	60	3
4	PC 504 EE	Microprocessors and Microcontrollers	3	0	-	3	3	40	60	3
5	PC 505 EE	Digital Signal Processing	3	1	0	3	3	40	60	3
6	**Professional Elective – II**		3	0	-	3	3	40	60	3
	PE 521 EE	Control Systems Design								
	PE 522 EE	Electrical Energy Conservation and Auditing								
	PE 523 EE	IoT Applications in Electrical Engineering								
Practicals										
7	PC 551 EE	Electrical Machines Lab-II	-	-	3	3	3	25	50	1.5
8	PC 552 EE	Power Electronics Lab	-	-	3	3	3	25	50	1.5
9	PC 553 EE	Control Systems Lab	-	-	3	3	3	25	50	1.5
		Total	**18**	**3**	**9**	**27**	**27**	**315**	**510**	**22.5**

SCHEME OF INSTRUCTION AND EVALUATION

B.E. (Electrical and Electronics Engineering) w.e.f. 2022-23

VI – Semester

S.No.	Course Code	Course Title	Scheme of Instruction			Contact hr/week	Scheme of Evaluation			Credits
			L	T	P		Hrs	CIE	SEE	
1	PC 601 EE	Power System Operation and control	3	1	0	3	3	40	60	3
2	PC 602 EE	Power Electronic Applications in Renewable Energy	3	0	0	3	3	40	60	3
3	PC 603 EE	Power Quality Engineering	3	0	0	3	3	40	60	3
4	**Professional Elective – III**		3	0	0	3	3	40	60	3
	PE 631 EE	AI Techniques in Electrical Engineering								
	PE 632 EE	Digital Control Systems								
	PE 633 EE	Electric Machine Design								
	PE 634 EE	Battery Management Systems and Charging Stations								
5	**Open Elective – I**		3	0	0	3	3	40	60	3
	OE 601 BM	Engineering Applications in Medicine								
	OE 602 CE	Disaster Management								
	OE 603 EC	Electronic Instrumentation								
	OE 604 EC	Principles of Electronic Communication Systems								
	OE 605 ME	3D Printing Technology								
	OE 606 ME	Finite Element Method								
	OE 607 EE	Applications of Electrical Energy								

	OE 609 EE	Electrical Safety Management								
Practicals										
6	PC 651 EE	Microprocessors and Microcontrollers Lab	0	0	3	3	3	25	50	1.5
7	PC 652 EE	Electrical Simulation Lab	0	0	3	3	3	25	50	1.5
8	PC 653 EE	Digital Signal Processing lab	0	0	3	3	3	25	50	1.5
9	PW 651 EE	Mini-Project	-	-	9	9	-	50	-	3
		Total	**15**	**1**	**17**	**32**	**24**	**325**	**450**	22.5

SCHEME OF INSTRUCTION AND EVALUATION
B.E. (Electrical and Electronics Engineering) w.e.f. 2022-23

VII – Semester

SNo	Code	Course Title	Scheme of Instruction			Contact Hrs/Wk	Scheme of Evaluation			Credits
			L	T	P		Hrs	CIE	SEE	
Theory										
1	PC 701 EE	Utilization of Electrical Energy	3	0	-	3	3	40	60	3
2	PC 702 EE	Electric Drives and Static Control	3	0	-	3	3	40	60	3
3	PC 703 EE	FACTS and HVDC Transmission	3	0	-	3	3	40	60	3
4	PC 704 EE	Signals and Systems	3	0	-	3	3	40	60	3
5	**Professional Elective - IV**		3	0	-	3	3	40	60	3
	PE 701 EE	Energy Management Systems								
	PE 702 EE	High Voltage Engineering								
	PE 703 EE	Smart Grid Technologies								
6	**Open Elective –II**		3	0	-	3	3	40	60	3
	OE 701 BM	Micro Electro-Mechanical Systems								
	OE 702 CE	Green Building Technology								
	OE 703 CS	Information Security								
	OE 704 CS	Data Base Management Systems								
	OE 705 EC	Embedded Systems								
	OE 706 EC	Verilog HDL								
	OE 707 EC	Satellite Communication and Applications								
	OE 708 EE	Optimization Techniques								
	OE 709 EE	Non-Conventional Energy Sources								
	OE 710 ME	Startup Entrepreneurship								
	OE 711 ME	Nano Technology								

Practicals										
7	PC 751 EE	Power Systems Lab	-	-	3	3	3	25	50	1.5
8	PW 751 EE	Project Work – I	-	-	6	6	-	50	-	3
9	PW 752 EE	Summer Internship	-	-	4	6	-	50	-	2
		Total	**18**	**0**	**13**	**33**	**21**	**365**	**410**	**24.5**

SCHEME OF INSTRUCTION AND EVALUATION

B.E. (Electrical and Electronics Engineering) w.e.f. 2022-23

VIII – Semester

SNo	Code	Course Title	Scheme of Instruction			Contact Hrs/Wk	Scheme of Evaluation			Credits
			L	T	P		Hrs	CIE	EE	
Theory										
1	MC – I 800 CE	Environmental Studies	3	-	-	3	3	40	60	0
2	MC – II 801 HS	Constitution of India	3	-	-	3	3	40	60	0
3	MC – III 802 AS	Essence of Indian Traditional Knowledge	3	-	-	3	3	40	60	0
Practicals										
4	PW 851 EE	Project Work – II	-	-	12	12	-	50	100	6
		Total	**9**	**0**	**12**	**21**	**9**	**170**	**280**	**06**

Credit Summary

Semester	I	II	III	IV	V	VI	VII	VIII	Total
Credits	21.5	17	24.5	24.5	22.5	22.5	24.5	06	163

Scheme of Instruction, Evaluation

and

Syllabi

of

B.E. ELECTRICAL AND ELECTRONICS ENGINEERING

(Honors)

With effect from Academic Year 2022-23

DEPARTMENT OF ELECTRICAL ENGINEERING

UNIVERSITY COLLEGE OF ENGINEERING

(Autonomous)

Osmania University

Hyderabad – 500 007, TS, INDIA

HONORS IN ELECTRICAL AND ELECTRONICS ENGINEERING

SCHEME OF INSTRUCTION and EVALUATION

for Honors Program in EEE

(Effective from AY2022-23)

S. No.	Code	Course Title	Scheme of Instruction			Contact Hrs/Wk	Scheme of Evaluation			Credits	Sem.
			L	T	P		Hrs	CIE	SEE		
Theory											
1	HR301EE	High Power Inverters	3	0	0		3	40	60	3	V
2	HR302EE	Distributed Generation and Micro Grid	3	0	0		3	40	60	3	VI
3	HR303EE	Advanced Control Techniques For Power Converters	3	0	0		3	40	60	3	VI
4	HR304EE	Electrical Transients in Power Systems	3	0	0		3	40	60	3	VII
5	HR305EE	Energy Storage Systems and Applications	3	0	0		3	40	60	3	VII
6	HR306EE	Control and Integration of Renewable Energy Sources	3	0	0		3	40	60	3	VIII
		Total	**18**	**0**	**00**		**18**	**240**	**360**	**18**	

Scheme of Instruction, Evaluation

and

Syllabi of

B.E. ELECTRICAL AND ELECTRONICS ENGINEERING

(Minor)

With effect from Academic Year 2022-23

DEPARTMENT OF ELECTRICAL ENGINEERING

UNIVERSITY COLLEGE OF ENGINEERING

(Autonomous)

Osmania University

Hyderabad – 500 007, TS, INDIA

MINOR IN ELECTRICAL AND ELECTRONICS ENGINEERING

SCHEME OF INSTRUCTION and EVALUATION
for Minor Program in EEE
(Effective from AY2022-23)

S.No.	Code	Course Title	Scheme of Instruction			Contact Hrs/Wk	Scheme of Evaluation			Credits	Sem.
			L	T	P		Hrs	CIE	SEE		
Theory											
1	MI301EE	PLC and SCADA Applications	3	0	0		3	40	60	3	III
2	MI302EE	Special Purpose Machines	3	0	0		3	40	60	3	IV
3	MI303EE	Restructuring and Deregulation	3	0	0		3	40	60	3	V
4	MI304EE	EHV AC Transmission	3	0	0		3	40	60	3	VI
5	MI305EE	Digital Control System	3	0	0		3	40	60	3	VII
6	MI306EE	Robotics and Automation	3	0	0		3	40	60	3	VIII
		Total	**18**	**0**	**0**		**18**	**240**	**360**	**18**	

B.E. ELECTRICAL AND ELECTRONICS ENGINEERING

I SEMESTER

SYLLABUS

DEPARTMENT OF ELECTRICAL ENGINEERING

UNIVERSITY COLLEGE OF ENGINEERING

(Autonomous)

Osmania University

Hyderabad – 500 007, TS, INDIA

BS 101 MT	ENGINEERING MATHEMATICS – I					
Pre-requisites	Mathematical Knowledge of 12th / Intermediate level		**L**	**T**	**P**	**C**
			3	-	-	3
Evaluation	**SEE**	60 Marks	**CIE**		40 Marks	

Course Objectives :	
The course is taught with the objectives of enabling the student to:	
1	To Introduce the Concepts of Sequences, Series and their Properties.
2	To Study the Concepts of Mean Value Theorems.
3	To Introduce the Concepts of Functions of Several Variables and its Applications.
4	To Introduce the Concepts of Multiple Integrals and its Applications
5	To Study Vector Differential and Integral Calculus.

Course Outcomes :	
On completion of this course, the student will be able to :	
CO-1	Find the Nature of Sequences and Series
CO-2	To Apply the Mean Value Theorem and to Find the Roots of Continues Functions
CO-3	To find the Maximum and Minimum Values of Multiple Variable Functions.
CO-4	Use the Knowledge of Multiple Integrals in Finding the Area and Volume of any Region Bounded by Given Curves
CO-5	Apply the Knowledge of Vector Calculus to Find Line, Surface and Volume Integrals.

Articulation matrix of Course Outcomes with POs:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	3	2	2	1	1	1	-	-	1	-	-	2	-	-
CO 2	3	2	1	2	2	2	-	-	1	-	-	2	-	-
CO 3	3	2	2	3	2	2	-	-	1	-	-	2	-	-
CO 4	3	2	1	1	1	2	-	-	1	-	-	2	-	-
CO 5	3	2	2	3	1	2	-	-	1	-	-	2	-	-

Correlation rating: Low / Medium / High: 1 / 2 / 3 respectively.

UNIT – I
Sequences and Series: Sequences, Series, General properties of series, Series of positive terms, Comparison tests, P-test, tests of Convergence, D'Alembert's ratio test, Cauchy's n^{th} root test, Raabe's test, Integral 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 (without proof) Taylor's series, Curvature, Radius of curvature, Circle of curvature, Envelope of a family of curves, Evolutes and Involutes

UNIT - III
Multi variable 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 two variables , Lagrange's method of multipliers.

UNIT - IV
Multi variable Calculus (Integration): Double integrals, change of order of integration, Triple integrals, Change of variables in integrals and applications- areas and volumes, Beta and Gamma functions.

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, 4th Edition 2014.
2	Erwin Kreyszi, Advanced Engineering Mathematics, John Wiley, 9th Edition, 2012.
3	B.S. Grewal, Higher Engineering Mathematics, Khanna Publications, 43rd Edition, 2014.
4	G.B. Thomas, Maurice Weirand Joel Hass, Thomas Calculus, Peterson, 12th Edition, 2010.
5	B.V . Ramana, Higher Engineering Mathematics, 23rd reprint, 2015.
6	N.P. Bali and M.Goyal, A text book of Engineering Mathematics, Laxmi Publications, 2010.
7	H.K. Dass, Er. Rajnish Varma, higher Engineering Mathematics, S.Chand Technical 3rd Edition.

BS 101 PH	APPLIED PHYSICS					
Pre-requisites			**L**	**T**	**P**	**C**
			3	-	-	3
Evaluation	**SEE**	60 Marks	**CIE**		40 Marks	

Course Objectives :	
The course is taught with the objectives of enabling the student to:	
1	make student understand the basic concepts of matter waves and experimental implications. To understand Schrodinger's wave equation and its implications.
2	appraise significance of stimulated emission and laser light production. Subsequently propagation of laser light through waveguides.
3	make student understand the formation of energy bands and classification of the solids based on the band theory. To understand the concept of superconductors.
4	understand implications of basic laws of electricity and magnetism to know the significance of techniques of Modern Optics.
5	sensitize the student towards nanomaterial and appraise the various characterization techniques.

Course Outcomes :	
On completion of this course, the student will be able to :	
CO-1	enrich and ***understand*** concepts and real time applications of mater waves and implications of matter waves as quantum mechanics evolution.
CO-2	understand construction and working of the laser systems and ***apply*** them to propagate through fiber optical cable as cutting edge application.
CO-3	***analyze*** and semiconducting materials, superconducting materials, basics laws of electricity and magnetism to know the significance of techniques of Modern Optics.
CO-4	***evaluate*** the different material characterization techniques.
CO-5	appreciate significance of nanomaterials and ***create*** desired properties by using various methods of synthesis processes.

COs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**
CO1	**2**	**2**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**1**	**-**	**1**
CO2	**2**	**2**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**1**	**-**	**1**
CO3	**2**	**2**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**1**	**-**	**1**
CO4	**2**	**2**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**1**	**-**	**1**
CO5	**2**	**2**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**1**	**-**	**1**

UNIT – **I**
Matter waves: de-Broglie hypothesis – properties of matter waves – Davison and Germer's experiment – G.P. Thomson experiment – Uncertainty principle.

Quantum Mechanics: Physical significance of wave function – Schordinger's time independent and time dependent wave equation – Particle in 1-D box – Wave function, Probability function, energy level.

UNIT – **II**

Electromagnetic Theory: Basic laws of electricity and magnetism – Derivation of Maxwell's equations in integral and differential forms - Conduction and displacement current – modification of Ampere's law - Relation between Displacement Current (D), Electric Intensity (E) and Polarization (P) - Equation of plane wave in free space – Poynting theorem.

Modern Optics: Interference – Newton's Rings by reflected light – Experimental arrangement – Types of diffraction – diffraction grating (Conditions of maxima and minima) – Resolving power of grating –Types of polarized light – Polarization by reflection – Malus law – Double refraction – Nicol's Prism. – Optical activity and polarimeter.

UNIT – **III**

Lasers: Characteristics of lasers – Absorption of radiation, spontaneous and stimulated emission of radiation - Einstein's coefficients and their relation - Population inversion– Types of lasers - Ruby laser, Helium-Neon laser and Semiconductor laser – Applications of lasers.

Fibre Optics: Construction of an optical fiber – Propagation of light through an optical fiber - Acceptance angle - Numerical aperture – Types of optical fibers (Based on number of modes and refractive index profile) – Fibre drawing process (double crucible method) - Applications of optical fibers.

UNIT – **IV**

Semiconductor Physics: Classification of materials based on band theory - 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, Zener diode, Light Emitting Diode and their I-V characteristics – Thermistor and its characteristics - Hall effect and its applications.

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**

Nanomaterials: Introduction - Properties of materials at reduced size - Surface to volume ratio – Quantum confinement effect – Classification of nanomaterials - Preparation of nanomaterials: bottom–up methods (e.g., Sol Gel method and Chemical Vapor Deposition method), Top-down methods (e.g., Ball milling method) - Basic ideas of carbon nanotubes – Applications of nanomaterials and their health hazards.

Techniques for Characterization: Morphological studies of materials – X-ray Diffraction (XRD), Scanning Electron Microscopy (SEM). Spectroscopic studies of materials – Fourier Transform Infrared (FTIR), Beer's law, UV-Visible and Raman spectroscopy.

Suggested Reading:

1	M.S. Avadhanulu and P.G. Kshirasagar - Engg. Physics, S.Chand & Co.
2	C.M. Srivastava and C. Srinivasan - Science of Engg. Materials, New Age International.
3	R.K. Gour and S.L. Gupta – Engg. Physics, Dhanpat Rai Publications.
4	B.K. Pandey and S.Chaturvedi – Engineering Physics, Cengage Learning.
5	A.K Bhandhopadhya - Nano Materials, New Age International.
6	S.K. Sharma, et al., Hand book of Material Characterization – Springer.

ES 101 CS	PROGRAMMING FOR PROBLEM SOLVING					
Pre-requisites			**L**	**T**	**P**	**C**
			3	-	-	3
Evaluation	**SEE**	60 Marks	**CIE**		40 Marks	

Course Objectives :	
The course is taught with the objectives of enabling the student to:	
1	To introduce the basic concepts of Computing environment, number systems and flowcharts
2	To familiarize the basic constructs of C language – data types , operators and expressions
3	To understand modular and structured programming constructs in C
4	To learn the usage of structured data types and memory management using pointers
5	To learn the concepts of data handling using files

Course Outcomes :	
On completion of this course, the student will be able to implement	
CO-1	Explain various functional components in computing environment
CO-2	Develop algorithmic solutions to problems and draw the flow charts
CO-3	Explain and use basic constructs of C in writing simple programs
CO-4	Use standard library functions in C and develop modular programs using user defined functions and structured data types

COs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**
CO1	**2**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**-**	**-**	**2**
CO2	**2**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**2**	**-**	**2**
CO3	**2**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**2**	**-**	**2**
CO4	**2**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**2**	**-**	**2**

UNIT – I

Introduction to Computers: Computer Systems, Computing Environments, Computer Languages, Creating and Running Programs, Software Development, Flow charts. **Number Systems**: Binary, Octal, Decimal, Hexadecimal.

Introduction to C Language - Background, C Programs, Identifiers, Data Types, Variables, Constants, Input / Output Statements

Arithmetic Operators and Expressions: Evaluating Expressions, Precedence and Associativity of Operators, Type Conversions.

UNIT – II
Conditional Control Statements: Bitwise Operators, Relational and Logical Operators, If, If-Else, Switch-Statement and Examples. Loop Control Statements: For, While, Do-While and Examples. Continue, Break and Goto statements **Functions:** Function Basics, User-defined Functions, Inter Function Communication, Standard Functions, Methods of Parameter Passing. **Recursion-** Recursive Functions. **Storage Classes:** Auto, Register, Static, Extern, Scope Rules, and Type Qualifiers

UNIT– III
Preprocessors: Preprocessor Commands **Arrays** - Concepts, Using Arrays in C, Inter-Function Communication, Array Applications, Two-Dimensional Arrays, Multidimensional Arrays, Linear and Binary Search, Selection and Bubble Sort.

UNIT – IV
Pointers - Introduction, Pointers for Inter-Function Communication, Pointers to Pointers, Compatibility, L -value and R-value, Arrays and Pointers, Pointer Arithmetic and Arrays, Passing an Array to a Function, Memory Allocation Functions, Array of Pointers, Programming Applications, Pointers to void, Pointers to Functions, Command-line Arguments. **Strings -** Concepts, C Strings, String Input/Output Functions, Arrays of Strings, String Manipulation Functions

UNIT –V
Structures: Definition and Initialization of Structures, Accessing Structures, Nested Structures, Arrays of Structures, Structures and Functions, Pointers to Structures, Self Referential Structures, Unions, Type Definition (typedef), Enumerated Types. **Input and Output:** Introduction to Files, Modes of Files, Streams, Standard Library Input/Output Functions, Character Input/Output Functions.

Suggested Reading:

1	B.A. Forouzan and R.F. Gilberg, *"A Structured Programming Approach in C"* , Cengage Learning, 2007
2	Kernighan BW and Ritchie DM, "*The C Programming Language"*, 2nd Edition, Prentice Hall of India, 2006.
3	Rajaraman V, "*The Fundamentals of Computer"*, 4th Edition, Prentice-Hall of India, 2006.
4	Dromey " *How to Solve it By Computer* , Pearson education, 2006

PC 101 EE	ELECTRICAL WIRING ESTIMATION AND AUTOMATION					
Pre-requisites			L	T	P	C
			3	-	-	3
Evaluation	SEE	60 Marks	CIE		40 Marks	

Course Objectives

1. To provide the knowledge and estimation of different electrical components selection and purchase.
2. To give awareness about electrical wiring.
3. To introduce the basic concepts of earthing and materials used for earthing.
4. To acquire the basic knowledge of domestic service wire and fuses.
5. To explain the students about different electrical ventilation systems and basic domestic wiring.

Course Outcomes:

After completion of this course, the students shall be able to:

1. Understand different electrical components estimations.
2. Construct wiring diagrams for different domestic and intertrial applications.
3. Ability to design practical earthing circuits and usage of materials for earthing.
4. Obtain the knowledge of fuses and installation of service wire.
5. Apply the concepts electrical ventilations and installations of fan and lighting.

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
CO1	2	2	2	-	2	2	-	-	-	1	-	-	-	2
CO2	2	2	2	-	2	2	2	-	-	1	-	2	-	2
CO3	2	2	2	-	2	2	2	-	-	1	-	2	-	2
CO4	2	2	2	-	2	2	2	-	-	1	-	2	-	2

UNIT – 1

Estimation Principles: Estimation purpose Electrical Schedule, Catalogues, Market Survey and source selection, Recording of estimates, Determination of required quantity of material, Labour conditions, Determination of cost material and labour, Contingencies, Overhead charges, Profit, Purchase system, Purchase enquiry and selection of appropriate purchase mode, Comparative statement, Purchase orders, Payment of bills, Tender form.

UNIT – 2

Wiring and Safety Systems: Systems of distribution of electrical energy, Methods of wiring, Systems of wiring, Choice of wiring systems, general rules for wiring, Determination of number of points, total loads, sub circuits size of conductor, layout of wiring. Fuses, Fuse element material, Necessity of fuse, Types of fuses, Determination of size of fuse wire, Fuse

units, HRC fuses, Working principle and installation of MCB, Service line, Service lines installation methods,

UNIT – 3

Installation of Lighting Sub – Circuits and Ventilation: Types of lighting circuits, Various circuit diagrams, two-way switching, bed room lighting. Methods of ventilation, Fans, Terminology, Ceiling fans, Table fans, Pedestal fans, Exhaust fans, Industrial fans, Fan selection, Desert coolers.

UNIT – 4

Earthing: Earthing specifications, Points to be earthed, Methods of reducing earth resistance, earth electrodes and earthing leads, Methods of earthing, Determination of size of earth wire and plate for domestic and motor, Materials required for pipe earthing, Specifications of earth wire and earth plate, Measurement of earth resistance, Effect of electric current on human body.

UNIT – 5

Smart Homes: Smart Home Foundations, Smart Home Design, The Cost of a Smart Home, Designing and Building the Smart Home LAN, Smart Home Safety Systems, Smart Home Utility Systems, Smart Home Entertainment and Integration.

Suggested Reading:

1. J.B.Gupta, " A Course in Electrical Installation Estimating & Costing" S.K.Kataria and Sons, Ninth Edition, reprint 2016.

2. K.B. Raina & S.K. Bhattacharya, "Electrical Design, Estimating and Costing", New age International publishers, 1991.

3. S.L.Uppal, "Electrical Wiring, Estimating and Costing" Khanna Publishers, seventh reprint 2006.

4. Robert C. Elsenpeter, mToby J. Velte, "Build Your Own Smart Home" , McGraw-Hill,

PC 102 EE	ELECTRICAL AND ELECTRONICS ENGINEERING MATERIALS					
Pre-requisites			**L**	**T**	**P**	**C**
			3	-	-	3
Evaluation	**SEE**	60 Marks	**CIE**		40 Marks	

Course objectives:

The course is taught with the objectives of enabling the student to:

1. To understand the theory of electrical conduction in conductors and semiconductors and to learn about the basic properties of magnetic materials.
2. To learn about dielectric polarization and its characteristics.
3. To learn about techniques for material studies.

Course Outcomes:

After successful completion of the course students will be able

1. To understand the theory of electrical conduction in conductors and semiconductors and to learn about the basic properties of magnetic materials.
2. To learn about dielectric polarization and its characteristics.
3. To get basic understanding about material used for solar power.
4. To learn about techniques for material studies.

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
CO1	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**
CO2	**2**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**-**	**2**	**-**	**2**	**-**	**-**
CO3	**2**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**-**	**2**	**-**	**2**	**-**	**2**
CO4	**2**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**-**	**2**	**-**	**2**	**-**	**2**

UNIT I

Conducting materials: Review of metallic conduction on the basis of free electron theory- Fermi-Dirac distribution – variation of conductivity with temperature and composition, Materials for electric resistances- General Electric properties: brushes of electrical machines, lamp filaments, fuses and solder.

Semiconductors: Compound semiconductors – basic ideas of amorphous and organic semiconductor – preparation of semiconductor materials – zone-refining technique – fabrication of p-n-p junction.

Insulating Materials and their applications: Plastics, classification, Thermosetting materials, Thermo-plastic materials, Natural insulating materials, properties and their applications, Gaseous materials; Air, Hydrogen, Nitrogen, SF6 their properties and applications.

UNIT II

Magnetic materials: Classification of magnetic materials – origin of permanent magnetic dipoles – ferromagnetism - hysteresis curve – hard and soft magnetic materials – magnetic material used in electrical machines, instruments and relays.

Nonferrous Alloys and Ceramics: Aluminum Alloys, Magnesium and Beryllium Alloys, Copper Alloys, Nickel and Cobalt Alloys, Titanium Alloys. Ceramics: Bonding in Ceramics, Structures of Crystalline Ceramics, Defects in Crystalline Ceramics, Flaws in Ceramics, Synthesis and Processing of Crystalline Ceramics, Silica and Silicate Compounds, Inorganic Glasses, Glass-Ceramics, Processing and Applications of Clay Products

UNIT III

Dielectrics: dielectric polarization under static fields – electronic, ionic and dipolar polarizations – behavior of dielectrics in alternating fields – mechanism of breakdown in gases, liquids and solids - factors influencing dielectric strength – capacitor materials Insulating materials – complex dielectric constant – dipolar relaxation dielectric loss insulator materials used – inorganic materials (mica, glass, porcelain, asbestos) – organic materials (paper, rubber, cotton silk, fibre, wood, plastics, bakelite)- resins and varnishes – liquid insulators (transformer oil) – gaseous insulators (air, SF6, and hydrogen) – ageing of insulators.

UNIT IV

Superconducting Materials: Introduction, The Phenomenon of Superconductivity, Electrical Resistance Behavior at Low Temperature, The Critical Magnetic Field, The Meissner Effect, Two Fluid Model, Thermodynamics of Superconductors, Thermal Conductivity, Thermoelectric Power, The Energy Gap, The Isotope Effect, Flux Quantization, The Concept of Coherence Length and Positive Surface Energy, Determination of Energy Gap (Single Particle Tunneling), The Josephson Effect, Type II Superconductors, High Temperature Cuprate Superconductors and Later Discoveries, A Review of Theories of Superconductivity, Practical Superconductors.

UNIT V

Solar energy and Materials: Solar radiation, spectrum, UV, VIS, IR Solar constant, optical response of materials, optical band gap. Photo thermal conversion – use of coatings for enhanced solar thermal energy collection – Solar selective coatings – Cold mirror coatings – Heat mirror coatings – Anti reflection coatings. Photovoltaic conversion – Solar cells – cell efficiency, characteristics, equivalent circuit–Silicon, Cadmium sulphide and Gallium arsenide. Planner PN Junction. I-V curve of dark and illuminated junction. Solar cell parameters.

Suggested Reading:

1. Indulkar, C.S. Thirivengadam , S An Introduction to Electrical Engineering Materials, S Chand Co, 1998.
2. A.J Dekker Electrical Engineering Materials, Prentice Hall of India. 2008.
3. Arumugam , M Materials Science, Anuradha Publishers, 1990.
4. The Science and Engineering of Materials, Seventh Edition, Donald R. Askeland, Wendelin J. Wright, Cengage Learning, Seventh Edition – 2016.
5. Superconductivity Basics and Applications to Magnets, R.G. Sharma, Springer Series in Materials Science, Volume 214, Springer International Publishing Switzerland 2015.
6. Electrical and Electronic Engineering Materials by K.B. Raina, Dr. S.K. Bhattacharya, S.K. Kataria & Sons, Edition 10th 2021.

BS 151 PH	APPLIED PHYSICS LAB					
Pre-requisites	Strength of Materials		**L**	**T**	**P**	**C**
			-	-	3	1.5
Evaluation	**SEE**	50 Marks	**CIE**		25 Marks	

Course Objectives :	
The course is taught with the objectives of enabling the student to:	
1	Demonstrate an ability to make physical measurements and understand the limits of precision in measurements.
2	Demonstrate the ability to use experimental statistics to determine the precision of a series of measurements.
3	Demonstrate the ability to understand optical / Semiconducting properties of materials.
4	Demonstrate the ability to understand the construction and working of different experiments.

Course Outcomes :	
On completion of this course, the student will be able to :	
CO-1	recognize the transformation concepts into practicals.
CO-2	use a best fit to create a graph from a series of data points. Students can extrapolate and interpolate.
CO-3	appreciate the mathematical abilities to meaningful physical conclusions.
CO-4	develop skills to impart practical knowledge in real time solution and learn to design new instruments with practical knowledge.
CO-5	understand the link between theory and practicals.

Experiment - I
To calculate the Numerical aperture (NA), acceptance angle of a given optical fibre.

Experiment - II
Determination of wavelength of LASER using diffraction grating.

Experiment - III
Verification of Beer's law.

Experiment - IV
To determine specific rotatory power of a given solution by using Laurent's Half shade polarimeter.

Experiment - V
To Estimate Radius of curvature of given lens by forming Newton's rings.

Experiment - VI
To determine resolving power of plane grating.

Experiment - VII
Determination of carrier concentration, Mobility and Hall Coefficient of Ge Crystal using Hall Effect Experiment.

Experiment - VIII
To draw the I-V Characteristics of P-N Junction diode and to evaluate the value of potential barrier of the diode.

Experiment - IX
To find the values of Electrical conductivity and energy gap of Ge crystal by Four probe method.

Experiment – X
To determine the constants of A, B and α of given Thermistor.

Experiment - XI
To study V-I characteristics of Light Emitting Diode.

Experiment - XII
To draw the I-V characteristics of Zener diode.

ES 151 CS	PROGRAMMING FOR PROBLEM SOLVING LAB					
Pre-requisites			**L**	**T**	**P**	**C**
			-	-	2	1
Evaluation	**SEE**	50 Marks	**CIE**		25 Marks	

Course Objectives :	
The course is taught with the objectives of enabling the student to:	
1	To use tools available under LINUX for C programming
2	To gain hands-on experience on basic constructs of C programming
3	To formulate problems and implement algorithmic solutions in C
4	To write modular programs in C using structure programming techniques and data files.

Course Outcomes :	
On completion of this course, the student will be able to implement	
CO-1	Write, compile and debug C programs in Linux environment
CO-2	Write simple programs using control structures, user defined functions and data manipulation using arrays
CO-3	Use standard C library functions to develop modular programs in C

COs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**
CO1	**2**	**2**	**-**	**2**	**2**	**-**	**-**	**-**	**1**	**2**	**-**	**-**	**-**	**-**
CO2	**2**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**1**	**2**	**-**	**1**	**-**	**-**
CO3	**2**	**2**	**1**	**2**	**-**	**-**	**-**	**-**	**1**	**2**	**-**	**1**	**-**	**-**

1. Introducing to programming Environment(Linux commands, editing tools such as vi editor, sample program entry, compilation and execution)
2. Write programs using arithmetic, logical, bitwise and ternary operators.
3. Write programs simple control statements : Roots of a Quadratic Equation, extracting digits of integers, reversing digits ,finding sum of digit ,printing multiplication tables, Armstrong numbers, checking for prime, magic number,
4. Sin x and Cos x values using series expansion

5. Conversion of Binary to Decimal, Octal, Hexa and Vice versa
6. Generating a Pascal triangle and Pyramid of numbers
7. Recursion: Factorial, Fibonacci, GCD
8. Finding the maximum, minimum, average and standard deviation of given set of numbers using arrays
9. Reversing an array ,removal of duplicates from array
10. Matrix addition , multiplication and transpose of a square matrix .using functions
11. Bubble Sort, Selection Sort ,
12. Programs on Linear Search and Binary Search using recursion and iteration
13. Functions of string manipulation**:** inputting and outputting string , using string functions such as strlen( ),strcat( ),strcpy( )……etc
14. Writing simple programs for strings without using string functions.
15. Finding the No. of characters, words and lines of given text file
16. File handling programs : student memo printing
17. Create linked list, traverse a linked list, insert a node, delete a node, reversing list .

ES 151 CE	ENGINEERING GRAPHICS					
Pre-requisites			**L**	**T**	**P**	**C**
			-	-	4	2
Evaluation	**SEE**	50	**CIE**		25	

Course Objectives :	
The course is taught with the objectives of enabling the student to:	
1	Introduction to fundamentals and need of AUTOCAD software drawings
2	Knowledge about various 2D command of AUTOCAD drawing applicable for drawing and printing options.
3	Inputs on basic concepts of engineering drawing, lettering formats for analyzing various topics via. Conic Sections, Involutes.
4	Awareness towards the various types of projections and the drawings of 2D and 3D views.
5	Introduction to fundamentals and need of AUTOCAD software drawings

Course Outcomes :	
On completion of this course, the student will be able to :	
CO-1	Knowledge on the fundamentals of AUTOCAD 2D commands
CO-2	Application of basic principles of drawing and scales for representation of prototype objects
CO-3	Relate the logic of projections to points, straight lines and various views of 2D and 3D objects
CO-4	Capability to imagine and project the developed surface and truncated portion of 3D solids
CO-5	Assimilation of visualization process to efficiently communicate ideas graphically and provide editable solutions

COs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**
CO1	**2**	**2**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	**2**	**2**	**-**	**-**	**-**	**-**	**2**	**2**	**-**	**2**	**-**	**2**	**-**	**-**
CO3	**2**	**2**	**1**	**-**	**-**	**-**	**2**	**2**	**-**	**2**	**-**	**2**	**-**	**-**
CO4	**2**	**2**	**1**	**-**	**-**	**-**	**2**	**2**	**-**	**2**	**-**	**2**	**-**	**-**
CO5	**2**	**2**	**2**	**-**	**-**	**-**	**2**	**2**	**-**	**2**	**-**	**2**	**-**	**-**

Correlation rating: Low / Medium / High: 1 / 2 / 3 respectively**.**

UNIT - I
Introduction to Engineering Drawing covering, Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering. Geometrical Constructions (General method only), Conic sections (General and special method); Cycloid, Epicycloid, Hypocycloid and Involute (line, triangle, square, circle, Regular Polygons), Construction of Tangent and Normal to all General methods of Conic sections, Cycloid, Epicycloid, Hypocycloid and Involutes.

UNIT - II
Overview of Computer Graphics: Listing the computer technologies that impact on graphical communication, demonstrating knowledge of the theory of CAD software, setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning, Snap to objects manually and automatically; Drawings straight lines using various coordinate input entry methods, Applying various ways of drawing circles.

UNIT - III
Commands, initial settings, Drawing basic entities, Modify commands, Text and Dimensioning, Blocks Applying dimensions to objects, applying annotations to drawings. Setting up and use of Layers, Create, edit and use customized layers; Changing line lengths through modifying existing lines (Extend/Lengthen); Printing Options

UNIT - IV
Scales – Reduced and Enlarged scales, Representative Fraction, Problems - Plain, Diagonal and Vernier Scales, Projections of Points – projection when placed in different quadrants Projection of Straight lines– Projections when parallel to one plane, perpendicular to one plane, inclined to one plane and inclined to both planes.

UNIT - V
Projections of Planes – Projections when parallel to one plane, perpendicular to one plane, inclined to one plane and inclined to both planes. Projections of Regular Solids – Projections covering those parallel to one plane, perpendicular to one plane, inclined to one plane and inclined to both planes. Sections of Solids - sectional Views of Right regular solids covering Prism, Cylinder, Pyramid, and Cone Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone.

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	Agrawal B. & Agrawal C. M. (2012). *Engineering Graphics*, TMH Publication
4	Jeyapoovan T. (2015). *Engineering Graphics Using Autocad*, Vikas Publishing House Pvt. Ltd., Noida, 7th Edition
5	Lal S. N. *Engineering Drawing* (2018). M/s. Cengage Learning India Pvt. Ltd., Pratap Gunj, Delhi.

B.E. ELECTRICAL AND ELECTRONICS ENGINEERING

II SEMESTER

SYLLABUS

DEPARTMENT OF ELECTRICAL ENGINEERING

UNIVERSITY COLLEGE OF ENGINEERING

(Autonomous)

Osmania University

Hyderabad – 500 007, TS, INDIA

BS 201 MT	ENGINEERING MATHEMATICS–II					
Pre-requisites	Mathematical Knowledge at Pre-University Level		**L**	**T**	**P**	**C**
			3	-	-	3
Evaluation	**SEE**	60 Marks	**CIE**		40 Marks	

Course Objectives:	
The course is taught with the objectives of enabling the student to:	
1	To Study Matrix Algebra and its use in Solving System of Linear Equations and Solving Eigen Value Problems
2	To Study the First Order Linear and Non-Linear Ordinary Differential Equations
3	To Study the Higher Order Linear Ordinary Differential Equations with Variable and Constant Coefficients
4	To Introduce the Concept of Functions of Complex Variable and their Properties
5	To Study the Values of Improper Integers Using Residue Theorem.

Course Outcomes:	
Upon successful completion of this course, the student shall be able to	
CO-1	Solve System of Linear Equations and Eigen Value Problems
CO-2	Find the Solution of First Order Ordinary Differential Equations
CO-3	Identify the Solution of Higher Order Ordinary Differential Equations
CO-4	Determine the Analyticity and Integrals of Complex Functions
CO-5	Evaluate Complex and Real Integrals Using Residue Theorem

Articulation matrix of Course outcomes with POs:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	3	2	2	1	1	2	-	-	1	-	-	2	-	-
CO 2	3	2	1	2	2	1	-	-	1	-	-	2	-	-
CO 3	3	2	3	1	1	2	-	-	2	-	-	2	-	-
CO 4	3	2	1	2	1	2	-	-	1	-	-	2	-	-
CO 5	3	2	2	1	2	1	-	-	1	-	-	2	-	-

Correlation rating: **Low/Medium/High - 1/2/3** respectively

UNIT – I
Matrices: Elementary row and column operations, Rank of a matrix, Echel on form, System of linear equations, Linearly dependence and independence of vectors, Linear transformation, Orthogonal transformation, Eigen values, Eigenvectors, Properties of Eigen values, Cayley-Hamilton theorem, Quadratic forms, Diagonalization of Matrices, Reduction of quadratic form to canonical form by orthogonal transformation, Nature of quadratic forms.

UNIT - II
First Order Ordinary Differential Equations: Exact First Order Differential Equations, Integrating factors, Linear First Order Equations, Bernoulli's, Riccati's and Clairaut's Differential Equations, Orthogonal Trajectories of a given family of curves.

UNIT - III
Differential Equations of Higher Orders : Linear Independence and Dependence, Solutions of Second and Higher Order Linear Homogeneous Equations with Constants Coefficients, Method of Reduction of order for the Linear Homogeneous Second Order Differential Equations with Variable Coefficients , Solutions of Non- Homogeneous Linear Differential Equations, Method of Variation of Parameters, Solution of Euler-Cauchy Equation, Simultaneous Linear Differential Equations.

UNIT - IV
Functions of a Complex Variable: Limits and Continuity of a Function, Differentiability and Analyticity, Elementary Analytic Functions, Necessary and Sufficient Conditions for a Function to be Analytic, Cauchy-Riemann Equations in Polar form, Harmonic Functions, Complex Integration, Cauchy's Integral Theorem, Extension of Cauchy's Integral Theorem for multiply connected regions, Cauchy's Integral Formula, Cauchy's Formula for Derivatives.

UNIT -V
Residue Calculus: Power Series, Taylor's Series, Laurent's Series, Zeros and Singularities, Residues, Residue Theorem, Evaluation of Real Integrals Using Residue Theorem, Bilinear Transformations (All Theorems without Proof).

Suggested Reading:

1	R. K. Jain & S.R.K Iyengar, Advanced Engineering Mathematics, Narosa Publications, 4th Edition 2014 (Text Book).
2	Erwin Kreyszi, Advanced Engineering Mathematics, John Wiley, 9th Edition, 2012.
3	B.S. Grewal, Higher Engineering Mathematics, Khanna Publications, 43rd Edition, 2014.
4	Dr.M.D. Rai Singhania, Ordinary and Partial Differential Equations, S.CHAND,17thEdition2014
5	James Brown, R.VChurchill, Complex Variables and applications, McGrawHill 9th Edition 2013
6	N.P. Bali and M.Goyal, A text book of Engineering Mathematics, Laxmi Publications, 2010.
7	H.K. Dass, Er. Rajnish Varma, higher Engineering Mathematics, S.Chand Technical 3rd Edition.

BS 105 CH	ENGINEERING CHEMISTRY					
Pre-requisites			**L**	**T**	**P**	**C**
			3	-	-	3
Evaluation	**SEE**	**60 Marks**	**CIE**		**40 Marks**	

Course Objectives :	
The course is taught with the objectives of enabling the student to:	
1	Understand the fundamentals of application of water chemistry in industry and applications of principles of corrosion to minimize corrosion and associated problems.
2	Gain the knowledge of application of Electrochemical principles to construct the electrodes for various purposes and the criterion for determination of feasibility of processes.
3	Analyze and interpret the structure of molecules by applying basic principles of spectroscopy.
4	Acquire knowledge of biopolymers used for medical purposes with various applications .
5	Grasp the latest application of nanotechnology in various industries and manufacturing different kinds of batteries.

Course Outcomes :	
On completion of this course, the student will be able to :	
CO-1	Attains knowledge about the disadvantages of hard water for domestic and industrial purposes. Also teaches the techniques of softening of hard water and treatment of water for drinking purpose and throws light on prevention of corrosion
CO-2	Rationalize bulk properties and processes using thermodynamic considerations.
CO-3	A Distinguishes the ranges of electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques.
CO-4	Analyze the basic methods of reactions of organic molecules and study their properties.
CO-5	Knowing the about different batteries, fuel cells and their applications of nanomaterials.

Course outcome		**Program Outcome**										
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**	**PO-7**	**PO-8**	**PO-9**	**PO-10**	**PO-11**	**PO-12**
CO-1	3	3	2	1	1	1	1					2
CO-2	3	3	2	1	1	1	1					1
CO-3	2	2	1	1	1	1	-					1
CO-4	2	2	2	1	1	1	-					1
CO-5	2	2	2	2	1	1	-					2

UNIT – **I WATER CHEMISTRY AND CORROSION (10L):**

Water chemistry: Hardness of water-Types and units of hardness, estimation of temporary and permanent hardness of water by EDTA method. Alkalinity of water and its determination Water softening by Ion exchange and Reverse Osmosis methods. Boiler troubles-scales and sludges formation-causes, effects and prevention. Numerical problems. Specifications of potable water. Water treatment for drinking purpose-coagulation, sedimentation, filtration, sterilization by Chlorination.

Corrosion-causes and its effects. Types of corrosion-Dry or Chemical corrosion and Wet or Electrochemical corrosion and their mechanism. Electrochemical corrosion and its types. Factors influencing rate of corrosion.

Corrosion control methods: Cathodic protection methods- Sacrificial anodic and impressed current cathodic protection methods. Surface coating methods: Hot dipping-Galvanizing and Tinning.

UNIT – **II**

THERMODYNAMICS AND ELECTRO CHEMISTRY(10L):

Thermodynamics: Terminology of Thermodynamics, thermodynamic processes, Work done in Reversible isothermal and adiabatic processes, efficiency of heat engine by Carnot cycle, concept of entropy, physical significance of entropy, Work function, Gibbs free energy and their significance, variation of free energy with temperature and pressure, criteria of spontaneity in terms of entropy and free energy-Numerical.

Electrochemistry: Electrochemical cells- Electrolytic and Galvanic cells-notation, cell reaction and cell potentials. Types of electrodes-Calomel, Quinhydrone and Glass electrodes. Determination of P^H of a solution by using Quinhydrone electrode. Thermodynamics of emf of cells-Nernst equation and its derivation. Application of Nernst equation to electrode potential and emf of cells. Numericals.

Principles and applications of Potentiometric titrations.

UNIT – **III**

MOLECULAR STRUCTURES AND SPECTROSCOPY (10L):

Molecular Orbital Theory. Linear Combination of Atomic Orbital's (LCAO).Molecular Orbital energy level diagrams of diatomic molecules-O_2,N_2 and NO.

Description of Electromagnetic spectrum.

Principles of UV-Visible Spectroscopy: Statement of Beer-Lambert Law. Absorption and intensity shifts: Bathochromic, Hypsochromic, Hyper chromic and Hypo chromic shifts with one example each. Principle and applications of UV Sensors.

IR Spectroscopy: Principle of IR Spectroscopy.IR active and IR inactive molecules (two examples each). Principle and applications of IR Sensors.

NMR Spectroscopy: Principle of H^1-NMR Spectroscopy. Multiplicity, Chemical Shift. Principle and Applications of MRI.

UNIT - **IV**
Organic Reactions: Introduction to Addition, Substitution and Elimination reactions. Addition to C=C and C=O, Nucleophilic substitution in aliphatic system: SN^1 and SN^2 mechanism, Elimination reactions: E^1 and E^2 mechanism.
Polymers: Introduction, Classification of polymers -Plastics, Fibres and Elastomers. Preparation, properties and engineering applications of the following polymers: Plastics: PVC and Bakelite Fibers: Nylon 6:6, and Dacron. Elastomers: Buna-S and Butyl Rubber. **Conducting polymers**: Introduction. Mechanism of conduction in polymers. Intrinsic conducting polymers: Poly-acetylene and poly-aniline. Applications of conducting polymers

UNIT – **V**
Energy Sources and Nanomaterials (8L) **Batteries:** Primary batteries-Zn carbon battery. Secondary batteries-Pb- Acid battery and Ni-Cd battery. Lithium-ion batteries- advantages and applications. **Fuel cells**: Concept of fuel cells and their advantages. Construction and working of H_2-O_2 and methanol-Oxygen fuel cells. **Solar cells**: Concept of solar energy conversion, photovoltaic cells.
Nanomaterials: Introduction. Properties of nanomaterials. Synthesis of nanomaterials-Top down, Bottom up approach and Sol-gel method. Applications of nanomaterials.

Suggested Reading:

1	Jain & Jain, *Engineering chemistry*, Dhanpat Rai publishing Co.,16th Edition.
2	B.L.Tembe,Kamaluddin and M.S.Krishnan, Engineering Chemistry(NPTELWeb-book)
3	Prashanth Rath, Engineering Chemistry, Cengage Learning.
4	M.J.Sienko and R.A.Plane, Chemistry: Principles and Applications, MGH Publishers.
5	B.H.Mahan, University Chemistry, Pearson Publishing Co., 4th Edition.
6	C.N. Banwell, *Fundamentals of Molecular Spectroscopy*, TMH

HS 101 EG	COMMUNICATIVE ENGLISH					
Pre-requisite	English proficiency above B1 level as per the CEFR (Common European Framework of Reference) for languages		**L**	**T**	**P**	**C**
			3	-	-	3
Evaluation	**SEE**	60 Marks	**CIE**		40 Marks	

Course Objectives :	
The course is taught with the objectives of enabling the student to:	
1	Communicate clearly, accurately and appropriately using correct grammar and vocabulary
2	Write effective paragraphs and essays using devices of coherence & cohesion
3	Write business letters and emails
4	Demonstrate the ability to employ a range of critical to inferential reading.
5	Employ active and passive voice in engineering and scientific contexts to compile technical reports

Course Outcomes :	
On completion of this course, the student will be able to :	
CO-1	Heighten the awareness of correct usage of English grammar and vocabulary in writing and speaking besides improving their fluency and comprehensibility
CO-2	Develop their ability as critical readers and writers and will produce paragraphs independently on any context with coherence
CO-3	Draft effective business letters and emails
CO-4	Exercise critical reading skills by enhancing the quality of life and to support lifelong learning.
CO-5	Will produce short reports using the drafting process

	PPO 1	**PPO 2**	**PPO 3**	**PPO 4**	**PPO 5**	**PPO 6**	**PPO 7**	**PPO 8**	**PPO 9**	**PPO1 0**	**PPO1 1**	**PPO1 2**	**PSO 1**	**PSO 2**
CO 1	-	-	-	-	-	-	-	-	1	3	-	3	-	-
CO2	-	-	-	-	-	-	-	-	1	3	-	3	-	-
CO 3	-	-	-	-	-	-	-	-	1	3	-	3	-	-
CO4	-	-	-	-	-	-	-	-	1	3	-	3	-	-
CO5	-	-	-	-	-	-	-	-	1	3	-	3	-	-

UNIT – I
Importance of listening, Importance of reading, Importance of communication, types of communication, Discourse markers & linking words, Homonyms, Homophones, Homographs , Concord

UNIT – II
Types of listening, Reading skills-skimming, scanning, intensive and extensive reading, Communication barriers, Paragraph & Precise writing, One word substitutes, Tenses
UNIT – III
Dos and don'ts of listening, Types of comprehension questions, Styles of communication Essay writing, Root words, Active and Passive voice
UNIT – IV
Listening for specific purposes, Critical reading passages, Proverb expansion through JAM, Letter writing, Email writing, Synonyms, Antonyms, Common errors-I
UNIT – V
Listening to various texts –contd . (in language laboratory), Inferential reading passages, Effective presentations, Report writing, Idioms & Phrases, Common Errors-II

Suggested Reading:

1	Ashraf, M Rizvi. Effective Technical Communication. Tata McGraw-Hill, 2006
2	Language and Life A Skills Approach, Orient Black Swan,2018
3	Michael Swan, Practical English Usage. OUP,1995.
4	Meenakshi Raman and Sangeetha Sharma. Technical Communication: Principles and Practice 2nd Edition, Oxford University Press, 2011
5	Singer F L. (1975). *Engineering Mechanics Statics and Dynamics*, 3rd Edition, Harper Collins International Edition.

PC 201 EE	DIGITAL ELECTRONICS AND LOGIC DESIGN					
Pre-requisite			**L**	**T**	**P**	**C**
			3	-	-	3
Evaluation	**SEE**	60 Marks	**CIE**		40 Marks	

Course Objectives :

1. To be able to understand the principles of digital systems and binary arithmetic circuits.
2. To study the properties and realization of various logic gates, A/D and D/A converters.
3. To analyze and design various digital combinational circuits**.**

Course Outcomes:

At the end of the course the students will be able to

1. Differentiate the number system, convert and compare a number system to another number systems used in digital logic design.
2. Understand Boolean algebra and its application to DeMorgan's theorems and Karnaugh map reduction method.
3. Analyze and design various digital combinational circuits.
4. Analyze and do some simple design of sequential logic.

Course outcome	**Program Outcome**											
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**	**PO-7**	**PO-8**	**PO-9**	**PO-10**	**PO-11**	**PO-12**
CO-1	2	2	3	1	-	1	-	-	-	-	-	2
CO-2	2	2	3	1	-	1	-	-	-	-	-	2
CO-3	2	2	3	1	-	1	-	-	-	-	-	2
CO-4	2	2	3	1	-	1	-	-	-	-	-	2

UNIT I

Boolean algebras and combinational logic, AND, OR and NOT operations. Laws of Boolean algebra, Minimization of Boolean expressions, Truth tables and maps. Sum of products and product of sums, Map method of reduction, Incompletely specified functions, Multiple output minimization.

UNIT II

Tabular minimization, Digital logic families and IC's, Characteristics of Digital IC's, Introduction
to RTL, DTL, TTL, CMOS, ECL families, Details of TTL logic family, Totem pole, Open collector outputs, wired AND Operation, Comparison of performance, TTL sub-families, Multiplexer and dc-multiplexer, Encoder and decoder, Code converters, Implementation of combinational logic using standard logic gates and multiplexers.

UNIT III

Binary arithmetic and circuits, Half and Full adder, Subtractor and Magnitude comparator, Number complements, Two's complement arithmetic, Carry look ahead adder, Decimal numbers and their codes, BCD and Excess -3 arithmetic

UNIT IV

Synchronous Sequential Circuits: basic latch circuits, Debouncing switch, SR, JK, D and T flipflops, Truth table and execution table, Ripple and Synchronous counters, Up/down counters, General BCD counter, Shift registers, ring counters

UNIT V

A/D and D/A Converters: Converter types — Tracking type, Flash type, Successive approximation type: R-2R ladder, Weighed register type, Switched current source type, Switched capacitor type

Suggested Reading:

1. Anand Kumar A., *Fundamentals of Digital Circuits*, Prentice Hall of India, 4th Edition, 2003.
2. Morriss Mano M., *Digital Design*, Prentice Hall of India, 3rd Edition, 2002.
3. Zvykohavi, *Switching & Finite Automata Theory*, Tata McGraw Hill, 2nd Edition, 1991

BS 151 CH	ENGINEERING CHEMISTRY LAB					
Pre-requisites			**L**	**T**	**P**	**C**
			2	-	-	1
Evaluation	**SEE**	**50 Marks**	**CIE**		**25 Marks**	

Course Objectives:	
The course taught with objectives of enabling the student to:	
1	Determination of hardness of water by Complexometry.
2	Estimation of HCL by conductometry and Potentiometry.
3	Verification of Beers law and estimation of $KMnO_4$ by colorimetry.
4	To determine the rate constant of reactions from concentration as a function of Time
5	Synthesis of organic compounds.

Course Outcomes :	
On completion of this course, the student will be able to :	
CO-1	Estimate the strength of acids and ions present in unknown solution by conductometry and potentiometry.
CO-2	Estimate the concentration of ions present in unknown solution from the absorbance by colorimetric analysis.
CO-3	Conduct experiment to estimate hardness of industrial water.
CO-4	Estimate the rate constants of reactions from concentration of reactants/products as a function of time.
CO-5	Synthesize small drug molecules.

Course outcome	**Program Outcome**											
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**	**PO-7**	**PO-8**	**PO-9**	**PO-10**	**PO-11**	**PO-12**
CO-1	2	2	1	1	1	-	-	-	-	-	-	2
CO-2	2	2	1	1	1	-	-	-	-	-	-	2
CO-3	2	2	2	1	-	-	-	-	-	-	-	2
CO-4	2	2	2	1	1	-	-	-	-	-	-	2
CO-5	1	1	2	1	-	1	-	-	-	-	-	1

Correlation rating: Low / Medium / High : 1 / 2 / 3 respectively**.**

Experiment - I
1.Estimation of HCL by Conductometry.

Experiment – II
Estimation of Acetic Acid by Conductometry.

Experiment - III
Estimation of HCL by Potentiometry.

Experiment - IV
Estimation of $KMnO_4$ by Potentiometry.

Experiment – V
Verification of Beer's law.and Estimation of $KMnO_4$ by colorimetry.

Experiment – VI
Verification of Beer's law.and Estimation of $CuSO_4$ by colorimetry.

Experiment - VII
Determination of Partition Coefficient of Acetic acid in BuOH and water.

Experiment - VIII
Synthesis of Acetyl Salicylic Acid (Aspirin).

Experiment - IX
Estimation of Total hardness of water by Complexometry.

Experiment – X
Estimation of Permanent and Temporary hardness of water by Complexometry.

Experiment - XI
Determination of Chloride content of water by Precipitation method.

Experiment - XII
Determination of Order of Acid catalysed Hydrolysis of Methyl acetate reaction.

Suggested Reading:

1. Senior practical Physical chemistry by BD Khosla, A.Ghulati, VC.Garg., ,R.Chand and Co., New Delhi 10^{th} ed. 2001.
2. Laboratory Manual in Engineering Chemistry, S.K. Bhasin and Sudha Rani Dhanpath Rai Publishing Co.,

HS 151 EG	COMMUNICATIVE ENGLISH LAB					
Pre-requisites	English proficiency above B1 level as per the CEFR (Common European Framework of Reference) for languages.		**L**	**T**	**P**	**C**
			2	-	-	1
Evaluation	**SEE**	50 Marks	**CIE**		25 Marks	

Course Objectives :	
The course is taught with the objectives of enabling the student to	
1	Learn IPA and the transcription; using dictionary to decode phonetic transcription; overcome the difficulties with sounds of English; self learning through CALL
2	Demonstrate and use English speech sounds, stress and intonation in day-to-day situations/conversations/interactions
3	Introducing oneself in various contexts : Social, Academic and Professional
4	Improve listening and understand various accents – GIE, RP and GenAm
5	Learn to participate in various contexts – extempore, group discussions, and presentations

Course Outcomes :	
On completion of this course, the student will be able to	
CO-1	Sensitize the nuances of English speech sounds with computer-assisted individualized and independent language learning
CO-2	Use better pronunciation and right accent and intonation
CO-3	Use functional English
CO-4	Listen and speak effectively by understanding various accents
CO-5	Increase possibilities of job prospects and communicate confidently

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**
CO 1	-	-	-	-	-	-	-	-	1	3	-	3	-	-
CO2	-	-	-	-	-	-	-	-	1	3	-	3	-	-
CO 3	-	-	-	-	-	-	-	-	1	3	-	3	-	-
CO4	-	-	-	-	-	-	-	-	1	3	-	3	-	-
CO5	-	-	-	-	-	-	-	-	1	3	-	3	-	-

UNIT - I
English Sound system: Sounds of English, Vowels, Consonants, using dictionary to decode phonetic transcription, transcription exercises with the help of CALL (Computer Aided Language Lab)
UNIT - II
Stress and Intonation: Syllable, Word stress and its importance, Intonation-falling and rising tone
UNIT - III
Introductions and Presentation skills: In social, formal, academic and professional contexts; JAM, Picture description/perception; Role plays: use of dialogues in various situations and settings; Occasions to give various presentations with emphasis on visual aids and body language
UNIT - IV
Listening Comprehension: Listening to various accents, listening practice and exercises
UNIT - V
Group Discussions: Types of group discussions; case studies; dos and don'ts of group discussion-intensive practice.

Suggested Reading/Software:

1	T.Balasubramanian.A Textbook of English Phonetics for Indian Students. Macmillan,2008.
2	J. Sethi et al., A Practical Course in English Pronunciation (with CD). Prentice Hall of India, 2005.
3	Hari Mohan Prasad. How to Prepare for Group Discussions and Interviews. TataMcGraw Hill, 2006
4	English for Engineers and Technologists (Combined edition , Vol. 1 and 2) Orient Blackswan 2010.
5	**Software:** 1. Sky Pronunciation Suite 2. Study Skills 3. English Pronunciation Dictionary –CALD

ES 152 ME	WORKSHOP PRACTICE					
Pre-requisites			**L**	**T**	**P**	**C**
			-	-	4	2
Evaluation	**SEE**	50 Marks	**CIE**		25 Marks	

Course Objectives:

- To learn about different tools used in workshop
- To understand the different manufacturing processes.
- To learn about fabrication of components using different materials.

Course Outcomes

Upon successful completion of this course, the student shall be able to

- Study and practice on tools and their operations of different trades.
- Practice on manufacturing of components using workshop trades including carpentry, fitting, foundry, smithy, sheet metal & welding
- Select suitable tools for machining process including facing, turning & knurling
- Attain basic electrical knowledge for house wiring practice

SNO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3				3				1	1		1	1	
CO2	3				3				1	1		1	1	
CO3	3				3				1	1		1	1	
CO4	3				3				1	1		1	1	

LIST OF EXPERIMENTS:

1. **Carpentry shop**
   - Making of Cross lap joint with Wood
   - Making of End Lap/ Tee Lap Joint with wood
2. **Fitting shop**
   - Making of Step cut with Mild Steel flat
   - Making of semicircular and V- cut with Mild Steel flat
3. **Sheet metal shop**
   - Making of Funnel with GI Sheet
   - Making of Rectangular box with GI Sheet
4. **House wiring**
   - Making of Cleat wiring
   - Making of casing wiring
5. **Welding shop**
   - Making of Butt joint using Arc Welding
   - Making of Lap Joint using Arc Welding

6. **Machine shop**
    - Making of Step turning on MS cylindrical rod
    - Making of Taper turning on MS cylindrical rod
7. **Foundry shop**
    - Preparation of casting using single piece pattern
    - Preparation of casting using core pattern
8. **Smithy shop**
    - Forging of square shape peg from cylindrical work piece
    - Forging of square shape L- bend peg from cylindrical work piece

Suggested Text/Reference Books:

(i) 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.

ES 151 EE	COMPUTER AIDED ELECTRICAL DRAWING LAB					
Pre-requisites			L	T	P	C
			-	-	2	1
Evaluation	SEE	50	CIE		25	

Course Objectives :

1. To understand the terminology of electric circuit and electrical components.
2. To be able to familiarize with electrical machines, apparatus and appliances.
3. To acquire knowledge on various Electrical Engineering software.

Course Outcomes:

At the end of the course students will be able to

1. Identify and draw different components of electrical systems
2. Draw different control and wiring diagrams
3. Draw winding diagrams of electrical machines.

Drawing of the following using Electrical CADD / Corel Draw / MS Word / PPT/Visio

1. Lines, Arcs, Curves, Shapes, Filling of objects, Object editing & Transformation.
2. Electrical, Electronic & Electro – mechanical symbols.
3. House – wiring diagrams and layout.
4. Simple power and control circuit diagrams.
5. Electrical machine winding diagrams. (A.C & D.C)
6. Transmission tower, Over head lines – ACSR conductors, Single circuit, Double circuit, Bundle conductor.
7. Constructional features of D.C motors, AC motors and Transformers.
8. D.C and A.C motor starter diagrams.
9. Lamps used in illumination
10. Single line diagram of Power System

Suggested Reading:

1. KB. Raina, S.K. Bhattacharya, Electrical Design, Estimating and Costing, Wiley Eastern Ltd.,1991.
2. Nagrath, Kothari, Electrical Machines, Tata McGraw Hill Publishing Company Ltd., 2000.
3. A.K. Sawhney, A Course in Electrical Machines Design, Dhanpat Rai and Sons, 1996.

ES 101 EE	BASIC ELECTRICAL ENGINEERING					
Pre-requisite			**L**	**T**	**P**	**C**
			3	-	-	3
Evaluation	**SEE**	60 Marks	**CIE**		40 Marks	

Course Objectives :	
The course is taught with the objectives of enabling the student to:	
1	To understand the fundamentals of DC and AC electrical circuits.
2	To understand the working principles of DC motor, DC generator, Transformers and single phase induction motors.
3	To understand working principles of protection devices used in electrical circuits.

Course Outcomes:	
On completion of this course, the student will be able to :	
CO-1	Analyze the performance of simple electrical circuits exciting with DC and AC excitations.
CO-2	Apply different theorems to solve complicated electrical circuits to obtain the current, voltage and power.
CO-3	Understand the main components, characteristics, applications of different DC and AC electrical machines used in industry.
CO-4	Understand the importance of protective devices and their rating used in electrical circuits.
CO-5	Obtain the overall understanding of basic electrical circuits and appliances required for any industry.

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

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	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 Electrical Engineering" Tata McGraw Hill, Publications, 2009
4	Hughes, "Electrical Technology", VII Edition, International Student -on, Addison Wesley Longman Inc., 1995.

Course Outcome	**Program Outcome**													
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
CO 1	3	3	3	-	-	-	-	-	-	-	-	-	3	3
CO 2	3	3	3	-	-	-	-	-	-	-	-	-	3	3
CO 3	3	2	2	-	-	-	-	-	-	-	-	-	2	3
CO 4	3	2	2	-	-	-	-	-	-	-	-	-	2	3
CO 5	3	2	2	-	-	-	-	-	-	-	-	-	3	3

Correlation rating**:** **Low / Medium / High – 1 / 2 / 3** respectively

ES 151 EE	BASIC ELECTRICAL ENGINEERING LAB					
Pre-requisite			**L**	**T**	**P**	**C**
			-	-	2	1
Evaluation	**SEE**	50 Marks	**CIE**		25 Marks	

Course Objectives :	
The course is taught with the objectives of enabling the student to:	
1	To understand the fundamentals of DC and AC electrical circuits.
2	To understand the working principles of DC motor, DC generator, Transformers and single phase induction motors.
3	To understand working principles of protection devices used in electrical circuits.

Course Outcomes:	
On completion of this course, the student will be able to :	
CO-1	Get an exposure to common electrical components and their ratings. Make electrical connections by wires of appropriate ratings.
CO-2	Understand the usage of common electrical measuring instruments.
CO-3	Analyze the performance of AC and DC circuits with appropriate operating conditions.
CO-4	Understand the basic characteristics of transformers and electrical machines.
CO-5	Obtain the overall understanding of basic electrical circuits and appliances required for any industry.

Suggested List of Laboratory Experiments/Demonstrations:

I - Cycle

Demonstration: Basic safety and precautions - Introduction and use of measuring instruments

Exp 1. Verification of Kirchhoff's Laws

Exp 2. Verification of Thevenin's & Norton's Theorems

Exp 3. Steady-state and transient time-response of R-C circuit to a step change in voltage

Exp 4. Sinusoidal steady state response of R-L and R-L-C circuits - impedance calculation and verification

Exp 5. Measurement of three-phase power in balanced three-phase circuits using Two-Wattmeter method

II - Cycle

Demonstration: cut-out sections of machines: DC machine, induction machine, synchronous machine and single-phase machine

Exp 6. Load test on single phase transformer: Measurement of primary and secondary voltages, currents and power

Exp 7. Three-phase Transformer: Star and Delta connections. Voltage and current relationship

Exp 8. Torque-speed characteristics of separately excited DC motor

Exp 9. Synchronous speed of two-pole and four-pole, three-phase induction motor, Speed reversal by change of phase-sequence

Exp 10. Magnetization curve of a separately excited DC Generator

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 Electrical Engineering” Tata McGraw Hill, Publications, 2009
4	Hughes, "Electrical Technology", VII Edition, International Student -on, Addison Wesley Longman Inc., 1995.

Course Outcome	**Program Outcome**													
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
CO 1	3	3	3	-	-	-	-	-	-	-	-	-	3	3
CO 2	3	3	3	-	-	-	-	-	-	-	-	-	3	3
CO 3	3	2	2	-	-	-	-	-	-	-	-	-	2	3
CO 4	3	2	2	-	-	-	-	-	-	-	-	-	2	3
CO 5	3	2	2	-	-	-	-	-	-	-	-	-	3	3

Correlation rating**:** **Low / Medium / High – 1 / 2 / 3** respectively