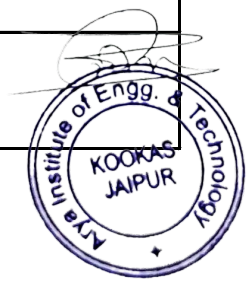
ARYA INSTITUTE OF ENGINEERING & TECHNOLOGY

2.6.1 POs & COs (Additional Information)

Index



List of Program Education Objectives (PEO)	
PEO-1	**Preparation:-** To prepare to pursue advanced graduate studies in computing or related disciplines and provide students broad-based education in core areas of Computer Science, including theoretical foundations, algorithms and data structures, and hardware, with an appropriate blend of theory and practice and to specialize in a variety of areas of Computer Science through a selection of elective courses.
PEO-2	**Core Competence:-**To provide students with a solid foundation in engineering field required to solve computing problems using various programming languages and software's, and students can solve problems through logical and analytical thinking.
PEO-3	**Breathe:-**To train students with good engineering breadth so as to comprehend, analyze, design, and create novel products and solutions for the real life.
PEO-4	**Professionalism:-**To inculcate in students professional and ethical attitude, effective communication skills, teamwork skills, multidisciplinary approach, and an ability to relate engineering issues to broader social context.
PEO-5	**Learning Environment:-**To provide students with an academic environment aware of excellence leadership and lifelong learning needed for successful professional career through independent studies, thesis, internships etc.

List of Program Outcomes	
PO-1	**Engineering Knowledge**: Apply knowledge of mathematics and science, with fundamentals of Engineering to be able to solve complex engineering problems related to CSE.
PO-2	**Problem Analysis**: Identify, Formulate, review research literature and analyze complex engineering problems and reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
PO-3	**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.
PO-4	**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.
PO-5	**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.
PO-6	**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.
PO-7	**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.
PO-8	**Ethics**: Apply Ethical Principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO-9	**Individual and Team Work**: Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary Settings.
PO-10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large such as able to comprehend and with write effective reports and design documentation, make effective presentations and give and receive clear instructions.
PO-11	**Project Management and Finance**: Demonstrate knowledge and understanding of the engineering management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multi disciplinary environments.
PO-12	**Life-Long Learning**: Recognize the need for and have the preparation and ability to engage in independent and life-long learning the broadest context of technological change.

List of Program Specific Outcomes (PSO) CSE	
PSO-1	**Knowledge Enhancement in Computing:** The ability to interpret the foundation and strategy of hardware and software of computer systems. Graduates can solve the problems in the areas related to algorithms, multimedia, data analytics, cloud computing, human computer interface, robotics, artificial intelligence and networking for efficient design of computer systems.
PSO-2	**Software Design and Development**: The ability to understand the software development lifecycle and methodologies of software systems. Graduate will learn competent skills and knowledge of software design process. Graduate will be acquaintance to practical proficiency with a broad area of programming concepts.

MAPPING OF PEO WITH PO & PSO

Program Education Objectives (PEO)	PROGRAM OUTCOME												PSO	
	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
PEO-1	3	3	2	3	-	-	-	1	-	-	1	2	3	2
PEO-2	3	3	3	3	3	-	1	-	-	-	-	2	2	3
PEO-3	3	3	3	2	3	-	-	-	-	-	-	3	3	2
PEO-4	-	-	-	-	-	2	2	3	3	3	3	3	1	2
PEO-5	-	1	2	1	-	3	2	2	3	2	3	3	2	3

Note: Correlation levels 1, 2 or 3 as defined below:
1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

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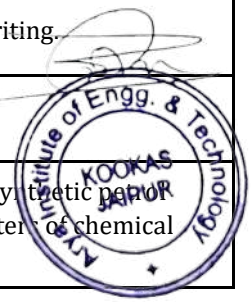
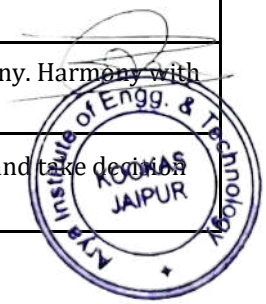
1st Year & Humanities

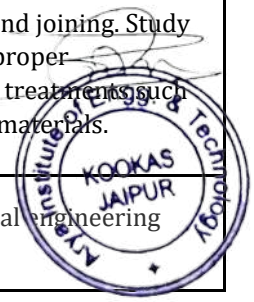
S. No.	Course Code	Course Title	Course Outcomes (COs)
1	1FY3/2FY3-06	Programming For Problem Solving	**CO1**: Graduates gain ability tounderstand the fundamental of computer architecture and stored programs. It provides the basic understanding of software used in the compilation process.
			CO2: Graduates will able to analyze and understand programming language in the context of basic structure of C programming, data types, operators, variable declaration and input/output function.
			CO3:. Graduates gain ability to develop programs using the basic elements likecontrol statements with conditional and iterative statements, arrays, strings and pointers.
			CO4: Graduates can understand the concept of effective usage of structures and functions to understand the memory management concepts. It elaborates the issues in file organization and the usage of file systems.
			CO5: Graduates gain ability to obtain the knowledge about the number systems which will be very useful for bitwise operations.
2	1FY1/2FY1-04	Communication Skill	**CO1:** Graduates gain ability to understand classes needed for the communication major and emphasis. They should become acquainted with practicums, internships and job opportunities.
			CO2: Graduate will be able to communicate effectively in both verbal and written form. They will develop a better, presentation skill on academic and personal grounds that will enhance their personality in all aspects.
			CO3: Graduate will be able to enhance reading and writing skills by analyzing various comprehensions.
			CO4: Graduate will be able to enhance reading and writing skills by analyzing various literary texts.They should be able to mould the fictious world to the real world.
			CO5: Graduate will be able to learn the use of poetic devices and they should enhance their style of writing.
3	1FY2/2FY2-03	Engineering Chemistry	**CO1**: To define, determine, remove hardness & purify the water by applying suitable techniques.
			CO2: To determine, numerically calculate & analyze calorific value of different fuels. Also synthesize synthetic petrol through various methods. Identify instrumental techniques for analysis & analyze the quality parameters of chemical fuels.



3	1FY2/2FY2-03	Engineering Chemistry	**CO3:** To define & analyze engineering problems related to corrosion &solve the corrosion problems by different techniques & methods.
			CO4: To manufacture Cement & Glass by suitable technology. Identify & compare the materials like cement , glass best suited for construction.
			CO5: To understand the reaction mechanism involved in the synthesis of various chemicals & drugs.
4	1FY2-01	Engineering Mathematics I	**CO1:** Interpret the area enclosed between curves as a definite integral and compute its value.
			CO2: Use comparison with a corresponding integral with other series to decide whether infinite series (including p-series) converge or diverge.
			CO3: Represent continuous-time periodic signals using Fourier series.
			CO4: Manipulate vectors to perform geometrical calculations in three dimensions.
			CO5: Use Green's theorem and the Divergence theorem to compute integrals.
5	2FY2-01	Engineering Mathematics II	**C01:** Use computational techniques and algebraic skills essential for the study of systems of linear equations, matrix algebra, vector spaces, eigenvalues and eigenvectors, orthogonality and diagonalization. (Computational and Algebraic Skills).
			C02: Analyze real world scenarios to recognize when ordinary differential equations (ODEs) or systems of ODEs are appropriate, formulate problems about the scenarios, creatively model these scenarios (using technology, if appropriate) in order to solve the problems using multiple approaches, judge if the results are reasonable, and then interpret and clearly communicate the results.
			C03: Use computational tools to solve problems and applications of Ordinary Differential Equations and Partial Differential Equations.
			C04: Apply partial derivative equation techniques to predict the behaviour of certain phenomena.
			C05: Use appropriate numerical methods to study phenomena modelled with partial derivative equations.
6	1FY1/2FY1-05	Human Value	**CO1**: Graduates gain ability to understand the Values needed to became good human being .Skill with Values makes the complete meaning of development and complement to each other.
			CO2: Graduate will be able to understand their goal by self-exploration and able to take Right Decision an every aspect of their personality in all aspects.
			CO3: Graduate by learning not only in Professional life, all levels of Living/order enable to with Harmony. Harmony with Self along with Harmony of Family.
			CO4: Graduate by Learning of Values, able to become Self-confident, able to develop to judge the facts and take decision by Natural Acceptance not Merely by Imagination and Pre-condition.



			CO5: Graduate will be able to learn Professional Ethics and Code of Conduct to lead Discipline life and make Substantial growth both in Professional life and Personal Life.
7	1FY3/2FY3-09	Basic Civil Engineering	**CO1:** Graduates gain to define the scope, Specialization and role of Civil Engineering along with the Impact of infrastructural development on economy of country.
			CO2: Graduates analyze and understand the field of surveying, its methods and the instruments used in the field to perform the survey work along with applications.
			CO3: Graduates gain ability to visualize the concept of building construction and can learn to understand the concept of RCC along with the importance of different factors required for building construction.
			CO4: Graduates can understand the concept of transportation and learn the various traffic signs along with the importance and measures for road safety.
			CO5: Graduates gain ability to understand the concept of environment engineering which include the concept of ecology and biodiversity, treatment of water, its usage and saving and be able to define and learn about the various environmental pollutions and factors such as global warming, greenhouse effect and climate change.
8	1FY3/2FY3-07	Basic Mechanical Engineering	**CO1:** Graduates understand fundamentals of mechanical engineering. Various classifications of boilers on the basis of direction of axis and flow which will help them to better understanding of boilers and with various accessories and mountings. They understand various steam turbines such as reaction and impulse turbine. they also learn different power plant such as Thermal, nuclear and hydro power plant.
			CO2: Graduates gain ability to understand the working of centrifugal and reciprocating pumps. They learn various aspects of four stroke and two stroke IC engines along with PV, TS and valve timing diagrams.
			CO3: Graduates understand about Refrigerants and their nomenclatures. Comparative study of vapour compression refrigeration system and vapour absorption refrigeration system clarify every minute difference between both systems. Graduates gain knowledge about various air conditioning also.
			CO4: Graduates differentiate and formulate various arrangements such as Open and cross belt drives. Study of rope drive , gear and design of belt for deriving the values of maximum power, tension ratio, velocity ratio, slip and length of belt generate ability to have problem solving approach in graduates.
			CO5: Graduates gain ability to understand various manufacturing processes such as Casting, forming and joining. Study of various engineering materials help them to know about various metallurgical properties and their proper implementation in engineering aspects. Graduates come to know that how the proper selection of heat treatments such as annealing, normalizing, tempering, hardening and quenching, reduce the dependency on expensive materials.
			CO1: Graduates gain ability toknowledge of fundamental physics and basic electrical and/or mechanical engineering principles to include advanced knowledge in one or more engineering disciplines



9	1FY2/2FY2-02	Engineering Physics	**CO2:** Graduate will be able to identify, formulate, and solve engineering physics problems.
			CO3:. Graduate will be able to apply the design process to engineering problems.
			CO4: Graduate will be able to formulate, conduct, analyze and interpret experiments in engineering physics.
			C05: Graduate will be able to use modern engineering physics techniques and tools, including software and laboratory instrumentation.
10	1FY3/2FY3-08	Basic Electrical Engineering	**CO1:** Graduates gain ability tounderstand the basics of Electrical DC circuits solving, and understand various DC circuit solving technique by learning theorems
			CO2: Graduates analyze and understand the AC representation in single and tree phase, and its working and characteristics.
			CO3: Graduates gain ability to visualize and identify Electrical Machine., motor and generator and can learn to draw construction parts.
			CO4: Graduates can understand the Design of semiconductors. Understanding and analyzing of converter, inverter, rectifier and their practical application.
			CO5: Graduates gain ability to understand the LT switchgears and their layout, configurations; they can also learn the different kind of switchgear and Earthing techniques.

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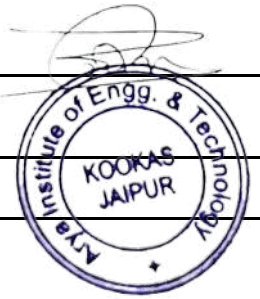
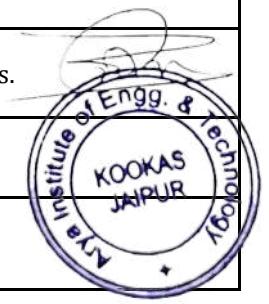
Electronics & Communication Engineering

S. No.	Course Code	Course Title	Course Outcomes (COs)	
1	3EC2-01	Advanced Engineering Mathematics-I	CO 1	The use of Numerical Methods in solving practical technical problems using scientific and Mathematical tools when available, and using experience and intuition otherwise, Mathematical models provide a prior estimate of performance very desirable when prototypes or experiments are costly. Engineering problems frequently arise in which exact analytical solutions are not available. Approximate solutions are normally sufficient for engineering applications, allowing the use of approximate numerical methods.
			CO 2	To use Fourier and Laplace transform, to evaluate the transfer function of linear time- invariant systems. Also use to Characterize and analyze the properties of DT signals and compute Z-transform and Fourier transform for DT signals.
2	3EC1-03	Managerial Economics And Financial Accounting	CO 1	Develop the understanding of number system and its application in digital electronics And analysis of K-map to solve the Boolean function to the simplest form for the implementation of compact digital circuits.
			CO 2	Design various combinational and sequential circuits using various metrics: switching speed, throughput/latency, gate count and area, energy dissipation and power.
			CO 3	Understanding Interfacing between digital circuits and analog component using Analog to Digital Converter (ADC), Digital to Analog Converter (DAC) etc
			CO 4	Design and implement semiconductor Memories, programmable logic devices (PLDs) and field programmable gate arrays (FPGA) in digital electronics.
2	3EC4-04	DIGITAL SYSTEM DESIGN	CO 1	Students will able to describe and explain literary cultural theories of English literature
			CO 2	Students will able to choose and describe the most enduring problems in philosophy
			CO 3	Students will able to gather and explain the history of philosophy, discuss the value of open, free inquiry and religious diversity.
			CO 4	Students will able to Display a general ability to understand and evaluate information
			CO 5	Students will able to Demonstrate an awareness of diverse cultures
			CO 1	Analyze different types of signals and system properties

3	**3EC4-05**	**SIGNAL & SYSTEM**	**CO 2**	Represent continuous and discrete systems in time and frequency domain using different transforms
			CO 3	Investigate whether the system is stable.
			CO 4	Sampling and reconstruction of a signal.
			CO 5	Acquire an understanding of MIMO systems
4	**3EC4-06**	**NETWORK THEORY**	**CO 1**	Apply the basic electrical laws and simplify the network using nodal, mesh and network theorems
			CO 2	Apply frequency domain and Laplace techniques in different circuit applications
			CO 3	Evaluate transient response of the circuit and two port network parameters
			CO 4	Analyze the series and parallel resonance in the circuit and design filters
5	**3EC4-07**	**Electronic Devices**	**CO 1**	Understanding the semiconductor physics of the intrinsic, P and N materials.
			CO 2	Understanding the characteristics of current
			CO 3	flow in a bipolar junction transistor and MOSFET.
			CO 4	Understand and utilize the mathematical
			CO 5	models of semiconductor junctions and MOS transistors for circuits and systems.
6	**3EC4-21**	**Electronic Devices Lab**	**CO 1**	Understand the characteristics of different Electronic Devices.
			CO 2	Verify the rectifier circuits using diodes and implement them using hardware.
			CO 3	Design various amplifiers like CE, CC, common source amplifiers andimplement them using hardware and also observetheir
			CO 4	frequency responses
			CO 5	Understand the construction, operation and
			CO 1	Students have the basic knowledge of logic gates, Universal logic gate



7	**3EC4-22**	**Digital System Design Lab**	**CO 2**	To minimize the complexity of digital logic circuits.
			CO 3	To design and analyse combinational circuits
			CO 4	To design and analyse sequential logic circuits
			CO 5	Students will be able to implement applications of combinational & sequential Logic Circuits
8	**3EC4-23**	**Signal Processing Lab**	**CO 1**	Able to generate different continuous and discrete time signals.
			CO 2	Understand the basics of signals and different operations on signals.
			CO 3	Develop simple algorithms for signal processing and test them using MATLAB.
			CO 4	Able to generate the random signals having different distributions, mean and variance.
			CO 5	Design and conduct experiments, interpret and analyze data and report results
9	**3EC7-30**	**Industrial Training**	**CO 1**	Student will be able to demonstrate the use, interpretation and application of an appropriate international engineering standard in a specific situation
			CO 2	Student will be able analyze a given engineering problem, identify an appropriate problem solving methodology, implement the methodology and propose a meaningful solution
			CO 3	Develop simple algorithms for signal processing and test them using MATLAB.
			CO 4	Able to generate the random signals having different distributions, mean and variance.
			CO 5	Design and conduct experiments, interpret and analyze data and report results
10	**4EC2-01**	**AEM-II**	**CO 1**	To use Harmonic conjugates (Complex Theorem) in analog and Digital communication for modulation of signals.
			CO 2	To use special function in solving the problems of probabilities related with random variables.
			CO 3	Vector space are use to solve space-time related problems in multiple access techniques.
11	**4EC1-02**	**Technical Communication**	**CO 1**	Graduates will be more confident in verbal & non verbal communication
			CO 2	Graduates will be able to develop analytical frame of mind through practical exposure of life

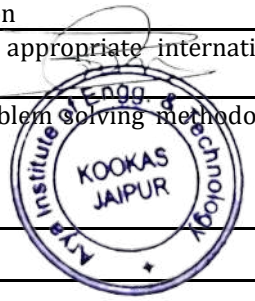


			CO 3	Graduates will be able to develop communication process, understanding the intricacies of communication to be used in corporate world
12	**4EC4-04**	**ANALOG CIRCUITS**	**CO 1**	Understand the characteristics of diodes and transistors Design and analyze various rectifier and amplifier circuits
			CO 2	Design sinusoidal and non-sinusoidal oscillators.
			CO 3	Understand the functioning of OP-AMP and design OP-AMP based circuits.
			CO 4	Understanding the designing of ADCs and DACs
13	**4EC4-05**	**MICRO-CONTROLLERS**	**CO 1**	Develop assembly language programming skills.
			CO 2	Able to build interfacing of peripherals like, I/O, A/D, D/A, timer etc
			CO 3	Develop systems using different microcontrollers.
			CO 4	Explain the concept of memory organization. Understand RSIC processors and design ARM microcontroller based systems.
14	**4EC3-06**	**ELECTRONIC MEASURMENT & INSTRUMENTATION**	**CO 1**	Describe the use of various electrical/electronic instruments, their block diagram, applications, dnd principles of operation, standards errors and units of measurements.
			CO 2	Develop basic skills in the design of electronic equipments
			CO 3	Analyse different electrical/electronic parameters using state of equipments of measuring instruments which is require to all types of industries.
			CO 4	Solve: Identify electronics/ electrical instruments, understanding associated with the instruments . Explain use of transducers in different types of field applications
15	**4EC4-07**	**ANALOG and Digital Communication**	**CO 1**	Ability to understand the basic AM and FM and its scope.
			CO 2	Calculation of noise of AM and FM
			CO 3	Ability to understand the PCM, Delta Modulation
			CO 4	Study of elements of detection theory

			CO 5	Study of probability of error of ASK,FSK and PSK system
16	**4EC4-21**	**ANALOG and Digital Communication Lab**	**CO 1**	Analyze and compare different analog modulation schemes for their efficiency and bandwidth
			CO 2	Analyze the behavior of a communication system in presence of noise
			CO 3	Investigate pulsed modulation system and analyze their system performance
			CO 4	Analyze different digital modulation schemes and can compute the bit error performance
			CO 5	Design a communication system comprised of both analog and digital modulation techniques
17	**4EC4-22**	**ANALOG Circuits Lab**	**CO 1**	Discuss and observe the operation of a bipolar junction transistor and field-effect transistor in different region of operations
			CO 2	Analyze and compare design of transistor Amplifier and Oscillators. Importance of negative feedback.
			CO 3	Analyze the frequency response of amplifiers and operational amplifier circuits. Develop an intuition for analog circuit behavior in both linear and nonlinear operation
			CO 4	Design op-amps for specific gain, speed, or switching performance. Compensate operational amplifiers for stability
			CO 5	Design and conduct experiments, interpret and analyze data, and report results
18	**4EC4-23**	**Microcontrollers Lab**	**CO 1**	Develop skills related to assembly level programming of microprocessors and microcontroller.
			CO 2	Interpret the basic knowledge of microprocessor and microcontroller interfacing, delay generation, waveform generation and Interrupts.
			CO 3	Interfacing the external devices to the microcontroller and microprocessor to solve real time problems.
			CO 4	Illustrate functions of various general purpose interfacing devices
			CO 5	Develop a simple microcontroller and microprocessor based systems
		Electronics Measurement &	**CO 1**	understanding the fundamentals of Electronic instrumentation.
			CO 2	Able to measure resistance, inductance and capacitance by various methods

19	4EC4-24	Measurement & Instrumentation Lab	CO 3	Design an instrumentation system that meets desired specifications and requirements
			CO 4	Design and conduct experiments, interpret and analyze data and report results
			CO 5	Explain the principle of electrical transducers. Confidence to apply instrumentation solutions for given industrial applications
20	5EC3-01	Computer Architecture	CO 1	Graduates Understand how to implement memory chips, boards, modules and caches
			CO 2	Graduates Relate to arithmetic for ALU implementation.
			CO 3	Graduates Understand the basics of hardwired and micro-programmed control of the CPU
			CO 4	Graduates Learn about various I/O devices and the I/O interface.
21	5EC4-02	Electromagnetics Waves	CO 1	The basic knowledge of antenna working principle & antenna arrays working concepts.
			CO 2	The knowledge of antenna subject helps the students to perform various experiments in laboratories which will help in understanding theory more clearly.
			CO 3	The knowledge and use of modern upcoming technologies like GPS, Smart Antenna, Wave propagation through free.
22	5EC4-03	Control system	CO 1	Graduates to identify the various machines, working Principle, Characteristics and their applications.
			CO 2	Graduates To analyze the principles of system modeling, feedback control and evaluate feedback control systems with desired performance.
			CO 3	Graduates To understand system stability, sensitivity, transient and tracking performance
			CO 4	Graduates To control system design such as design of feedback controllers, such as PID, lead and lag compensators, pole placement designs, to meet desired system performance specifications.
23	5EC4-04	Digital Signal Processing	CO 1	Sampling - discrete time processing of continuous-time signals.
			CO 2	Introduction, the frequency response of LTI systems, Structures for discrete-time systems.
			CO 3	Basic structures for IIR and fir systems, transposed forms
			CO 4	Introduction, analog filter design: Butterworth &chebyshev.iir filter design by impulse invariance & bilinear transformation, Design Kaiser window.

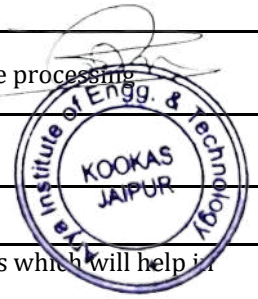
24	**5EC4-05**	**Microwave Theory & Techniques**	**CO 1**	Graduates gain ability to understand the impedance matching using L-Section and transmission line stub. Students will also learn quarter wave transformer and matching with quarter wave transformer.
			CO 2	Graduates analyze and understand the microwave diode like silicon crystal diode, schottky diode, varactor diode, GUNN diode, IMPATT diode, PIN diode etc.
			CO 3	Graduates analyze and understand the Microwave BJT, FET, MESFET and MOSFET. They will also learn stability of FET using K-delta test, transducer gain of single FET amplifier
			CO 4	Graduates gain ability to visualize the concept of microwave signal generator as reflex klystron and magnetron with its velocity modulation, bunching process.
			CO 5	Graduates gain ability to understand the microwave amplifier as two cavity klystron, travelling wave tube.
25	**5EC5-11**	**Bio-Medical Electronics**	**CO 1**	Students learn various technologies relating to the biological analysis in the electronic domain.
			CO 2	Students will be able to communicate and develop efficiently in the two multidimensional areas of biology and instrumentation.
			CO 3	Students will be able to understand the position of biomedical instrumentation in modern hospital care
26	**5EC4-21**	**RF Simulation Lab**	**CO 1**	Graduates understand the fundamentals of RF system design.
			CO 2	Graduates will gain knowledge about RF Filter designing.
			CO 3	Graduates will gain knowledge in RF Active components
			CO 4	Graduates will Learn the various techniques for RF transistor amplifier design, Oscillators and mixer design used in RF design.
27	**5EC5-22**	**Digital Signal Processing Lab**	**CO 1**	Signal and system and its application, elementary signals and their properties
			CO 2	The concept of signal processing, various types of signals used in Communication and image processing
			CO 3	To develop the skills for analyzing the system by using MATLAB
28	**5EC5-23**	**Microwave Lab**	**CO 1**	understand the basic knowledge of the transmission of Microwaves.
			CO 2	understand the basics of various Microwave guiding component such as Tees, Coupler, Circulators etc
			CO 3	understand the low and high power Microwave generators and their practical consideration
29	**5EC7-30**	**Industrial Training**	**CO 1**	Student will be able to demonstrate the use, interpretation and application of an appropriate international engineering standard in a specific situation
			CO 2	Student will be able analyze a given engineering problem, identify an appropriate problem solving methodology, implement the methodology and propose a meaningful solution
			CO 3	Student will be able apply prior acquired knowledge in problem solving



			CO 4	Students identify sources of hazards, and assess/identify appropriate health & safety measures.survive within it.
30	**6EC3-01**	**Power Electronics**	**CO 1**	Graduates have the basic knowledge of power electronic component.
			CO 2	Graduates will gain knowledge of rectifier and inverter helps the students to perform various experiments in laboratories which will help in understanding theory more clearly
			CO 3	Graduates have the knowledge and use of modern upcoming technologies
31	**6EC4-02**	**Computer Network**	**CO 1**	Graduates understand the evolution of MP technology
			CO 2	programming, debug and test a small scale circuits
			CO 3	Graduates identify, formulate, and solve engineering problems in MP based and to analyze their outcomes
			CO 4	Graduates develope ability to design circuits for various application using microcontroller
			CO 5	Graduates Learn the depth knowledge of applying the concepts of real time applications
32	**6EC4-03**	**Fiber Optics Communications**	**CO 1**	Graduates will get the basic knowledge of Ray theory principle & optical fiber working concepts
			CO 2	Graduates will get the knowledge of optical communication subject helps the students to perform various experiments in laboratories which will help in understanding theory more clearly.
			CO 3	Graduates will get the knowledge and use of modern upcoming technologies in optical communication.
			CO 4	Graduates To use design tools for optical system design, test and evaluation.
			CO 5	Graduates to use optical technology in Consumer Electronics, communication Systems Handheld computers, Communication devices.
33	**6EC4-04**	**Antennas and Propagation**	**CO 1**	Graduates gain ability to understand the Basic antenna parameters like Radiation pattern, beam-width, beam solid angle, directivity, efficiency, gain, radiation intensity, radiation resistance, input impedance and polarization.
			CO 2	Graduates analyze and understand the Point source, Array of two isotropic point sources. Uniform array of N point sources and array factor. 4 element broadside and endfire arrays
			CO 3	Graduates analyze and understand the different types of antenna as V- and Rhombic antennas, Monopole antenna, Small loop antenna, Folded dipole and Yagi-Uda antenna, Reflector antennas, Slot, Horn and Lens antennas, Helical antennas.
			CO 4	Graduates gain ability to visualize the concept of Mechanism of radio wave propagation. Theory of ground reflection-Plane earth reflection, reflection factors for horizontal and vertical polarizations
			CO 5	Graduates gain ability to understand the Various ionospheric layers, Electrical properties of the ionosphere and their effects on wave propagation, Critical frequency, virtual height, skip distance, maximum usable frequency.
34	**6EC4-05**	**Information Theory and Coding**	**CO 1**	Graduate will demonstrate knowledge of coding
			CO 2	Graduate will demonstrate an ability to identify, formulate and solve coding problems
			CO 3	Graduate will demonstrate an ability to study different coding scheme and also to visualize and work in laboratory and other tasks.
			CO 4	Graduate will demonstrate skills to use modern channel transmission techniques.
			CO 5	Graduate will demonstrate knowledge of eventual yield in security industry.

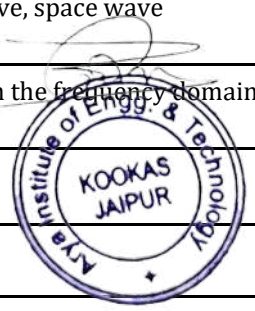
35	**6EC5-11**	**Introduction to MEMS**	**CO 1**	Graduates gain ability to understand the nonmaterial, Nanotechnology potential, STM, AFM, Idea of band structure-Metal, insulator and semiconductor, Superconductivity, Graphene, Carbon nano tube
			CO 2	Graduates analyze and understand the Silicon processing method, Cleaning /etching, Alkaline, Oxidation, CVD MOCVD, PVD Method, Photolithography, Nano imprinting, X-ray Lithography.
			CO 3	Graduates analyze and understand the Infrared spectroscopy, Raman spectroscopy, Raman Scattering, Rayleigh Scattering, X-ray Photon Spectroscopy, Photo electron spectroscopy, SEM ,TEM ,STM, Atomic force microscopy.
			CO 4	Graduates gain ability to visualize the concept of Classification of Nanomaterial, Metallic nanowires, Quantum dots, Nano-sensor Nano mediciene.
			CO 5	Graduates gain ability to understand the Evolution of micro fabrication, MEMS and its application in various fields, Description of MEMS, Manufacturing of MEMS, Advantage of MEMS, Potential application of MEMS device.
36	**6EC4-21**	**Computer Network Lab**	**CO 1**	Graduates understand fundamental underlying principles of computer networking
			CO 2	Graduates Understand details and functionality of layered network architecture.
			CO 3	Graduates Apply mathematical foundations to solve computational problems in computer networking.
			CO 4	Graduates Analyze performance of various communication protocols.
			CO 5	Graduates Compare routing algorithms.
37	**6EC4-22**	**Antenna & Wave Propagation LAB**	**CO 1**	Graduates understand the basic knowledge of antenna working principle & antenna arrays working concepts
			CO 2	Graduates Understand the knowledge of antenna lab helps the students to perform various experiments in laboratories which will help in understanding theory more clearly.
			CO 3	Graduates have the knowledge and use of modern upcoming technologies like GPS, Smart antenna, wave propagation through free space.
38	**6EC4-23**	**Electronics Design Lab**	**CO 1**	Graduates to perform the programs like addition, subtraction of two signals
			CO 2	Graduates Analyze and design various applications using Op-amp.
			CO 3	Graduates perform in laboratories which help in understanding the theory clearly. Design multivibrators using timer 555, and analog and digital circuits using op amps.
			CO 4	Graduates gain knowledge about RF Filter designing.
			CO 5	Graduates Learns the various techniques for RF transistor amplifier design, Oscillators and mixer design used in RF design.
39	**6EC4-24**	**Power Electronics Lab**	**CO 1**	Graduates Understand the basic knowledge of power electronic component
			CO 2	Graduates Have the knowledge of rectifier and inverter helps the students to perform various experiments in laboratories which will help in understanding theory more clearly.

			CO 3	Graduates have the knowledge and use of modern upcoming technologies.
40	**7EC5-11**	**VLSI DESIGN**	**CO 1**	Ability to understand the basic structure of MOSFET, Models.
			CO 2	Ability to design and understand the Cmos circuit designing & implementation layout.
			CO 3	Ability to understand various dynamic circuit and different type of memory.
			CO 4	Ability to obtain fundamental knowledge of basic designing tools like VHDL, FPGA.
41	**7CS6-60.1**	**Quality Management**	**CO 1**	To understand the concept of Quality
			CO 2	To realize the importance of significance of quality
			CO 3	To Implement Quality Implementation Programs
			CO 4	To have exposure to challenges in Quality Improvement Programs
42	**7EC4-21**	**VLSI DESIGN LAB**	**CO 1**	Student will be able to understand the evolution of VLSI technology
			CO 2	Student will be able to design logic circuit layouts for both static CMOS and dynamic clocked CMOS circuits
			CO 3	Student will be able to learn Layout, Stick diagrams, Fabrication steps, Static and Switching characteristics of inverters
			CO 4	Students to be aware about the trends in semiconductor technology, and how it impacts scaling and performance.
			CO 5	Student will be able to the design of digital systems using VHDL hardware description language
43	**7EC4-22**	**Advance communication lab (MATLAB Simulation)**	**CO 1**	Signal and system and its application, elementary signals and their properties
			CO 2	The concept of signal processing, various types of signals used in Communication and image processing
			CO 3	To develop the skills for analyzing the system by using MATLAB
44	**7EC4-23**	**Optical Communication Lab**	**CO 1**	Students have the basic knowledge of optical communication system
			CO 2	The knowledge of ofc Lab helps the students to perform various experiments in laboratories which will help in understanding theory more clearly



			CO 3	Students have the knowledge and use of modern upcoming technologies in optical Communication
45	**7EC7-30**	**Industrial Training**	**CO 1**	Student will be able to demonstrate the use, interpretation and application of an appropriate international engineering standard in a specific situation
			CO 2	Student will be able analyze a given engineering problem, identify an appropriate problem solving methodology, implement the methodology and propose a meaningful solution
			CO 3	Student will be able apply prior acquired knowledge in problem solving
			CO 4	Students identify sources of hazards, and assess/identify appropriate health & safety measures.survive within it.
46	**7EC7-40**	**Seminar**	**CO 1**	Ability to demonstrate the use, interpretation and application of an appropriate international engineering standard in a specific situation
			CO 2	Ability to analyse a given engineering problem, identify an appropriate problem solving methodology, implement the methodology and propose a meaningful solution
			CO 3	Ability to apply prior acquired knowledge in problem solving
			CO 4	Ability to identify sources of hazards, and assess/identify appropriate health & safety measures
47	**8EC5-12**	**Digital Image and Video Processing**	**CO 1**	Review the fundamental concepts of a digital image processing system and analyze images in the frequency domain using various transforms
			CO 2	Evaluate techniques for image enhancement and image restoration.
			CO 3	Apply the morphological operations for identification of image.
			CO 4	Interpret image segmentation and compression technique.
48	**8EE6-60.2**	**Soft Computing**	**CO 1**	To learn the basics of Soft Computing usage
			CO 2	To learn the basics of many optimization algorithm
			CO 3	To learn to solve and optimize the real world problem using soft computing methodology
			CO 4	To understand the concept and techniques of designing and implementing of soft computing methods in real world problem
			CO 5	To acquire the knowledge of soft computing and hard computing

49	**8EC4-21**	**Internet of Things (IOT) Lab**	**CO 1**	To give students basic knowledge of Internet of Things.
			CO 2	To make the students able to work on Raspbarry PI.
			CO 3	To give students Knowledge of Arduino.
			CO 4	Make students able to work with latest technology
50	**8EC4-22**	**Skill Development Lab**	**CO 1**	To increase the skills of the students.
			CO 2	To make the students to understand the Skill Developement techniques.
			CO 3	to encourage the students and motivate them to participate and show thier skills.
51	**8EC7-50**	**Project**	**CO 1**	be able to apply the relevant knowledge and skills, which are acquired within the technical area, to a given problem within given constraints, even with limited information, independently analyze and discuss complex inquiries/problems
			CO 2	be able to handle larger problems on the advanced level within the technical area - Reflect on, evaluate, and critically assess one's own and others' scientific results
			CO 3	be able to document and present one's own work, for a given target group, with strict requirements on structure, format, and language usage
			CO 4	be able to identify one's need for further knowledge and continuously develop one's own competencies
20	**7EC1A**	**Antenna & Wave Propagation**	**CO 1**	Understand important and fundamental antenna engineering parameters and terminology.
			CO 2	Develop the basic skills necessary for designing a wide variety of practical antennas and antenna arrays.
			CO 3	Ability to understand different type of wideband antenna like yagi-uda, horn, parabolic reflector etc
			CO 4	To understand the propagation of electromagnetic wave like sky wave, ground wave, space wave propagation
21	**7EC3A**	**Digital Image Processing**	**CO 1**	Review the fundamental concepts of a digital image processing system and analyze images in the frequency domain using various transforms
			CO 2	Evaluate techniques for image enhancement and image restoration.
			CO 3	Apply the morphological operations for identification of image.



			CO 4	Interpret image segmentation and compression technique.
22	**7EC4A**	**Wireless Communication**	**CO 1**	Ability to understand spread spectrum modulation techniques and its type and significance.
			CO 2	Ability to understand different type of fading and different types of free space losses.
			CO 3	Ability to understand different type of multiple access technique like CDAM, FDMA and TDMA.
			CO 4	Ability to understand the architecture of GSM system and satellite communication system. Also understand different type of wireless protocols like WLL and IEEE standards.
23	**7EC5A**	**VLSI DESIGN**	**CO 1**	Ability to understand the basic structure of MOSFET, Models.
			CO 2	Ability to design and understand the Cmos circuit designing & implementation layout.
			CO 3	Ability to understand various dynamic circuit and different type of memory.
			CO 4	Ability to obtain fundamental knowledge of basic designing tools like VHDL, FPGA.
24	**7EC6.3A**	**VHDL**	**CO 1**	Learn the IEEE Standard 1076 Hardware Description Language (VHDL)
			CO 2	Be able to model complex digital systems at several level of abstractions; behavioral and structural, synthesis and rapid system prototyping.
			CO 3	Be able to develop and simulate register- level models of hierarchical digital systems
			CO 4	Develop a formal testbench from informal system requirements and Be able to design and model complex digital system independently or in a team
25	**7EC4A**	**Wireless Communication**	**CO 1**	Ability to understand spread spectrum modulation techniques and its type and significance.
			CO 2	Ability to understand different type of fading and different types of free space losses.
			CO 3	Ability to understand different type of multiple access technique like CDAM, FDMA and TDMA.
			CO 4	Ability to understand the architecture of GSM system and satellite communication system. Also understand different type of wireless protocols like WLL and IEEE standards.
			CO 1	To introduce the basics of picture transmission and reception analysis and synthesis of composite video signal, receiver and picture tubes and television camera tubes.

26	**8EC2A**	**RADAR and TV**	**CO 2**	To study various colour television systems with greater emphasis on television standards
			CO 3	To introduce most latest and revolutionary ideas in the field of digital TV, HDTV, WDTV
			CO 4	Study different RADARs and its supporting systems.
27	**8EC3A**	**MEMS & Nanotechnology**	**CO 1**	To introduce Nanotechnology Potentials, Effect of crystal size on density of states and band gap.
			CO 2	To familiarize the operation principle CVD & MOCVD, Liquid Phase Techniques, XRL, Particle beam lithography
			CO 3	To introduce X- Ray Diffraction studies, Bragg's law, Raman Spectroscopy, Dynamic Light Scattering (DLS), NMR Spectroscopy, ESR Spectroscopy
			CO 4	To understand Electronic and electrical properties, Metallic Nanowires, Nano Sensors and Nanomedicines, Evolution of Micro Fabrication, MEMS packaging
28	**8EC4.1A**	**COMPUTER NETWORKS**	**CO 1**	To evaluate the mathematical expressions by using several algorithms for real time applications.
			CO 2	To make the students to understand the different layers of ISO/ OSI model and TCP/ IP Network.
			CO 3	Analyze different routing algorithms and methods to improve QOS.
			CO 4	Summarize the Application and transport layer protocols, congestion controls methods.

ARYA INSTITUTE OF ENGINEERING & TECHNOLOGY

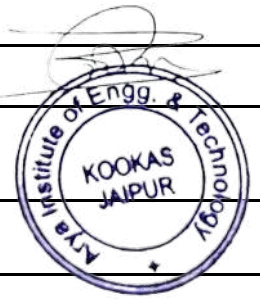
Electrical Engineering

S. No.	Course Code	Course Title	Course Outcomes (COs)
1	3EE2-01	Advanced Engineering Mathematics	CO1. Graduates gain ability to understand the decision making capability and how to translate real-world problems into probability models
			CO2- Graduates analyze the ability to formulate a wide range of management problems that can be solved to optimality by classical combinatorial optimization techniques and the knowledge of alternative solution approaches such as metaheuristics that can find nearly optimal solutions.
			CO3- Graduates understand the course aims to introduce students to Use operations research techniques for effective decisions–making, Model formulation and applications that are used in solving business decision problems.
2	3EE1-02	Technical Communication	CO1. Students learn the importance, nuances and aspects of communication.
			CO2. Graduates learn the art and science behind reading, how can one develop the skill and use it to one's benefit.
			CO3. Graduates learn the art and science of objective writing/business/scientific writing.
			CO4. Graduates learn the importance, characteristics, format of Technical document like, reports, proposals and article.
3	3EE3-04	Power Generation Process	CO1. Graduates will be analysis to learn the basics about the working of electrical power generation through different power plant and learn about different type of tariff calculation of power consumption.
			CO2. Graduates will understand about the different method of power factor improvement and its advantages like reduce penalty factor and able to understand the different load curves.
			CO3. Graduates will understand about the future of non renewable sources, its scope and advantages.
			CO4. Graduates can the different method of site selection for power plant and he will learn about the installation of different kind of power plants
			CO5. Graduates will able to learn the economics of a power plant and can understand how the tariff and annual cost of a power plant can be estimate.

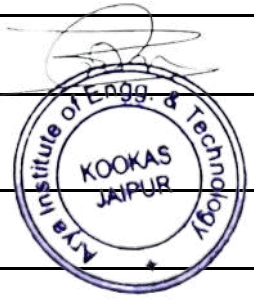
4	3EE4-05	Electrical Circuit Analysis	CO1.To understand the concept of circuit elements, circuit laws and to solve the electrical networks.
			CO2.To analyze a large & complex network using network theorem & to understand the power relation in three phase circuit.
			CO3.This subject find's its application in practical world in every field of electrical engineering where the analysis of rigorous electrical circuits is done for improving the system performance.
			CO4. This course will help the student to prepare for various competitive examinations.
5	3EE4-07	Electrical Machine-I	CO1. To understnd the concept of Conversion of 3-phase supply to 2- phase supply, parallel operation of 3-phase transformer.
			CO2. Principle, types, voltage build up, performance characteristics, torque evaluation in DC motors.
			CO3. Revolving and cross field theories, operation, characteristics, types, equivalent circuit & tests
6	3EE4-08	Electromegnetic Field	CO1. Graduates will learn the basics of Electromagnetic fields.
			CO2. The Electromagnetic fields course students will study & analyze the working on Vector analysis and calculate different types of errors.
			CO3. This course will help the student to pursue for various postgraduates courses in electrical and indulge into various research and developments that are associated with latest electrical techniques and can understand the use of Vector quantities.
			CO4. The subject will impart the knowledge for the practical use of vectors and will understand the coordinate systems in 3D.
			CO5. Electromagnetic Fields will help the student to prepare to a large extend for various competitive examinations like GATE, and other PSU's.
7	3EE4-06	Analog Electronics	CO1. Students are able to gain the knowledge about the basic of electronics.
			CO2. It is useful for understanding the behaviour of different electronics devices like oscillators, feedback amplifiers and power amplifiers.
			CO3. Students are able to understand the knowledge and concept of different types of Amplifiers.
			CO4. Students are able to understand the knowledge and concept of different types of filters.
			CO1. Graduates gain ability to apply the knowledge of managerial and economic concepts and ability to apply the tools and techniques.

8	4EE1-02	Managerial Economics and Financial Accounting	CO2. Ability to understand the demand and supply analysis and to Know the implementation of demand forecasting methods for production decisions and cost analysis.
			CO3. Ability to understand the types of markets and pricing methods and to understand the techniques regarding the long term investment decisions.
			CO4. Ability to understand the application of various ratios in order to know the firm's financial position in depth and to understand different techniques of capital budgeting.
9	4EE4-06	Power Electronics	CO1. Graduates gain ability to understand the basics of power electronics, and understand the semiconductor devices and their characteristics which will help them to differentiate between devices and components
			CO2. Graduates analyze and understand the rectification and control rectification techniques and their applications in future electrical drives and their control.
			CO3. Graduates gain ability to visualize the concept of Buck and Boost regulators and can learn to draw the waveforms
			CO4. Graduates can understand the concept of Single phase voltage source inverter and its applications.
			CO5. Graduates can understand the concept of Single phase voltage source inverter and its applications
10	4EE3-04	Electronic Measurement & Instrumentation	CO1. Graduates will learn the basics of Electronic Measurement & Instrumentation.
			CO2. The Electronic Measurement & Instrumentation course students will study & analyze the working on instruments and calculate different types of errors.
			CO3. This course will help the student to pursue for various postgraduates courses in electrical and indulge into various research and developments that are associated with latest electrical techniques and can understand the use of errors quantities.
			CO4. The subject will impart the knowledge for the practical use of errors and will understand the Instruments accuracy.
			CO5. Electronic Measurement & Instrumentation will help the student to prepare to a large extend for various competitive examinations like GATE, and other PSU's.
11	4EE4-05	Electrical Machine - II	CO1. Understand Principle, construction and operation of synchronous machine.
			CO2. The student has understood principle, construction, methods of staring synchronous motor, its operation with variable load operation with variable excitation, performance evaluation.
			CO3. The student has understood special motors like Repulsion, Hysteresis, Reluctance, Universal and Schrage motors.

12	4EE2-01	Biology	CO1. Demonstrate a working knowledge of the foundational concepts of biology, including cellular, organismic, ecological, and evolutionary biology.
			CO2. Rigorously and ethically apply the scientific methods to questions in biology by formulating testable hypotheses.
			CO3.Gathering and analyzing data to assess the degree to which they support the hypotheses.
13	4EE4-07	Signals & Systems	CO1. Students are able to apply the knowledge of math to analyse signals
			CO2. Students are able to Analyse the spectral characteristics of continuous-time periodic and a periodic signals using Fourier analysis.
			CO3. Students are able to Classify systems based on their properties and determine the response of LSI system using convolution
			CO4. Students are able to Analyze system properties based on impulse response and Fourier analysis.
			CO5. Students are able to Apply the Laplace transform and Z- transform for analyze of continuous-time and discrete-time signals and systems.
14	4EE4-08	Digital Electronics	CO1 Apply the principles of number system, binary codes and Boolean algebra to minimize logic expressions and knowledge about various logic gates
			CO2 Develop K-maps and apply Quine Mc Cluskey's method to minimize and optimize logic functions up to 4 variables
			CO3 Acquire knowledge about various logic families and analyze basic logic gate circuits of these families.
			CO4 Design various combinational circuits such as Adders, encoders , decoders and multiplexers
			CO5 Design various sequential circuits such as flip flops, counters and shift registers
15	5EE3-01	Electrical Materials	CO1: Student will understand about the physical and chemical characteristics of material
			CO2: To make student learn about dielectric properties of material
			CO3: To make student learn about properties of material in static and alternating field.
			CO4**:** Student will learn about properties of a material.



			CO5: To make student learn about Superconductor and semiconductor material.
16	5EE4-02	Power System-I	CO1: To make student learn about scenario of power system, energy sources
			CO2: To make student learn about components of power system(transmission line, generation, transformers)
			CO3: Student will learn about types of power system connections, dependence of loads
			CO4: Students will learn about protection and switchgear used in power system.
			CO5: To make students learn about faults, types and its analysis.
			CO6: Students will learn about the importance of DC Transmission line in electrical system.
17	5EE4-03	Control System	CO1: Students will learn about use of control system and modeling of physical system
			CO2: Students will learn about feedback control, time and frequency response and concept of stability.
			CO3: Students will learn about various controllers which will help students to know importance of control system.
			CO4: To introduce student with the advance control system and its concepts and applications.
			CO5: Student will gain knowledge about optical and non- linear controlling concept.
18	5EE4-04	Microprocesor	CO1:Student will gain knowledge about Fundamentals of Microprocessors.
			CO1:Student will gain knowledge about Fundamentals of Microprocessors.
			CO3:Student will gain knowledge aboutInterfacing and types to deal with to access the memory for reading instruction codes and the data stored in the memory.
			CO4:Student will gain knowledge about Compilers, Instruction set ,microprocessors architectures.
			CO5:Student will gain knowledge about the utilization of microprocessors in electrical engineering field.
			CO1:To introduce student with various considerations required in designing of electrical machines.



19	5EE4-05	Electrical Machine Design	CO2:To introduce student with component designs of machine like transformers , induction motors synchronous machine etc.
			CO3:Student will gain knowledge about sub component designing of main components of power system.
			CO4:Student will gain knowledge about structure of modern machine.
			CO5:Student will gain knowledge about Computer aided Design , needs, applications.
			CO6:Student will gain knowledge about the concept of both traditional and modern designing of machines.
20	5EE5-11	Restructured Power System	CO1: Student will gain knowledge about Understand the need for restructuring of Power Systems, discuss different market models, different stakeholders and market power .
			CO2: Understand and generalize the functioning and planning activities of ISO.
			CO3: Understand transmission open access pricing issues and congestion management
			CO4: Define transfer capability and estimate the transfer capability of a small power systems. (Numerical examples) .
			CO5: Define ancillary services and understand reactive power as ancillary service and management through synchronous generator
21	6EE4-01	Computer Architecture	C01:Graduates gain ability to understand the Architecture and function of computer System and ability to perform computer arithmetic operations on fixed and floating point numbers.
			C02: Graduates gain ability to visualize the concept of memory through the presentation of the hardware requirement for a cache memory and a virtual memory system.
			C03: Graduates gain ability to understand Input / Output Organization and modes of data transfer using DMA & IOP.
			C04: Graduates gain ability to understand 8086 microprocessor and their addressing modes ,instruction sets.
			C05: Graduates gain ability to understand pipelining and their reliability ,Different architecture like as VLIW Soc And MIPS.
22	6EE4-02	Power System -II	CO1: Students will understand the calculation of load density and various numerical methods for solution of non-linear equations.
			CO2: Students will know, how the loss coefficients effect the economic load dispatch , and stability constrain's
			CO3:Student will learn about the controlling of parameters of power system

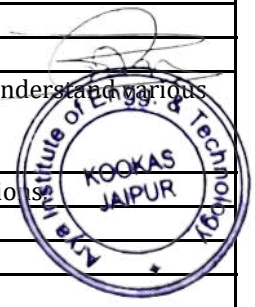
			CO4: Student will learn various managing and controlling of Power System
			CO5: Students will learn, financing methods in power sector.
			CO6: Students will also learn different pricing mechanism of electric energy and trading of power under deregulated environment.
23	6EE4-03	Power System Protection	CO1: To introduce students to power system protection, construction, applications of main types Circuit breakers, Relays for protection
			CO2:To introduce students with faults and it's analysis.
			CO3: To teach students theory and applications of the main components used in power system protection for electric machines, transformers, bus bars.
			CO4: To develop an ability and skill to design the feasible protection systems needed for each main part of a power system in students.
			CO5: Student will learn about sampling, modeling and simulation of power system.
24	6EE4-04	Electrical Energy Conservation and Auditing	CO1: To facilitate the students to achieve a clear conceptual understanding of technical and commercial aspects of energy conservation
			CO2: To facilitate the students to achieve a clear understanding about energy efficiency in various sectors of power system.
			CO3: To facilitate the students to achieve a clear conceptual understanding of energy auditing.
			CO4: To enable students to develop managerial skills to assess feasibility of alternative approaches and drive strategies regarding energy conservation and energy auditing.
			CO5: To enable students to understand energy efficient technologies in power system.
25	6EE4-05	Electrical Drives	CO1:To provide the students the fundamental concepts of drives and types of drives used in traction.
			CO2:To impart knowledge on Performance of the fundamental control practices associated with AC and DC machines (starting, reversing, braking, plugging, etc.) using power electronics
			CO3:To impart industry oriented learning.
			CO4:Student will learn about characteristics and controlling of machine.
			CO1: The course is designed to teach load forecasting, power system planning, power quality.

26	6EE5-11	Power System Planning	CO2: The course is designed to teach students reliability issues in power system.
			CO3:Describe the factors affecting the planning in power system
			CO4: To impart knowledge on environmental effects on planning.
			CO5: It aims to arm the students with the concepts of evaluation of generation, transmission and distribution system reliability and their impacts on system planning.
			CO6: Discuss the deregulations of electrical utilities including various issues and approaches as well as various evaluation methods.
27	7EE5-13	Control System Design	CO1: Students will learn about design specifications of control system.
			CO2: Students will learn about Classical Control System in the time domain and frequency domain.
			CO3: Students will learn about various controllers which will help students to know importance of control system.
			CO4: To introduce student nonlinearities and its effect on system performance.
28	7ME6-60.2	Quality Management	CO1: The course is designed to teach students about the Quality Management.
			CO2: The course is designed to teach students about the Quality Management.
			CO3:Describe the Leadership.
			CO4: To impart knowledge on Product Quality Improvement.
			CO5: It aims to arm the students with the concepts of Design Failure.
29	8EE4-11	HVDC Transmission System	CO1: To facilitate the students to achieve a clear conceptual understanding of dc Transmission Technology.
			CO2: To facilitate the students to achieve a clear understanding about Analysis of Line Commutated and Voltage Source Converters.
			CO3: To facilitate the students to achieve a clear conceptual understanding of Control and components of HVdc Converters:
			CO4: To enable students to develop managerial skills to assess Stability Enhancement using HVdc Control.
			CO5: To enable students to understand MTdc Links.

30	8AG6-60.1	Energy Management	CO1: To introduce students to Energy Demand Management.
			CO2:CO3: To teach students Need for Energy Management by Agriculture, Domestic; Energy forecasting techniques; Energy Integration, Energy Matrix.
			CO3: To teach students Need for Energy Management by Industry, Buildings & Houses, Transport, Electric Power.
			CO4: To develop an ability and skill to Energy Auditing.
31	7EE1A	Power System Planning	CO1. Graduates analyze the study of generation planning, transmission planning distribution planning and bulk power supply systems, production costing analysis and load forecasting. Dispersed generation. execute production costing analysis like power sector economics and finance and private participation and rural electrification expansion plans in a deregulated environment
			CO2. Graduates gain ability to analyze electric power system reliability and stability, load forecasting, power quality and reliability issues in power system. It aims to arm the students with the concepts of evaluation of generation, transmission and distribution system reliability and their impacts on system planning. Concept of Online power flow studies, state estimation, and computerized management
			CO3. Graduates visualize the concept of Computer aided planning for power system memory management through the use of the hardware and memory and a virtual memory system.. Effect on environment of generation of electrical energy, the greenhouse effect. Requirement of Insulation coordination and Reactive power compensation.
			CO4. Graduates gain ability to understand optimal power system expansion planning : Formulation of least cost optimization problem incorporating the capital, Operating and maintenance cost of candidate plants of different types .
32	7EE2A	Power System Analysis	CO1.Understand basics of Power System.
			CO2.Modeling & representation of the system components used in power system.
			CO3.Understand use of cables in distribution network.
			CO4.Concept of designing transmission line parameters.
			CO5.The basic concept of load flow analysis.
			CO1. This course will provide understanding of various non conventional sources of energy that can be use to convert into their usable forms.

33	7EE4A	Non Conventional Energy Sources	CO2. In this course students will study about the solar energy, wind energy, geothermal energy, biomass energy sources and magneto hydrodynamic power generation.
			CO3. This course will help the learner to implement this knowledge in power generation using non conventional energy sources.
			CO4. This subject will help in utilization of renewable energy sources for both domestics and Industrial applications.
			CO5. This course will help the student to prepare for various competitive examinations like public sector, GATE,GRE etc.
34	7EE5A	Power System Engineering	CO1. Economic operation of power system makes the whole generating system to operate in economical manner.
			CO2. This Subject gives the stable operation of operation power system, study of rotor dynamic equation and swing equation, stable operation of power system in transient period.
			CO3. This course gives the brief idea of optimization technique which can be used to implement in various course of electrical engineering.
			CO4. This course find its application in generation companies along with various power handling companies
35	7EE6A	Economic Operation of Power System	CO1. Graduate will learn the basic about the art of power system economics.
			CO2. In this course students will study about the economical operations and coordination of various power plants
			CO3. This course is the stepping stone for further studies and analysis in power system Engineering and Energy Management courses.
			CO4. This subject is the building block for power system engineers who are engaged in research and in various industries looking forward to opt the various processes for the optimization in cost and also in the field of management.
			CO5. This course will help the student to prepare for various competitive examinations.
36	8EE2A	Electrical Drives and Their Control	CO1. Economic operation of traction system by using different starting and speed control methods.
			CO2. This Subject gives the knowledge of different types of braking for different types of motors as plugging and dynamic braking.
			CO3. This course gives the brief idea of speed regulation of traction system which can be used to implement in various course of electrical engineering.
			CO4. This course find its application in various industries along with various power handling companies.
			CO1. Explain the working of different types of switchgear equipments like circuit breakers and relays

37	8EE3A	Protection of Power System	CO2. It gives knowledge to identify the main components and features of a protection scheme
			CO3. Provides practical knowledge to understand fault clearing phenomena under abnormal conditions in different type of circuit breakers
			CO4. Provides knowledge to acquire skill to design the feasible protection systems needed for each main part of a power system.
			CO5. Provides techniques to apply conventional and numerical relays to the protection of rotating machines, bus bars, transformers, transmission lines and distribution network
38	8EE4A	Utilization of Electrical Power	CO1. Modeling & representation of the system components used in power system.
			CO2. Understand use of cables in distribution network.
			CO3. The basic concept of load flow analysis.
LAB			
1	3EE4-21	Analog Electronics Lab	CO1: Acquire basic knowledge of physical and electrical conducting properties of semiconductors.
			CO2: Develop the Ability to understand the design and working of BJT / FET amplifiers.
			CO3: Observe the effect of negative feedback on different parameters of an Amplifier and different types of negative feedback topologies.
			CO4: Able to design amplifier circuits using BJT s And FET's. and observe the amplitude and frequency responses of common amplifier circuits
2	3EE4-22	Electrical Machine-I Lab	CO1: Student are able to gain thebasic concept of electrical machine.
			CO2: Student are able to understand the knowledge of electrical machine so as to facility in application in electrical engineering.
			CO3: Student are able to test electrical machine.
3	3EE4-23	Electrical Circuit Design Lab	CO1: Student are able to understand basic electronic circuits.
			CO2: Acquire basic knowledge on the working of various semi-conductor devices
			CO3: .Student have ability to design electronic circuits.
4	3EE7-30	Industrial Training	CO1: Students can understand about the industrial work of an engineer.
			CO2: Students are able to apply engineering skills in real life.
5	4EE4-21	Electrical Machine - II Lab	CO1: Student are able to understand the use of electrical machine in industrial application in electrical engineering.
			CO2: Student are able to gain the basic concept of electrical machine.
			CO3: Student are able to understand the maintenance of electrical machine.
6	4EE4-22	Power Electronics Lab	CO1: Students are able to use modern power electronics devices and their usages.
			CO2: Students are able to understand about the practical knowledge of theoretical concepts, which help them to understand various power electronic devices and components.
7	4EE4-23	Digital Electronics Lab	CO1: Students are able to understand process & working of digital electronics and their logics along with applications.
			CO2: Students are able to design & analyse combinational & sequential circuits.
			CO3: Student are able to understand the behaviour of different digital electronic components.
		Measurement	CO1: Student are able to understand the measurement of various quantities in electrical circuits.



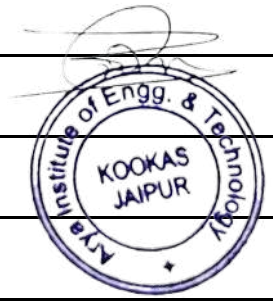
8	4EE3-24	Measurement Lab	CO2: Student are able to understand the wide Practical knowledge as theoretical concept of electrical measurement.
			CO3: Students are able to understand the calibration of voltmeter, ammeter & wattmeter
9	5EE4-21	POWER SYSTEM - I LAB	CO1: Student are able to test Dielectric strength of Insulating Material.
			CO2: Student are Able to estimate performance of Transmission Line and Distribution line.
			CO3: Students are Able to test the high voltage electrical equipments.
10	5EE4-22	CONTROL SYSTEM LAB	CO1: Simulate, analyze system behavior using software simulator/hardware
			CO2: Design compensators, filters, controllers to meet desired performance of system.
			CO3: Design , analysis of Ist and 2nd order Electrical circuits.
11	5EE4-23	Microprocessor LAB	CO1: Able to test fundamental of 8051 programs using the trainer kit
			CO2: Able to solve small assignments using the 8085 basic instruction sets and memory mapping through trainer kit and simulator.
			CO3: Able to write 8085 assembly language programs like Addition, Subtraction, Multiplication, Square, Complement, Look up table, Copying a block of memory, Shifting ,Packing and unpacking of BCD numbers, Ascending order, Descending order etc. using trainer kit.
			CO4: Able to validate the interfacing technique using 8255 trainer kit through subroutine calls and IN/OUT instructions like glowing LEDs accordingly, stepper motor rotation etc.
12	5EE4-24	SYSTEM PROGRAMMING LAB	CO1: study about the basic concepts of Matlab Software.
			CO2: The course is designed to teach students about simulink, problems based on simulink
			CO3: students will be able to program to generate Machine Op- code table using two pass Assembler
			CO4: Able to simulate Torque- speed characteristics of induction motor.
13	5EE7-30	Industrial Training	CO1: Students can understand about the industrial work of an engineer.
			CO2: Students are able to apply engineering skills in real life.
14	6EE4-21	POWER SYSTEM - II LAB	CO1: Apply the concept of per unit system and symmetrical components to analysis of different kinds of faults in an interconnected power systems.
			CO2: Understand methods available for analysis of load flow problem and develop software for solution of the same.
			CO3: Analyze different kinds of stability problems in multi machine power system.
			CO4: Able to validate the transient stability analysis using MATLAB/ETAP Software
15	6EE4-22	ELECTRIC DRIVE LAB	CO1: Apply the concept to analyze the characteristics of thyristor controlled DC Drives.
			CO2: Students will be able to assess the performance of three phase AC controller (with R and R-L load), Dual converter and cycloconverter .
			CO3: Students will be able to Control speed of a 3-phase BLDC,PMSM motor.
			CO4: analysis of 3 phase controlled bridge converter with R and RL loads to improve the power quality.
16	6EE4-23	POWER SYSTEM	CO1: Identify the challenges and solutions to industrial power system protection problems.
			CO2: Select the appropriate protection schemes for various applications.

		PROTECTION LAB	CO3: Identify, apply, and calculate settings for overcurrent, directional overcurrent, distance, differential and pilot protection schemes.
			CO4: Identify, apply, and calculate settings for power lines, transformer, generator and bus bar protection schemes.
17	6EE4-24	MODELLING AND SIMULATION LAB	CO1: . Develop skills to apply simulation and Modelling software to construct and execute electrical machines.
			CO2: able to design FACTS controller for SMIB systems.
			CO3: Interpret the model and apply the results to resolve critical issues in a real world environment.
			CO4: . Describe the role of important elements of discrete event simulation and modeling paradigm.
18	7EE4-21	EMBEDDED SYSTEM LAB	CO1:This course gives the introduction to Embedded Systems and their working.
			CO2:Provides knowledge to write program for interfacing GAS sensor and perform GAS leakage detection, design the Traffic Light System and implement the same using suitable hardware and program for interfacing finger print sensor.
			CO3: It gives knowledge of Data transfer instructions using different addressing modes and block transfer.
			CO4:Provides knowledge to write program for implement a PWM based speed controller for 12 V/24V DC Motor incorporating a suitable potentiometer to provide the set point, variable frequency square wave generation using with suitable hardware and program for Master Slave Communication between using suitable hardware and using SPI.
19	7EE4-22	Advanced Control System Lab	CO1: It gives knowledge of basic controllers use in MATLAB.
			CO2: It gives knowledge of different types of controllers used in control system.
			CO3: Provides knowledge to fourth order, nonlinear and unstable real-time control system
			CO4: Students are able to do Mini project on real life motion control system.
20	8EE4-21	Energy Systems Lab	CO1: It gives knowledge to V-I characteristics of solar cell, solar Charge controller, PWM, MPPT with boost converter and algorithms.
			CO2: It gives study of wind turbine generators with DC generators, DFIG, PMSG.
			CO3: Provides knowledge of Simulation on Intelligent Controllers for on-grid and off-grid Hybrid Power Systems, hybrid wind-solar power generation system using simulation software..
			CO4: Study different components of Micro Grid.

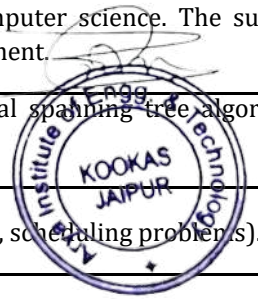
ARYA INSTITUTE OF ENGINEERING & TECHNOLOGY

Computer Science Engineering & Information Technology

S. No.	Course Code	Course Title	Course Outcomes (COs)
1	3CS2-01	Advanced Engineering Mathematics	1. Graduates gain ability to understand the decision making capability and how to translate real-world problems into probability models
			2- Graduates analyze the ability to formulate a wide range of management problems that can be solved to optimality by classical combinatorial optimization techniques and the knowledge of alternative solution approaches such as metaheuristics that can find nearly optimal solutions.
			3- Graduates understand the course aims to introduce students to Use operations research techniques for effective decisions–making, Model formulation and applications that are used in solving business decision problems.
2	3CS1-03	Managerial Economics and Financial Accounting	1. Graduates gain ability to apply the knowledge of managerial and economic concepts and ability to apply the tools and techniques.
			2. Ability to understand the demand and supply analysis and to Know the implementation of demand forecasting methods for production decisions and cost analysis.
			3. Ability to understand the types of markets and pricing methods and to understand the techniques regarding the long term investment decisions.
			4. Ability to understand the application of various ratios in order to know the firm's financial position in depth and to understand different techniques of capital budgeting.
3	3CS3-04	Digital Electronics	1 Apply the principles of number system, binary codes and Boolean algebra to minimize logic expressions and knowledge about various logic gates
			2 Develop K-maps and apply Quine Mc Cluskey's method to minimize and optimize logic functions up to 4 variables
			3 Acquire knowledge about various logic families and analyze basic logic gate circuits of these families.
			4 Design various combinational circuits such as Adders, encoders , decoders and multiplexers
			5 Design various sequential circuits such as flip flops, counters and shift registers
			1. Graduate will be able to visualize of the programming languages paradigms.



4	3CS4-05	Data Structures and Algorithms	2. Student will be able to use space & time complexity for particular functions.
			3. Graduate will be able to develop effective algorithms through the attribute conceptual integrity.
			4. Student will be able to analyze the concept of array and structure and implementation of 2-d array & sparse matrix.
			5. Graduate will be able to improve the use existing programming language in a more efficiently way through the data such as array, strings, records, list.
3	3CS4-06	Object Oriented Programming	1.To build an understanding of basic concepts of object oriented programming techniques
			2.To develop programming skills in C++ programming language
			3.To implement object oriented techniques using C++ language features.
			4.To develop software using object oriented programming paradigms
6	3CS4-07	Software Engineering	1 Gain knowledge of basic Software engineering methods and practices, and their appropriate application, understanding of software development process models such as the waterfall and evolutionary modelsetc and approaches of verification and validation including static analysis, and reviews.
			2 An understanding of the role of project management including planning, scheduling, risk management.
			3 An understanding of software requirements and the SRS document, different software architectural styles and implementation issues such as modularity.
			4 Analyze and translate a specification into a design, and then realize that design practically, using an appropriate Software engineering methodology.
			5 Provide basic knowledge of object orientation and OO analysis and design using the Unified Process and the Unified Modeling Language (UML) as tools.
7	4CS2-01	Discrete Mathematics Structure	1. Graduates gain ability to understand the To develop logical thinking and its application to computer science. The subject enhances one's ability to reason and ability to present a coherent and mathematically accurate argument.
			2. Graduate gain ability to understand algorithms on networks such as shortest path algorithm, minimal spanning tree algorithm and min-flow max-cut algorithm.
			3. Graduates analyze the ability to Formulate graph theoretic models to solve real world problems (e.g., scheduling problems).



			4. Graduate analyze combinatorial objects satisfying certain properties and answer questions related to existence, construction (describing how to create such objects in the case they exist), enumeration and optimization (determining which objects satisfy a certain extremal property).
8	4CS1-02	Technical Communication	1 Graduates will know about the grammar of Modern English Language
			2 Graduates will be able to Comprehend and use a report in the professional arena.. Students will be able to identify imagination to express himself, broadening their vocabularies, to appreciate the cultural diversity.
			3 Graduates will be able to develop reading habit, the art of writing. Student will assistant with the mainstream of society by studying the text that pertains to the most basic area of the branch of Humanities.
			4 Students will be able to correctly apply the concept of technical and professional communication for employability skills generating a novel idea or opinion based on relevant information and pre established criteria.
9	4CS3-04	Microprocessor & Interfaces	1. Describe the architecture of 8085 microprocessor and understand the basic concept of static and dynamic RAM and types of ROM
			2. Understand instruction set and write programs using assembly language programming
			3. Write programs using advance assembly language using interrupts and subroutine.
			4. Interface peripheral devices like 8255, 8259 and understand and describe Interfacing external devices like memory and other hardware devices.
			5. Understand microprocessor applications such as Interfacing scanned multiplexed display and liquid crystal display, USART 8251, RS232C and RS422A
10	4CS4-05	Database Management System	1 Graduates gain ability to understand the concept of database concept and database management system software.
			2 Graduates will have high-level understanding of major DBMS components and their function
			3 Graduates will be able to model an application's data requirements using conceptual modeling tools like ER diagrams and design database schemas based on the conceptual model.
			4 Graduates will be able to write SQL commands to create tables and indexes ,insert/update/delete data and query data in a relational DBMS..
			5 Graduates gain ability to understand normalization theory and apply such knowledge to the normalization of a database and to be able to program a data-intensive application using DBMS APIs.

11	4CS4-06	Theory of Computation	1. Students will learn several formal mathematical models of computation along with their relationships with formal languages. Also students will learn that not all problems are solvable by computers, and some problems do not admit efficient algorithms.
			2. Students will Be able to construct finite state machines and the equivalent regular expressions and they willBe able to prove the equivalence of languages described by finite state machines and regular expressions.
			3. Students will Be able to construct pushdown automata and the equivalent context free grammars and prove the equivalence of languages described by pushdown automata and context free grammars
			4.Students will Be able to construct Turing machines and Post machines and prove the equivalence of languages described by Turing machines and Post machines
12	4CS4-07	Data Communication and Computer Networks	1. Enumerate the layers of the OSI & TCP/IP model and functionality of each layer.
			2. Detect the different types of error and their correction method in data link layer
			3. Summarize and compare different routing alorithm in network layer.
			4 To be familiar with working of transport layer and its services and protocols
			5. Explain the different protocols used in Applicatin layer
13	5CS3-01	Information Theory and Coding	1 To provide the understanding and analytical tools necessary to apply information theory to a range of relevant modern problems in communication engineering.
			2 In particular: to convey the source coding and noisy channel theorems; to furnish students with the means to compute information theoretic quantities; to deliver the principles and applications of source codes; to convey the principles and applications of channel codes; to provide exposure to the latest developments in the area.
			3 Design and performance evaluation of error correcting codes. Knowledge of lossy compression.
14	5CS4-02	Compiler Design	1 To learn the process of translating a modern high-level language to executable code
			2 To provide a student with an understanding of the fundamental principles in compiler design and to provide the skills needed for building compilers for various situations that one may encounter in a career in Computer Science.
			3 To develop an awareness of the function and complexity of modern compilers
			4 To apply the code generation algorithms to get the machine code for the optimized code.
			1 Describe and explain the fundamental components of a computer operating system.

15	5CS4-03	Operating Systems	2 Define, restate, discuss, and explain the policies for scheduling, deadlocks, memory management, synchronization, system calls, and file systems.
			3 Describe and extrapolate the interactions among the various components of computing systems.
			4 Design and construct the following OS components: System calls, Schedulers, Memory management systems, Virtual Memory and Paging systems.
			5 Measure, evaluate, and compare OS components through instrumentation for performance analysis.
16	5CS4-04	Computer Graphics and Multimedia	1 To list the basic concepts used in computer graphics.
			2 To implement various algorithms to scan, convert the basic geometrical primitives, transformations, Area filling, clipping.
			3 To describe the importance of viewing and projections.
			4 To define the fundamentals of animation, virtual reality and its related technologies.
			5 To understand a typical graphics pipeline
17	5CS4-05	Analysis of Algorithms	1 Ability to analyze the performance of algorithms.
			2 Ability to choose appropriate algorithm design techniques for solving problems.
			3 Ability to understand how the choice of data structures and the algorithm design methods impact the performance of programs.
			4 To clear up troubles the usage of set of rules design methods including the grasping approach, divide and overcome, dynamic programming, backtracking and department and certain
18	5CS5-11	Wireless Communication	1.Articulate the fundamental concepts of Telecommunications such as bandwidth, capacity and data rates ,Network reference models.
			2. Describe and determine the performance of different error control coding schemes for the reliable transmission of digital representation of signals and information over the channel and data link control.
			Understand the basics of Wireless LAN witn their architecture and protocol stack model. Also discuss data link layer swictching.
			3.Examine the concept of multiplexing ,multiple access technique and switching.
			4. Analyze various spreading techniques and generation of spreading sequence ,generation of spreading codes.
			1 Explain how digital images are represented and manipulated in a computer, including reading and writing from storage, and displaying.

19	6CS4-01	Digital Image Processing	2 To learn and understand the fundamentals of digital image processing, and various image Transforms, Image Enhancement Techniques, Image restoration Techniques and methods, image compression and Segmentation used in digital image processing.
			3 Write a program which implements fundamental image processing algorithms. Be conversant with the mathematical description of image processing techniques.
20	6CS4-02	Machine Learning	1Differentiate various learning approaches, and to interpret the concepts of supervised learning.
			2. Compare the different dimensionality reduction techniques and apply theoretical foundations of decision trees to identify best split and Bayesian classifier to label data points.
			3. Illustrate the working of classifier models like SVM, Neural Networks and identify classified model for typical machine learning applications
			4. Identify the state sequence and evaluate a sequence emission probability from a given HMM
			5. Illustrate and apply clustering algorithms and identify its applicability in real life problems
21	6CS4-03	Information Security System	1 Illustrate the concept of network security attacks, various encryption techniques and modern block ciphers.
			2 Explain various symmetric key techniques and concept of S-Box theory.
			3 Illustrate the concept of Public Key Cryptosystems, key management and understand the concept of key exchange.
			4 Summarize the different authentication techniques and illustrate the concept of digital signature.
			5 Implement IP Security Architecture and understand the concept of strong password protocols.
22	6CS4-04	Computer Architecture and Organisation	1 Graduates should be able to use graphic computing techniques to plan, develop, evaluate and manage a solution to a particular problem based on graphic systems.
			2 Graduates should understand and apply ethical responsibility, legislation and codes of practice to professional activity in computer engineering.
			3 Graduates should be able to explain, discuss and solve simple problems in the basic representation and handling of multimedia data (images, audio and animation), and the basic components of a 2D and 3D-environments.
			1 To introduce basic principles that drive complex real world intelligence applications.

23	6CS4-05	Artifical Intlligence	2 To introduce and discuss the basic concepts of AI Techniques and Learning
			3 To introduce discuss the basic concept of Game Planning Algorithm and Robotics Algorithm
			4 To intouduce the basic concept of knowledge representation and expert system
24	6CS4-06	Cloud Comuting	1 Define what is cloud computing and how other technologies involved in the development of cloud computing.
			2 Understand the model of cloud computing and programming languages used in cloud computing.
			3 Understand the concept of virtualization and visualize the security threats in cloud..
			4 Understand the cloud platform and applications in the industry
25	6CS5-11	Distributed System	1 Define what is computer system and humans and how they can interact with each other.
			2 Understand the design process and design rules of a HCI system.
			3 User can evaluate the HCI system with the help of evaluation techniques.
			4 Understand the cognitive methods and various communication models with system and user.
25	7CS1A	Cloud Comuting	1 Define what is cloud computing and how other technologies involved in the development of cloud computing. 2Understand the model of cloud computing and programming languages used in cloud computing. 3 Understand the concept of virtualization and visualize the security threats in cloud.. 4 Understand the cloud platform and applications in the industry
26	7CS2A	ISS	1 Illustrate the concept of network security attacks, various encryption techniques and modern block ciphers.
			2 Explain various symmetric key techniques and concept of S-Box theory.
			3 Illustrate the concept of Public Key Cryptosystems, key management and understand the concept of key exchange.
			4 Summarize the different authentication techniques and illustrate the concept of digital signature.
			5 Implement IP Security Architecture and understand the concept of strong password protocols.

27	7CS3A	DMW	1 Students will identify the core concepts of distributed systems: the way in which several machines orchestrate to correctly solve problems in an efficient, reliable and scalable way.
			2 Students will examine how existing systems have applied the concepts of distributed systems in designing large systems and will additionally apply these concepts to develop sample systems.
			3 Understand scheduling in distributed operating systems, fault tolerance, real- time distributed systems, and designing of distributed file systems.
			4 Understand the concept of design and implementation in the context of distributed operating systems.
28	7CS4A	Computer Aided Design for VLSI	1Graduates gain ability to understand and designing different types of Programmable logic devices.
			2. Graduates analyze the internal designing and working of Boolean function using different types of algorithm and graph.
			3 Graduates gain ability to perform reducing the algorithm and concept of the pipelined circuit.
			Graduates can optimize and minimize the logic function.
29	7CS5A	Complier Construction	1 Graduates gain ability to learn concepts and types of various translators along with several representations, specification and construction formats using a variety of software tools and phases of a typical compiler, including the front- and backend part
			2 Graduate will able to identify tokens from a high-level programming language code, define regular expressions for tokens and design or implement a lexical analyzer using scanner generator.
			3 Graduate will learn role of a parser in a compiler and relate the yield of a parse tree to a grammar derivation and will able to construct a parser for a small context-free grammar.
			4 Graduates gain ability to visualize the concept of runtime memory organization and implementation of intermediate code generator based on given code patterns.
30	7CS6.1 A	Advanced Data base Management System	1 Graduates should be able to understand the Query Processing and Optimization in Relational DBMS and also gain knowledge of alternate plans.
			2 Graduates should be able to analyze the Objects, OIDs and able to design the ORDBMS for an enterprise and gain ability to compare RDBMS, OODBMS and ORDBMS.
			3 Graduates should be able to define Parallel and Distributed databases and gain basic understanding of Distributed transaction, Distributed concurrency control and distributed recovery.

			4 Graduates should be able to play the role of DBA and with good ethics should be able to secure and authorize the database access.
			5 Graduates should be familiar with the POSTGRES user interface and XML
31	8CS1A	Mobile Computing	1 Evaluate the architecture and principles of operation of mobile systems and networks. Synthesize principles and theories of computer science and software engineering for application to different computing paradigms.
			2 Synthesize new knowledge in the area of mobile computing by using appropriate research methodologies and techniques.
			3 Evaluate the role of mobile applications in software intensive systems.
			4 Evaluate the usability of representative mobile devices such as smartphones and tablets. Appraise the quality and performance of mobile applications. Assess and implement security principles in mobile applications.
			5Evaluate wireless network topologies, wireless connectivity and characteristics, and the impact of wireless networks on security and Internet communications.
32	8CS2A	Digital Image Processing	1 Explain how digital images are represented and manipulated in a computer, including reading and writing from storage, and displaying.
			2 To learn and understand the fundamentals of digital image processing, and various image Transforms, Image Enhancement Techniques, Image restoration Techniques and methods, image compression and Segmentation used in digital image processing.
			3 To learn program which implements fundamental image processing algorithms. Be conversant with the mathematical description of image processing techniques.
33	8CS3A	Distributed System	1 Students will identify the core concepts of distributed systems: the way in which several machines orchestrate to correctly solve problems in an efficient, reliable and scalable way.
			2 Students will examine how existing systems have applied the concepts of distributed systems in designing large systems and will additionally apply these concepts to develop sample systems.
			3 Understand scheduling in distributed operating systems, fault tolerance, real- time distributed systems, and designing of distributed file systems.
			4 Understand the concept of design and implementation in the context of distributed operating systems.
			1 Graduates gain ability to understand the real time system concepts and its applications.

34	8CS4.2	Real Time System	2 Graduates gain the ability to understand precedence constraints, data dependency and real time scheduling.
			3 Graduates analyze the problem and solution of periodic and aperiodic task scheduling.
			4 Graduates gain ability to understand resources access control.

ARYA INSTITUTE OF ENGINEERING & TECHNOLOGY

Mechanical Engineering

S. No.	Course Code	Course Title	Course Outcomes (COs)
1	3ME2-01	Advanced Engineering Mathematics-I	1. To solve mathematical problems and provide scientific calculation techniques. 2. This course will impart the knowledge of Laplace transform, Fourier transform, Z-transform. 3. This course will help the student to pursue for various postgraduates courses in Mechanical and indulge into various research and developments that are associated with latest mechanical techniques and can understand the use of converters and different waveforms with various loads. 4. Advanced Mathematics will help the student to prepare to a large extend for various competitive examinations like GATE, and other PSU's.
2	3ME1-02	TC	1. Act ethically in their role in the communication situation. 2. Apply concepts of information design. These concepts include effective ways to design documents for print, web, and other electronic means of communication in order to construct documents meaningful to the audience. 3. Use visual items in effectively constructing meaning in communication situations. 4. Create clear, concise technical documents that effectively use style and grammar and information structure in ways that create meaning with the reader. 5. Collaborate effectively in various writing situations, including planning, creating, and managing, evaluating, editing and revising document production.
3	3ME3-04	Engineering Mechanics	1. The primary objective of the study of engineering mechanics is to develop the capacity to predict the effects of force and motion while carrying out the creative design functions of engineering. This capacity requires more than a mere knowledge of the physical and mathematical principles of mechanics; also required is the ability to visualize physical configurations in terms of real materials, actual constraints ,and the practical limitations which govern the behavior of machines and structures. 2. One of the primary objectives in a mechanics course is to help the student develop this ability to visualize, which is so vital to problem formulation. Indeed, the construction of a meaningful mathematical model is often a more important experience than its solution. Maximum progress is made when the principles and heir limitations are learned together within the context of engineering application. 3. The course uses the Laws of Mechanics to predict forces in and motions of machines and structures. The course is the key prerequisite course to sequences of courses dealing with mechanics of machines, stress analysis and design of mechanical systems. 4. Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline. Apply fundamental concepts of kinematics and kinetics of particles and rigid bodies to the analysis of simple, practical problems. 5. Engineering Mechanics will help the student to prepare to a large extend for various competitive examinations like GATE , IES , Railways and other PSU's , pursue for various postgraduates courses in Mechanical and indulge into various research

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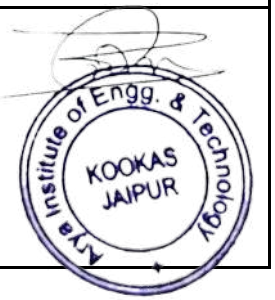
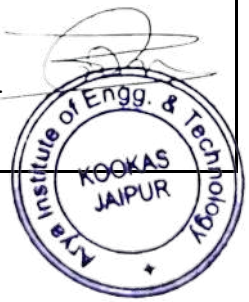
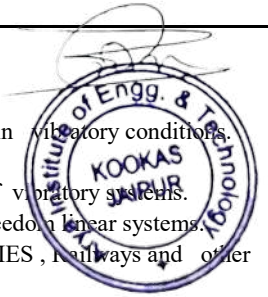
4	3ME4-05	Engineering Thermodynamics	1- Understand the nature and role of the following thermodynamic properties of matter: internal energy, enthalpy, entropy, temperature, pressure and specific volume. 2- Be able to apply the first law and second law of thermodynamics and their limitations to a control mass or control volume at an instant of time or over a time interval. 3- Lay the groundwork for studies in fields such as refrigeration, air conditioning, power plant, fuel cells, heat engine and computational fluid dynamics. 4- Engineering thermodynamics will help the student to prepare to a large extend for various competitive examinations like GATE , IES , Railways and other PSU's , pursue for various postgraduates courses in Mechanical and indulge into various research .
5	3ME4-06	MATERIAL SCIENCE	1. Give basic knowledge of science behind materials & physical metallurgy. Introduce the concept of structure property relations. 2. Lay the groundwork for studies in fields such as solid-state physics, mechanical behavior of materials, phase & phase diagram, heat treatment, failure of materials & their protection, applications of recent materials. 3. Develop intuitive understanding of the subject to present a wealth of real world engineering examples to give students a feel of how material science is useful in engineering practices. 4. Material Science will help the student to prepare to a large extend for various competitive examinations like GATE , IES , Railways and other PSU's , pursue for various post-graduates courses in Mechanical and indulge into various research .
6	3ME4-07	Mechanics of Solids	1- To give detail knowledge about stresses, strains, deformations, various forces and moments and their effects on different solid bodies. 2- To give an ability to apply various methods on stress and deflection based problems. Such comparative approaches help students to get detail command on topics. 3- To give an ability to apply the knowledge of strength of materials on engineering applications and design problems with consideration of factor of safety so that students can have the capability to understand in modern design problems. 4- To give knowledge which is based on engineering competitive examinations like GATE , IES , Railways and PSU's.
7	4ME2-01	Data analytics	1. To use Harmonic conjugates (Complex Theorem) in analog and Digital communication for modulation of signals 2. To use special function in solving the problems of probabilities related with random variables. 3. Vector space are use to solve space-time related problems in multiple access techniques.
8	4ME1-03	Managerial Economics and Financial	1- The primary objective of the study of managerial economics and financial accounting is to develop the capacity to predict the scope of economics which will helps students in national income concepts. 2- The course will help the students about the Demand and Supply System which will help the students to understand the market scenario of requirements and jobs. 3- By the production function and with the help of variable properties, students can analyse the production and cost analysis. 4- Students will learn about the Balance sheet and related concepts, profit and loss statement and related concepts which will help students in managing different business and financial conditions.
9	4ME3-04	Digital Electronics	1.To understand and examine the structure of various number systems and its application in digital design. 2. The ability to understand, analyze and design various combinational and sequential circuits. 3. To imbibe basic laws and equations used for analysis of static and dynamic fluids. 4. The ability to identify and prevent various hazards and timing problems in a digital design. 5. To develop skill to build, and troubleshoot digital circuits



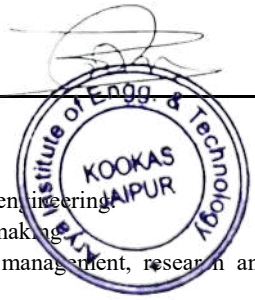
10	4ME4-05	Fluid mechanics and fluid machines	1.To introduce and explain fundamentals of Fluid Mechanics, which is used in the applications of Aerodynamics, Hydraulics, Marine Engineering, Gas dynamics etc. 2. To give fundamental knowledge of fluid, its properties and behavior under various conditions of internal and external flows. 3. To develop understanding about hydrostatic law, principle of buoyancy and stability of a floating body and application of mass, momentum and energy equation in fluid flow. 4. To imbibe basic laws and equations used for analysis of static and dynamic fluids. 5. To inculcate the importance of fluid flow measurement and its applications in Industries. 6. To determine the losses in a flow system, flow through pipes, boundary layer flow and flow past immersed bodies.
11	4ME4-06	Manufacturing processes	1 . To inculcate specialized knowledge and skill in advanced manufacturing processes using the principles and methods of engineering analysis and design. 2.To impart knowledge about principles/methods of casting with detail design of gating/riser system needed for casting, defects in cast objects and requirements for achieving sound casting. 3 To impart knowledge about welding behaviour of machine and process during welding, analysis of common and newer welding techniques and metallurgical and weldability aspects of different common engineering materials 4. To impart knowledge about principles and criteria of yielding during forming of metals, analysis of different bulk metal forming processes following different analysis approach. 5.To give knowledge which is based on engineering competitive examinations like GATE , IES , Railways and PSU's.
12	4ME4-07	Theory of machines	1.To determine the balancing of masses of rotating and reciprocating machine elements 2. To understand the principles of gyroscope and governors 3. To determine the forces and power calculations for brakes and dynamometer 4. To determine the static and dynamic forces for mechanical systems 5. To understand the principles of vibrations 6.To Analyze planar mechanism for displacement, velocity and acceleration graphically
13	5ME3-01	mechatronics system	1. Graduates gain ability to understand basic knowledge about Mechatronics and its application. 2. Graduates learn about different types of Sensors and its application in intelligent manufacturing processing. 3. Thorough understanding of frequency domain analysis of discrete time signals and its uses in Mechatronics. 4. Graduates learn about different component such as transducer, sensor, A/D converter, D/A converter etc and its uses in Data acquisition. 5. Graduates gain knowledge about Home appliances, ABS (anti lock braking system) and other areas in automotive engineering.
14	5ME4-02	Heat Transfer	1.To impart knowledge on the principles of heat transfer through conduction, convection and radiation modes and heat transfer during phase-change processes, such as condensation and boiling. 2.To impart knowledge on design of various heat transfer equipment such as heat exchangers. 3.To enable students carry out experiments verifying the various theories of heat transfer
15	5ME4-03	Manufacturing technology	1. Basics of non-conventional machining processes 2. To know Types of plastics & basics of plastic processing 3. Students will be able to know A few advanced manufacturing processes used in industry 4. Students will be able to apply Principles & types of comparators & introduction to measurement by light wave interference in metrology. 5. Principles & types of angular measurement



16	5ME4-04	Design of Machine Elements – I	1. To develop an ability to design a system, component, or process to meet desired needs within realistic constraints. 2. To apply mechanical engineering design theory to identify and quantify machine elements in the design of commonly used mechanical systems. 3. Students will be able to formulate and analyze stresses and strains in machine elements and structures to various loads. 4. Students will be able to apply multidimensional fatigue failure criteria in the analysis and design of mechanical components. 5. Design of Machine Elements-II will help the student to prepare to a large extend for various competitive examinations like GATE , IES , Railways and other PSU's , pursue for various postgraduates courses in Mechanical and indulge into various research.
17	5ME4-05	Principle of Managments	1. Upon completion of the course, students will be able to have clear understanding of managerial functions like planning, and have same basic knowledge on international aspect of management 2. To understand the planning process in the organization 3. To understand the concept of organization 4. Demonstrate the ability to directing ,leadership and communicate effectively 5. To analysis isolate issues and formulate best control methods
18	5ME5-11	Steam Engineering	1. To acquaint students with steam generation and to present some of the engineering calculations encountered in practice. 2. Students will able to analyze different types of steam cycles and estimate efficiencies in a steam power plant. 3. Students will able to List types, principles of operations, components and applications of steam turbines, steam generators, condensers, feed water and circulating water systems. 4. Steam Engineering will help the student to prepare to a large extend for various competitive examinations like GATE , IES , Railways and other PSU's , pursue for various postgraduates courses in Mechanical and indulge into various research.
19	6ME3-01A	Measurement and metrology	1. The main objective of the course is To develop in students the knowledge of basics of Measurements, Metrology and Measuring devices. 2. To understand the concepts of various measurement systems & standards with regards to realistic applications. 3. To develop basic principles and devices involved in measuring surface textures. 4. Student will be able to identify sources of variability, error, uncertainties and Machine tool testing to evaluate machine tool quality.
20	6ME4-02	CIMS	1. Student can able to understanding of General and Machine (G & M) code to generate or edit a program which will operate a CNC Lathe. 2. Choose an industrial machine operation or manufacturing process instruction manual for operators and maintenance personnel. 3. The student can able to operate a CNC machine and produce completed product as per the work order or approved drawings, meeting all required quality standards and scrap standards – consistent and repetitive output is the goal. 4. The student's knowledge of CNC specific technical work practices, such as blueprint reading, applied math concepts, tools and measurement concepts. 5. The student's knowledge of general manufacturing technical practices and procedures, that is applicable to all sectors of manufacturing.
21	6ME4-03	Mechanical Vibration	1. Students will be able to understand and appreciate the importance of vibrations in design of machine parts that operate in vibratory conditions. 2. Students will be able to obtain linear vibratory models of dynamic systems with changing complexities. (SDOF, MDOF) 3. One of the objectives in a Vibration Engineering is that students will be able to write the differential equations of motion of vibratory systems. 4. Student will be able to make free and force (harmonic, periodic, non- periodic) vibration analysis of single and multi degree of freedom linear systems. 5. Vibration Engineering will help the student to prepare to a large extend for various competitive examinations like GATE , IES , Railways and other PSU's , pursue for various postgraduates courses in Mechanical and indulge into various research.



22	6ME4-04	Design of Machine Elements – II	1. To develop an ability to design a system, component, or process to meet desired needs within realistic constraints. 2. To apply mechanical engineering design theory to identify and quantify machine elements in the design of commonly used mechanical systems. 3. Students will be able to formulate and analyze stresses and strains in machine elements and structures to various loads. 4. Students will be able to apply multidimensional fatigue failure criteria in the analysis and design of mechanical components. 5. Design of Machine Elements-II will help the student to prepare to a large extend for various competitive examinations like GATE , IES , Railways and other PSU's , pursue for various postgraduates courses in Mechanical and indulge into various research.
23	6ME4-05	Quality Management	1. To minimize the number of defects which are undetected at particular stage and surface at next levels of processes due to deficiencies in the Reliability Assurance Processes. 2. To aim for Zero non-conformances in Reliability Assurance Processes. 3. To strive for the highest level of customer satisfaction. 4. Quality Assurance and Reliability will help the student to prepare to a large extend for various competitive examinations like GATE, IES, Railways and other PSU's, pursue for various postgraduates courses in Mechanical and indulge into various research.
24	6ME5-11	Refrigeration & Air-conditioning	1. Understand the basic principles of refrigeration and air conditioning, 2. Analyze air refrigeration systems, vapor compression refrigeration systems, vapour absorption refrigeration systems, and steam jet refrigeration systems 3. Study the psychometric properties of air and utilize the principles of psychometric in the design of air conditioning equipments 4. Finally apply this knowledge for the design of refrigeration equipments and air conditioning equipments
25	7ME1A	Finite Element Methods	1.. To learn the theory and characteristicsof finite elements that representengineering structures. 2.. To learn and apply finite element solutions to structural, thermal,dynamic problem to develop the knowledge and skills needed to effectively evaluate finite element analyse performed by others. 3. Learn to model complex geometry problems and solution techniques.
26	7ME2A	Refrigeration & Air-conditioning	1. Understand the basic principles of refrigeration and air conditioning, 2. Analyze air refrigeration systems, vapor compression refrigeration systems, vapour absorption refrigeration systems, and steam jet refrigeration systems 3. Study the psychometric properties of air and utilize the principles of psychometric in the design of air conditioning equipments 4. Finally apply this knowledge for the design of refrigeration equipments and air conditioning equipments
27	7ME3A	Operations Research	1. Give basic knowledge of various optimization technique to maximize the profit & minimize the loss in practical world of engineering. 2. To provide the basic tools of operation research in solving the management problem using mathematical approach for decision making. 3. Lay the ground work of studies in field such as inventory management, man and machine management, time management, research and development, quality management within the constraints of industry. 4. Operation Research will help the student to prepare to a large extend for various competitive examinations like GATE , IES , CAT, Railways and other PSU's , pursue for various postgraduates courses in Mechanical as well as management into various research



28	7ME4A	Turbomachines	1. The course aims at giving an overview of different types of turbo machinery used for energy transformation, such as pumps, fans, compressors, as well as hydraulic, steam and gas-turbines 2. It will focus on applications in power generation, transport, refrigeration and the built environment. 3. Develop intuitive understanding of the subject to present a wealth of real world engineering examples to give students a feel of how Turbo machinery is useful in engineering practices. 4. Turbo machinery will help the student to prepare to a large extend for various competitive examinations like GATE , IES , Railways and other PSU's , pursue for various postgraduates courses in Mechanical and indulge into various research .
29	7ME5A	Operations Management	1. Understand the strategic role of operations management in creating and enhancing a firm's competitive advantages. 2. Understand key concepts and issues of OM in both manufacturing and service organizations. 3. Understand the interdependence of the operations function with the other key functional areas of a firm. 4. Apply analytical skills and problem-solving tools to the analysis of the operations problems. 5. Develop intuitive understanding of the subject to present a wealth of real world engineering examples to give students a feel of how operations management is useful in engineering practices.
30	7ME6.3A	CNC Machines and Programming	1. Student can able to understanding of General and Machine (G & M) code to generate or edit a program which will operate a CNC Lathe. 2. Choose an industrial machine operation or manufacturing process instruction manual for operators and maintenance personnel. 3. The student can able to operate a CNC machine and produce completed product as per the work order or approved drawings, meeting all required quality standards and scrap standards – consistent and repetitive output is the goal. 4. The student's knowledge of CNC specific technical work practices, such as blueprint reading, applied math concepts, tools and measurement concepts. 5. The student's knowledge of general manufacturing technical practices and procedures, that is applicable to all sectors of manufacturing.
31	8ME1A	Computer Integrated Manufacturing Systems	1- The main objective of the course is To give clear idea about the role of computer aided design in manufacturing to students. 2- To provide both the hardware and software knowledge of CAD/CAM systems together with the practical discussion of their use in engineering. 3- Students will develop problem-solving skills and apply their knowledge of research and design to create solutions to various challenges. 4- To learn the overall configuration and elements of computer integrated manufacturing systems.
32	8ME2A	Laws for Engineers	1. The course aims at giving an overview of different types of Laws used in industries and companies. 2. It will also focus on human right laws, labour laws, company laws and law related to intellectual property law. 3. It will also give knowledge about Election provisions under Indian constitution. 4. Engineers who learn law can come up with a breakthrough invention without may be blowing their patent rights

33	8ME3A	Power Generation	1- The main objective of the course is to give clear idea about the efficiency and output of modern cycle systems and steam power plant with reheat, regeneration, and irreversibility. 2- To expose the students to Energy Systems and Technologies: Sources, Conversion techniques, Utilization, Storage and Environmental Impact. 3- The purpose of this course is to impart adequate knowledge in both practically and theoretically of solar energy power and wind turbine power and estimate power generation potential. 4- Discuss power generation from renewable and alternative fuels and heat sources.
34	8ME4.1A	Product Development and Launching	1- The main objective of the course is to acquaint the students with the practical knowledge regarding conceptualization, design and development of a new product. 2- It will also focus on Identify the need of product development and problem formulation. 3- To develop Creativity and innovation in product design and Cost models for product design, development and production of a product. 4- To learn how to integrate with the customer and end-consumer into product development process. 5- The student is expected to demonstrate an understanding of the overview of all the product development processes and knowledge of concept generation and selection tools.