

E.G.S. PILLAY ENGINEERING COLLEGE

(Autonomous)

Approved by AICTE, New Delhi | Affiliated to Anna University, Chennai

Accredited by NAAC with 'A' Grade | Accredited by NBA

NAGAPATTINAM – 611 002



B.E. ELECTRICAL AND ELECTRONICS ENGINEERING

Full Time Curriculum and Syllabus

Second Year – Fourth Semester

Course Code	Course Name	L	T	P	C	Maximum Marks		
						CA	ES	Total
Theory Course								
1902EE401	Generation, Transmission and Distribution	2	1	0	3	40	60	100
1902EE402	Synchronous and Asynchronous Machines	2	1	0	3	40	60	100
1902EE403	Linear Integrated Circuits	3	0	0	3	40	60	100
1902EE404	Communication Engineering	3	0	0	3	40	60	100
1901EE405	Biology for Electrical Engineers	3	0	0	3	40	60	100
Laboratory Course								
1902EE451	Synchronous and Asynchronous Machines Laboratory	0	0	3	1.5	50	50	100
1902EE452	Analog and Digital Integrated Circuits Laboratory	0	0	3	1.5	50	50	100
1902GE451	Life Skills : Verbal ability	1	0	1	1.5	100	0	100
Audit Course								
1901MCX01	Environmental Science	3	0	0	0	00	00	000

L – Lecture | T – Tutorial | P – Practical | CA – Continuous Assessment | ES – End Semester

1902EE401	GENERATION, TRANSMISSION AND DISTRIBUTION	L	T	P	C
		2	1	0	3

MODULE I ELECTRICAL POWER GENERATION 9 Hours
(Block diagram/Qualitative approach only)

Structure of electric power system: Single line diagram, different operating voltages of generation, transmission and distribution.

Types of energy and classification of power plants; Present power position in India, Future planning for power generation.

Power generation from Non-Renewable energy sources: Thermal and Nuclear based power generation

Power generation from Renewable energy sources: Solar, Wind, Hydro, Tidal, Geothermal, Fuel cell and Bio-mass based power generation.

MODULE II MECHANICAL DESIGN OF LINES, AND INSULATORS 9 Hours

Mechanical design of OH lines: Line supports, Types of towers, Stress and Sag calculation, Towers at equal heights, Unequal heights, Effects of wind and ice loading, stringing chart.

Insulators: Types, voltage distribution in insulator string, improvement of string efficiency, testing of insulators.

MODULE III PARAMETERS OF TRANSMISSION LINES, AND UNDERGROUND CABLES 9 Hours

Parameters of single and three phase transmission lines: Resistance, inductance and capacitance of symmetrical and unsymmetrical transposed solid, stranded and bundled conductors; self and mutual GMD.

Underground cables: constructional features of LT and HT cables; capacitance of single-core cable; grading of cables, power factor and heating, capacitance of 3-core belted cable; DC cables; Cable faults and testing.

MODULE IV PERFORMANCE OF TRANSMISSION LINES 9 Hours

Performance of Transmission lines - short line, medium line and long line, equivalent circuits, Phasor diagram, attenuation constant, phase constant, surge impedance; transmission efficiency and voltage regulation; Real and reactive power flow in lines; surge impedance loading; Power circle diagrams; Skin and proximity effects; Ferranti effect; Interference with neighboring communication circuits; Corona discharge characteristics, Critical voltage and corona loss; Methods of voltage control

MODULE V DISTRIBUTION SYSTEMS AND SUBSTATION 09 Hours

Distribution systems: General Aspects, Radial and ring main systems; Calculation of voltage in distributors with concentrated and distributed loads, Kelvin's law; Techniques of voltage control and power factor improvement.

Substation: Types, typical key diagram of an 11kV / 400V substation; Grounding; Recent trends in transmission and distribution: EHVAC, HVDC and FACTS (Qualitative treatment only).

TOTAL: 45 HOURS

REFERENCES:

1. C.L.Wadhwa, 'Electrical Power Systems', New Academic Science Ltd, seventh edition 2017.
2. J.Brian, Hardy and Colin R.Bayliss 'Transmission and Distribution in Electrical Engineering', Newnes; Fourth Edition, 2011.
3. D.P.Kothari, I.J. Nagarath, "Power System Engineering", TataMcGraw Hill Publishing Company limited, New Delhi, 2nd edition. 2008.
4. HadiSaadat, 'Power System Analysis,' PSA Publishing; Third Edition, 2010.
5. S. L. Uppaland S. Rao "Electrical Power" Khanna Publishers, 15th Edition, 1987.
6. <http://nptel.ac.in/courses/108108099/>, <http://nptel.ac.in/courses/108105053/2>

1902EE402	SYNCHRONOUS AND ASYNCHRONOUS MACHINES	L	T	P	C
		2	1	0	3

MODULE I SYNCHRONOUS GENERATOR

9 Hours

Constructional details-types of rotors;EMF equation; specifications; Armature reaction-phasor diagram; Predetermination of voltage regulation– EMF, MMF, ZPF & ASA methods; Load characteristics; Power transfer equations and capability curves; Two reaction theory;Slip test;Parallel operation and synchronization to infinite bus bar; Application; Maintenance.

MODULE II SYNCHRONOUS MOTOR

9 Hours

Principle of operation, torque equation, power input and power developed equations; V and Inverted V curves; Effect of varying load and Excitation; Load test and characteristics; Starting methods; Hunting; Synchronous condenser; Applications. Synchronous induction motor.

MODULE III THREE PHASE INDUCTION MOTOR

9 Hours

Constructional details, types, principle of operation, rotating magnetic field, slip; Equivalent circuit; torque equation, Torque-Slip characteristics-Effect of supply voltage and rotor resistance on torque; Circle diagram, separation of losses; Tests; Cogging and crawling; Induction generator; Double cage deep bar induction motor.Role of asynchronous motor in industrial sector - Case study.

MODULE IV STARTING AND SPEED CONTROL OF THREE PHASE INDUCTION MOTOR

9 Hours

Need for starter; Types of starters – star delta starter, auto transformer starter, DOL starter, Comparison of starters; Speed control – voltage control, frequency control, pole changing, cascaded connection, v/f control, slip power recovery scheme; Braking methods.Safety procedures for installation of starters. Speed control applications in industry - Case study.

MODULE V SINGLE PHASE INDUCTION MOTOR & FRACTIONAL HP MOTORS

9 Hours

Principle of single phase induction motors-Rotating vs alternating magnetic field; double field revolving theory; Types or Starting methods; Construction; Torque - speed characteristics; equivalent circuit. Construction and working of fractional HP motors: Hysteresis motor; stepper motor; universal motor; linear induction motor.Role of single phase induction motor in industrial and house hold appliances. Use of capacitor bank- Applications of single phase induction motor- Case study.

TOTAL: 45 HOURS

REFERENCES:

1. Fitzgerald A.E,CharlesKingsley, Stephen. D.Umans, „Electric Machinery”, Tata McGraw-Hill Education Pvt. Ltd. 6th Edition, 2015.
2. Kothari D.P and I.J. Nagrath, “Electric Machines”,McGraw -Hill,5th Edition, 2017.
3. BhimbhraP.S, “ElectricalMachinery”,HannaPublishers,7thEdition, 2009.
4. Bandyopadhyay M.N, “Electrical Machines-Theory and Practice”, PHI Learning Pvt. LTD., New Delhi, 2014
5. Charles A. Gross, “Electric /Machines”, CRC Press, First Edition, 2006.
6. <https://nptel.ac.in/courses/108/106/108106072/>

1902EE403

LINEAR INTEGRATED CIRCUITS

L T P C
3 0 0 3

MODULE I FABRICATION OF INTEGRATED CIRCUITS

9 Hours

IC classification; Fundamental of monolithic IC technology; Epitaxial growth, masking and etching, diffusion of impurities; realization of monolithic ICs and packaging; fabrication of diodes, capacitance, resistance and FET.

MODULE II OPERATIONAL AMPLIFIER

9 Hours

Op-Amp- functional block diagram, ideal and practical op-amp; IC741- Pin diagram, Features, Interpretation of IC 741 datasheet; Characteristics-CMRR, open loop gain, slew rate, transfer characteristics, input bias and output offset voltage, offset compensation techniques, frequency response characterization, frequency compensation.

MODULE III APPLICATIONS OF OPERATIONAL AMPLIFIERS

9 Hours

Inverting and non-inverting amplifiers, voltage follower, summing amplifier, differential amplifier, instrumentation amplifier; Comparators; Integrator and differentiator; Precision rectifier; Logarithmic and anti logarithmic amplifiers. Sinusoidal oscillators - phase shift, Wein bridge & Hartley; sample and hold circuit; clipper and clamper; Schmitt trigger.

MODULE IV SIGNAL CONVERSION APPLICATIONS

9 Hours

V/F and F/V converters; V/I and I/V converter; D/A converter - weighted resistor type, R-2R ladder type, inverted R-2R, comparison; A/D converters- flash type, successive approximation type, single slope type, dual slope type, A/D converter using voltage-to-time conversion, comparison. Active filters-Low pass, High pass, Bandpass and Band reject filters; First, second and higher order filters.

MODULE V SPECIAL FUNCTION INTEGRATED CIRCUITS

9 Hours

555 Timer - functional block diagram and description, astable, monostable and bistable operations; 566 voltage controlled oscillator; 565 PLL - functional block diagram, principle of operation, characteristics; IC voltage regulators – regulation, need for voltage regulation; LM78XX, 79XX fixed voltage regulators; LM 317 & LM723; Interpretation of IC data sheets.

Total: 45 Hours

REFERENCES:

1. D Roy Choudhury and SheilB.Jani, "Linear Integrated Circuits" 4th Edition, New Age International, New Delhi, 2014.
2. S Salivahanan and V S KanchanaBhaaskaran, "Linear Integrated Circuits", 2nd Edition, McGraw-Hill Education, 2014.
3. RamakantA.Gayakward, "Op-amps and Linear Integrated Circuits", 4th Edition, PHI Learnings, 2003.
4. B Somanathan Nair, "Linear Integrated Circuits: Analysis, Design and Applications", Wiley, 2009.
5. Floyd and Buchla, "Fundamentals of Analog Circuits", Pearson, 2013.
6. James M. Fiore, "Operational Amplifiers & Linear Integrated Circuits: Theory and Application / 3E", November 2018.
7. Microelectronic circuits-by A.S.Sedra and K.C.Smith
8. <http://nptel.ac.in/courses/117107094/>

1902EE404	COMMUNICATION ENGINEERING	L	T	P	C
		3	0	0	3

MODULE I AMPLITUDE MODULATION SYSTEMS 9 Hours

Need for modulation – Classifications of modulation techniques-Generation and detection: AM, DSBSC, SSB-SC, VSB-Comparison of Amplitude modulation systems- AM transmitters-AM receivers.

MODULE II ANGLE MODULATION SYSTEMS 9 Hours

Frequency modulation: Narrowband and wideband FM- Phase Modulation- Generation of FM signal:Direct FM, indirect FM- Demodulation of FM signals -FM stereo multiplexing- FM transmitters- FM receivers.

MODULE III SAMPLING AND QUANTIZATION 9 Hours

Sampling Process – Aliasing – Instantaneous sampling – Natural Sampling – Flat Sampling – Quantization of signals –sampling and quantizing effects –channel effects – SNR for quantization pulses – data formatting techniques –Time division multiplexing

MODULE IV DIGITAL TRANSMISSION 9 Hours

Baseband Transmission: Wave form representation of binary digits - PCM, DPCM, DM, ADM systems, Pass band Transmission: ASK, FSK, PSK, QPSK, DQPSK, MSK, QAM , Noise performance of ASK, FSK, PSK,QPSK, DQPSK, MSK, QAM

MODULE V CELLULAR COMMUNICATION 9 Hours

Introduction, Frequency reuse, Cell Assignment techniques, Hand off Strategies, Interference and System Capacity, Trunking and Grade of Service, Improving Coverage and capacity in cellular systems. Multiple Accesstechniques: FDMA, TDMA, CDMA, SDMA

Total: 45 Hours

REFERENCES:

1. G.Kennedy and B.Davis, Electronic Communication Systems, fourth Edition, Tata McGraw-Hill -2008.
2. Simon Haykin, Communication Systems, John Wiley, 2001.
3. Simon Haykin, "Digital Communications", John Wiley, 2006.
4. Amitabha Bhattacharya, "Digital Communication", Tata McGraw Hill, 2006.
5. Rappaport. T.S., "Wireless Communications: Principles and Practices", Second Edition, PHI, 2014
6. <https://nptel.ac.in/courses/108/104/108104100/>

1901EE405	BIOLOGY FOR ELECTRICAL ENGINEERS	L	T	P	C
		3	0	0	3

MODULE I INTRODUCTION TO CELL BIOLOGY **09 Hours**

Basic Cell- chromosomes, genes, cell cycle and cell division phase, cell differentiation: evidences of evolution, theories of evolution, biological evolution; recombination- chromosome mapping, natural selection, mutation; Genetic algorithms; evolutionary algorithms.

MODULE II SENSORY FUNCTIONS OF HUMAN ORGANS **12 Hours**

Eye- visual acuity, visual perception, colour perceptions; camera, Digital Camera-; introduction to Image processing Ear- Auditory perception, equilibrioception; introduction to Signal processing Brain- neuron, cerebellum and cerebrum; motor control-, sensory, regulation-, Language; lateralisation- Emotion, cognition; Artificial neural network; introduction to Machine learning, Natural language processing .

MODULE III MUSCULAR AND LOCOMOTIVE FUNCTIONS **09 Hours**

Producing movement- body movements, Special movements-, Stabilizing joint, locomotion; Swimming of fish, active flight, gliding, soaring of birds ; Robots- degree of freedom, rigid transformations- kinematics, inverse kinematics- jacobians; trajectory following

MODULE IV BIO ELECTRONICS ENGINEERING **08 Hours**

Overview of bioelectronics; analogy between semiconductor and biological materials; advanced bio electronic devices; introduction to bio signals; Bio medical imaging, X-ray imaging, computed tomography, ultrasonic imaging systems, magnetic resonance imaging system ; introduction to bio chip technology

MODULE V BIO MEDICAL INSTRUMENTATION **07 Hours**

Introduction to bio electrical engineering- sensors and actuators- remote sensing role of electrical instrumentation in Biology – therapeutic equipments - EEG-ECG-EMG ; Introduction to Micro electro mechanical system (MEMS)

TOTAL: 45 HOURS

REFERENCES:

1. L. Cromwell, F. J. Weibell, E. A. Pfeiffer. "Biomedical Instrumentation and Measurement" Pearson Education, 2003
2. Guyton and Hall Textbook of Medical Physiology 13th Edition by John E. Hall Elsevier.
3. Biochips: Technology and Applications, Wan-Li Xing, Jing Cheng, Springer; 2003 edition (11 July 2003)
4. Biosensors and Bioelectronics, Chandran Karunakaran Kalpana Bhargava Robson Benjamin, Elsevier publications book series.
5. Andrew A. Biewener, Sheila N. Patek "Animal Locomotion" Second edition Oxford University Press.
6. Biology for Engineers: As per Latest AICTE Curriculum- Wiley Editorial.
7. Learn Physiology Online- Harvard Medical School (onlinelearning.hms.harvard.edu).
8. <https://www.edx.org/course/essential-human-biology-cells-and-tissues> (University of Adelaide).

1902EE451

**SYNCHRONOUS AND ASYNCHRONOUS MACHINES
LABORATORY**

L	T	P	C
0	0	3	1.5

LIST OF EXPERIMENTS:

1. No load, blocked rotor test and load test on single phase induction motor.
2. Parallel operation of alternators/ synchronization of alternator with infinite bus bar
3. No load, blocked rotor test and load test on three phase induction motor.
4. Synduction motor
5. Separation of no load losses ofthree phase induction motor.
6. Voltage regulation of an alternator by EMF and MMF method.
7. Voltage regulation of an alternator by ZPF and ASA method.
8. V & inverted V curve of three phase synchronous motor.
9. Determination of X_d, X_q and regulation of a salient pole alternator.
10. Determine the characteristics of three phase induction generator.
11. Speed control of single phase/three phase induction motor.

TOTAL: 36 HOURS

ADDITIONAL EXPERIMENTS:

Determination of negative & zero sequence reactance of a three phase alternator.

REFERENCES:

1. Suresh Babu.P.J, "Electrical Machinery Lab II Manual", 2018.
2. Kothari.D.P&Umre.B.S "Laboratory manual for electrical machines", I.K international Publishing House (P) Ltd. 2nd Edition, 2017

1902EE452	ANALOG AND DIGITAL INTEGRATED CIRCUITS LABORATORY	L	T	P	C
		0	0	3	1.5

LIST OF EXPERIMENTS:

1. Inverting and non-inverting amplifiers using op-amp.
2. Adder, subtractor and comparators using op-amp.
3. Sinusoidal oscillators using op-amps.
4. Schmitt trigger using op-amp.
5. Weighted resistor type DAC and R-2R ladder type DAC
6. Astable and monostable multivibrators using NE555 timer.
7. Implementation of Boolean functions, Adder/ Subtractor circuits
8. Design and implementation of code converters using logic gates
9. Design and implementation of encoder and decoder using logic gates.
10. Construction and verification of 4 bit ripple counter (up/down).
11. Implementation of SISO, SIPO, PISO and PIPO shift registers using Flip-flops.
12. Design and implementation of Multiplexer and De-multiplexer using logic gates.

TOTAL: 36 HOURS

ADDITIONAL EXPERIMENTS :

1. Applications of 565 Phase locked loop (PLL)
2. Applications of 566 voltage controlled oscillator (VCO)
3. Adjustable voltage regulators using LM317 and LM723.

REFERENCES:

1. Dr. T. Suresh Padmanabhan and Mr.K.Nandakumar, "Analog and Digital Integrated Circuits Manual", 2018.
2. D Roy Choudhury and SheilB.Jani, "Linear Integrated Circuits" 4th Edition, New Age International, New Delhi, 2014.
3. James M. Fiore, "Operational Amplifiers & Linear Integrated Circuits: Theory and Application / 3E", November 2018.
4. RamakantA.Gayakward, "Op-amps and Linear Integrated Circuits", 4th Edition, PHI Learnings, 2003.

1904GE451	LIFE SKILLS : VERBAL ABILITY	L	T	P	C
		2	0	0	1

MODULE1 VOCABULARY USAGE 6 hours

Introduction - Synonyms and Antonyms based on Technical terms – Single word Substitution – Newspaper, Audio and video listening activity.

MODULE 2 COMPREHENSION ABILITY 6 hours

Skimming and Scanning – Social Science passages – Business and Economics passages – latest political and current event based passages – Theme detection – Deriving conclusion from passages.

MODULE 3 BASIC GRAMMAR AND ERROR DETECTION 6 hours

Parallelism – Redundancy – Ambiguity – Concord - Common Errors – Spotting Errors – Sentence improvement – Error Detection FAQ in Competitive exams.

MODULE 4 REARRANGEMENT AND GENERAL USAGE 6 hours

Jumble Sentences – Cloze Test - Idioms and Phrases – Active and passive voice – Spelling test.

MODULE 5 APPLICATION OF VERBAL ABILITY 6 hours

Business Writing - Business Vocabulary - Delivering Good / Bad News - Media Communication - Email Etiquette – Report Writing - Proposal writing – Essay writing– Indexing –Market surveying.

TOTAL: 30 HOURS

REFERENCES:

1. Arun Sharma and MeenakshiUpadhyav, How to Prepare for Verbal Ability and Reading Comprehension for CAT, McGrawHill Publication, Seventh Edition 2017
2. R S Aggarwal and VikasAggarwal , Quick Learning Objective General English ,S.Chand Publishing House, 2017
3. Dr.K.Alex , Soft Skills, S.Chand Publishing House, Third Revise Edition, 2014
4. Raymond Murphy, Essential English Grammar in Use, Cambridge University press, New Delhi, Third Edition , 2007

1901MCX01

ENVIRONMENTAL SCIENCE
(Common to all Branches of B.E/ B.Tech)

L	T	P	C
3	0	0	0

MODULE I ECOSYSTEMS AND BIODIVERSITY

10 Hours

Concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers-Oxygen cycle and Nitrogen cycle – energy flow in the ecosystem – ecological succession processes – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity. Documentation of the medicinal plants in your native place

MODULE II NATURAL RESOURCES

10 Hours

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and overutilization of surface and ground water, dams- benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and nonrenewable energy sources, use of alternate energy sources. Energy Conversion processes – Biogas – production and uses, anaerobic digestion; case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles. Documentation of the effect of modern Agriculture in your nearby Village

MODULE III ENVIRONMENTAL POLLUTION

9 Hours

Definition – Source, causes, effects and control measures of: (a) Air pollution - Mitigation procedures- Control of particulate and gaseous emission, Control of SO_x, NO_x, CO and HC) -Technology for capturing CO₂ (metallo organic frame works)(b) Water pollution – Waste water treatment processes. (c) Soil pollution - soil waste management: causes, effects and control measures of municipal solid wastes – (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards–role of an individual in prevention of pollution – pollution case studies. Documentation study of local polluted site – Urban / Rural / Industrial / Agricultural.

MODULE IV SOCIAL ISSUES AND THE ENVIRONMENT

8 Hours

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management -environmental ethics: Issues and possible solutions – 12 Principles of green chemistry – consumerism and waste products – environment protection act – Air act – Water act – Wildlife protection act – Forest conservation act – The Biomedical Waste (Management and Handling) Rules; 1998 and amendments- scheme of labeling of environmentally friendly products (Ecomark) central and state pollution control boards- disaster management: floods, earthquake- Public awareness. Analyze the recent steps taken by government of India to prevent pollution (Green India and Clean India)

MODULE V HUMAN POPULATION AND THE ENVIRONMENT

8 Hours

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare –Environmental impact analysis (EIA) -GIS-remote sensing-role of information technology in environment and human health – Case studies. Documentation study of the Human health and the environment in nearby Hospital (Statistical report)

TOTAL: 45 HOURS

REFERENCES:

1. Trivedi.R.K., "Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards", Vol. I and II, Enviro Media, 3rd edition, BPB publications, 2010.
2. Cunningham, W.P. Cooper, T.H. Gorhani, "Environmental Encyclopedia", Jaico Publ., House, Mumbai, 2001.
3. Dharmendra S. Sengar, "Environmental law", Prentice hall of India PVT LTD, New Delhi,2007.
4. Rajagopalan, R, "Environmental Studies-From Crisis to Cure", Oxford University Press, 2005.
5. Benny Joseph, "Environmental Science and Engineering", Tata McGraw-Hill, New Delhi, 2006
6. Ravikrishnan“Environmental Science and Engineering” Sri Krishna Hi-tech Publishing Company Pvt .
7. https://en.wikipedia.org/wiki/Carbon_capture_and_storage.

