Department of Electronics and Communication Engineering

Gayatri Vidya Parishad College of Engineering for Women

Kommadi, Madhurawada
Visakhapatnam-530048, AP, India

Affiliated to JNTUK, Kakinada

Visit us at www.gvpcew.ac.in

Planning, Assessment and Attainment:

Tools and Techniques for Program Continuous Improvement

Regulation: R19

PART-I

Institute Vision

To emerge as an acclaimed centre of learning that provides value based technical education for the holistic development of students.

Institute Mission

- Undertake activities that provide value based knowledge in Science, Engineering and Technology
- Provide opportunities for learning through Industry – Institute interaction on the state of the art technologies
- Create a collaborative environment for the flourishment of research, innovation and entrepreneurship
- Promote activities that bring in a sense of social responsibility

Department Vision

Produce competitive engineers instilled with ethical and social responsibilities to deal with the technological challenges in the field of Electronics & Communication Engineering.

Department Mission

- Facilitate a value based educational environment that provides updated technical knowledge
- Provide opportunities for developing creative, innovative and leadership skills
- Imbue technological and managerial capabilities for a successful career and lifelong learning

Program Educational Objectives (PEOs)

- Analyze and apply the knowledge of Mathematics, Science and Engineering fundamentals for solving Electronics and Communication Engineering problems.
- Solve complex problems in Electronics and Communication Engineering and its allied areas to attain optimum solutions.
- Excel in chosen career by exhibiting life skills and professional ethics in multidisciplinary fields through continuous learning and research.

Establish consistency of PEOs with Mission of the Department

Preparation of matrix of PEOs and elements of Mission statements

The key elements of Mission statements are

1. Core competency with ethical values (M1).
2. Creativity and leadership (M2).
3. Desire for learning (M3).

The elements of the Mission statements and PEOs are mapped as given in the Table below.

PEOs & Mission matrix

	Elements of Mission Statements		
	M-1	**M-2**	**M-3**
Program Educational Objectives	Core competency with ethical values	Creativity and leadership	Desire for learning
PEO1: Analyze and apply the knowledge of Mathematics, Science, and Engineering concepts for solving Electronics and Communication Engineering problems.	3	2	2
PEO2: Solve complex problems in Electronics and Communication Engineering and its allied areas to attain optimum solutions.	2	3	2
PEO3: Excel in chosen career by exhibiting life skills and professional ethics in multidisciplinary fields through continuous learning and research.	2	2	3

Note: M1, M2,... Mn are distinct elements of Mission statement. Enter correlation levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

It there is no correlation, put "-"

Consistency/Justification of co-relation parameters of the PEO-Mission matrix of the Department

Justification of mapping of PEOs with Mission statements

	Mapping levels with Mission statements			Justification
PEO Statement	**M1**	**M2**	**M3**	
PEO1: Analyze and apply the knowledge of Mathematics, Science, and Engineering concepts for solving Electronics and Communication Engineering problems.	**3**	**2**	**2**	PEO1 strongly maps to M1 as the student applies the knowledge gained from the core subjects, displaying competency in the field of knowledge. PEO1 moderately maps to M2, In addition to the basic knowledge, students also require advanced technology to improve the creative thinking. PEO1 moderately maps to M3, In order to solve the real world problems in core areas, the students are required to learn advanced technologies along with the knowledge of basic courses.
PEO2: Solve complex problems in Electronics and Communication Engineering and its allied areas to attain optimum solutions.	**2**	**3**	**2**	PEO2 moderately maps to M1. The students can solve the complex problems by understanding the core subjects of Electronics and Communication Engineering. PEO2 strongly maps to M2. To solve the complex problems in Electronics and Communication Engineering, student requires creativity and leadership skills. PEO2 moderately maps to M3. In order to have a better solution for the complex problems in Electronics and Communication Engineering, curiosity for learning is also required.
PEO3: Excel in chosen career by	**2**	**2**	**3**	PEO3 moderately maps to M1. The student's ability to exhibit life skills and requires

exhibiting life skills and professional ethics in multidisciplinary fields through continuous learning and research.				continuous learning along with the core competency with ethical values. PEO3 moderately maps to M2. The student to excel in chosen career requires learning attitude along with creativity and leadership skills. PEO3 strongly maps to M3 as the continuous learning mainly requires an eagerness to learn.

Program Outcomes (POs) and Program Specific Outcomes (PSOs)

Engineering graduate will be able to

PO-1: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO-2: Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO-3: 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: 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: 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: 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: 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: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO-9: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO-10: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO-11: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO-12: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PSO-1: To Acquire knowledge required for designing Electronics and Communication systems.

PSO-2: Design, simulate and implement essential modules in the areas of Electronic circuits, VLSI, Embedded systems, Communication and Signal processing.

Guidelines to formulate Course

- Four to Six COs for theory to be formulated and each should inline with every unit of the course
- Four to Six COs for lab to be formulated and each should map the set of experiments listed in the lab course.
- Need to find a appropriate cognitive level for each CO and assign a suitable verb as per Blooms Taxonomy to frame the CO

Course Outcomes

1st Semester

Course Code	Course Title	Course Outcomes	
C111	English	CO1	**Analyze** the socio- economic conditions of Indian society as well as **make use of** LSRW skills and basic grammar concepts.
		CO2	**Examine** the socio- political conditions of Indian society as well as **apply** LSRW skills and the appropriate use of articles and prepositions.
		CO3	**Perceive** the challenges faced by the differently-abled and women in a male dominated society; **demonstrate** LSRW skills with the appropriate verb form and tense.
		CO4	**Interpret** the socio-cultural aspects of discrimination of Africans in society as well as **take part in** LSRW activities and utilize the quantifying expressions.
		CO5	**develop** motivation from the inspiring and eminent personalities and **identify** and correct common errors in grammar and usage.
C112	Mathematics - I	CO1	**Apply** various tests to identify the nature of the given series and **utilize** the mean value theorems to real life problems.
		CO2	**Solve** the first order, first degree differential equations and **apply** the techniques to solve problems related to various engineering fields.
		CO3	**Solve** the higher order differential equations with constant coefficients and **apply** it to solve physical situations whose behavior can be described by Linear D.E.
		CO4	**Utilize** multivariate differential calculus concepts to determine the extrema of multivariable functions.
		CO5	**Apply** double and triple integrals in evaluating area bounded by a region and volume enclosed by a surface.
C113	Applied Chemistry	CO1	**Outline** the mechanism properties and engineering applications of plastic materials and various additives added methods for polymer materials
		CO2	**Explain** the construction of batteries, fuel cells and interpret the mechanism of protection of corrosion
		CO3	**Demonstrate** the importance, preparation, properties of nano materials, Super conductors, fullerenes, liquid crystals, and magnetic materials

		CO4	**Utilize** the knowledge of computational chemistry and characteristics of molecular motors and machines
		CO5	**Make use** of different applications of analytical instruments and outline various natural energy sources.
C114	Programming for Problem Solving Using C	CO1	Explain about the Data Storage in Computer, Importance of various Data Types, Evaluating Expressions and various Storage Classes with Programming Examples using C.
		CO2	Understand the Concept of Bitwise operators, Logical Operators and Make use of Selection Statements, Repetitions to solve basic C programs
		CO3	Utilize Arrays , Strings ,Structures and Unions to develop various application programs.
		CO4	Identify the importance of pointers and Pointer Applications
		CO5	Apply and test Concepts of Functions and File I/O operations.
C115	Engineering Drawing	CO1	Make use of drawing instruments for construction of polygons, curves and scales.
		CO2	Understand the concept of orthographic projections and acquire visualization skills, projection of points, straight line inclined to one plane and both the planes.
		CO3	Identify and draw the basic views of planes in different positions inclined to one and both the reference planes.
		CO4	Visualize and draw the projections of geometrical solids in 3D space.
		CO5	Interpret orthographic and isometric views of objects.

Laboratory Courses

Course Code	***Course Title***	***Experiment No***	***CO. No.***	***Course Outcomes***
C116	English Lab	1,2	CO1	**Distinguish** the consonant and vowel sounds in English Phonetics.
		3,4	CO2	**Develop** the correct Pronunciation of Plural and Past tense Markers.
		5,6	CO3	**Apply** the right syllabic division for accurate pronunciation.
		7,8	CO4	**Identify** the appropriate word stress in disyllabic and polysyllabic words.
		9,10	CO5	**Choose** the accurate stress in connected speech for proper intonation.
C117	Applied Chemistry Lab	1,2	CO1	**Make use** of experimental skills for quantitative analysis in acid-base titrations using indicators
		3,4,13	CO2	**Apply** the principals of redox titrations like Mn(II), ferrous (II) and vitamin-C in different

				samples
		5,6	CO3	**Experiment with** complexometric titrations to determine hardness of water and estimate the amount of copper (II) using hypo solution by iodometric method
		7,8,9,10	CO4	**Perform** experiments with instruments such as conductometter, P^H -meter to acquire skills of different methods of chemical analysis
		11,12,14, 15	CO5	**Estimate** the amount of Mg^{2+} present in an antacid, adsorption of acetic acid by charcoal and $CaCO_3$ present in egg shell .
C118	Programming for Problem Solving Using C Lab	1,2	CO1	Understand the C-Programs on basic concepts like variables, datatypes
		3,4	CO2	Experiment with Selection, Decision control statements, Loop control statements Using C.
		5,6,7,8	CO3	Develop the C-Programs on the Arrays, Strings Concepts
		9,10,11,12,13	CO4	Make use of Structures, Pointers, Dynamic Memory Allocation in C
		14,15,16	CO5	Develop the programs on the Functions, Files concepts using C

2nd Semester

Course Code	Course Title	Course Outcomes	
C121	Mathematics – II	CO1	**Determine** the rank, eigen values and eigen vectors of a matrix and **Solve** linear system of equations using Gauss elimination method.
		CO2	**Develop** the use of matrix algebra techniques that aid engineers in practical applications.
		CO3	**Determine** the approximate roots of polynomial and transcendental equations using basic algorithms and solve linear system of equations using Jacobi & Gauss-Seidal methods.
		CO4	**Apply** Newton's forward & backward interpolation and Lagrange's formulae for polynomial Interpolation with equal and unequal intervals.
		CO5	**Apply** Numerical Integration techniques for approximating definite integrals and **solve** the ordinary differential equations numerically using Taylor, Picard, Euler's and RK methods.
C122	Mathematics –III	CO1	**Interpret** the physical meaning of vector differential operators and **evaluate** line, surface and volume integrals using Vector Integral theorems.
		CO2	**Find** the Laplace Transform of various functions and **Apply** it for solving differential equations .

		CO3	**Find** the Fourier Series of periodic signals and **Apply** Fourier Integral theorem to find Fourier transform to a range of non-periodic waveforms.
		CO4	**Solve** the linear and non-linear partial differential equations of first order.
		CO5	**Solve** higher order linear partial differential equations with constant coefficients and **utilize** the method of separation of variables to solve one dimensional wave, heat and two-dimensional Laplace equations.
C123	Applied Physics	CO1	Explain the concepts of interference and diffraction and determine the resolving power of various optical instruments.
		CO2	Understand quantum principles and derive Schrodinger's wave equations and apply them for free particle in an infinite potential box.
		CO3	Compare various electron theories of solids, determine the effect of temperature on Fermi-Dirac distribution function and distinguish conductors, semiconductors and insulators.
		CO4	Classify various types of semiconductors and apply Hall effect to identify the type of semiconductor.
		CO5	Explain dielectrics and magnetic materials, understand their properties and outline their applications.
C124	Network Analysis	CO1	Analyze the electric circuits by using basic concepts.
		CO2	Evaluate the transient response of electrical networks for different types of excitations.
		CO3	Summarize the steady state response of AC circuits
		CO4	Analyze the electrical networks by applying network theorems and Summarize the concept of resonance
		CO5	Summarize the parameters involved in two port networks
C125	Basic Electrical Engineering	CO1	Summarize the principle and characteristics of DC machines
		CO2	Outline the constructional details, principle of operation and performance of single phase transformers.
		CO3	Analyze the performance characteristics o Synchronous generator
		CO4	Analyze the performance and speed – torque characteristics of a three phase induction motor and starting methods.
		CO5	Outline the torque producing mechanism of a single phase induction motor

Laboratory Courses

Course Code	*Course Title*	*Experiment No*	*CO. No.*	*Course Outcomes*
C126	Electronic workshop	1,2	CO1	Name the components that are generally used in electronic laboratory
		3,4,	CO2	Demonstrate the working of different laboratory

		9,10		equipment including CRO
		7	CO3	Apply the knowledge of soldering practice in electronic circuits
		8	CO4	Utilize the necessary tools in PCB layout and design
		5,6	CO5	Test for the working of various active and passive components
C127	Basic Electrical Engineering Lab	1,3,4,5	CO1	Analyze the performance characteristics of DC machines.
		2	CO2	Analyze the methods to control the speed of DC shunt motor
		7,8	CO3	Demonstrate the performance of single phase transformer
		9	CO4	Analyze the performance characteristics of Induction Motor
		10	CO5	Analyze the performance characteristics of an Alternator
C128	Applied Physics Lab	1 &2	CO1	Operate travelling microscope to study the thin film interference.
		3&4	CO2	Determine the ability of telescope and grating to resolve two objects or spectral lines
		5&6	CO3	Determine the dispersive power and resolving power of a diffraction grating
		7	CO4	Apply tangent law to study the variation of magnetic fields due to current carrying conductors
		8,9&10	CO5	Estimate the properties of dielectrics and semiconductors.
C129	Communication Skills Lab	1,2	CO1	**Develop** the art of speaking spontaneously for a minute (JAM); express in different hypothetical situations, self profiles and peer profiles.
		3,4	CO2	**Understand** telephone etiquette; **take part in** role-plays for a given situation.
		5,6,7	CO3	**Organise** and structure the content for an effective presentation and **understand** the elements of Public Speaking.
		8	CO4	**Plan** and prepare for a Group Discussion.
		9,10	CO5	**Apply** preparatory techniques for successful Job interviews
C12A	Engineering Exploration Project		CO1	**Outline** the steps involved in Human –centered design methodology.
			CO2	**Summarize** the real-world applications with Human –centered design methodology.
			CO3	**Analyze** the ill defined problems using design thinking problem solved Methodology.
			CO4	**Compare** several design challenges and work towards the final design challenge.
			CO5	**Develop** effective solutions for real –world problems through Design thinking Approach.

3rd Semester

Course Code	Course Title	Course Outcomes	
C211	EDC	CO1	Outline the basic concepts of semiconductor physics to understand the operation of PN Junction diode.
		CO2	Compare various types of special diodes, and construct the rectifiers with filters.
		CO3	Explain the working of BJT and FET, and compare various configurations of BJT and FET.
		CO4	Apply the concepts of biasing and stabilization for the design of BJT and FET amplifiers.
		CO5	Apply the small signal low frequency model to design BJT and FET amplifiers.
C212	STLD	CO1	Represent different number systems, perform binary arithmetic, Apply Boolean theorems to minimize logic functions and Realize any logic gates with NAND and NOR gates.
		CO2	Manipulate Boolean expressions using Karnaugh Maps in both SOP and POS forms. Model combinational logic circuits using gates.
		CO3	Model combinational logic circuits using PLD's
		CO4	Outline the concept of latches and flip-flops. Construct sequential logic circuits like counters and registers using flip-flops.
		CO5	Model Finite State Machines using Mealy and Moore
C213	S&S	CO1	Characterize the signals and systems and build the analogy between vectors & signals to develop the fourier series concepts
		CO2	Make use of fourier concept to analyze the spectral characteristics for different classes of signals
		CO3	Outline the concept of convolution to analyze LTI Systems
		CO4	Examine the process of correlation in detection of signals in the presence of noise, Explain the process of sampling and reconstruction of signals
		CO5	Apply Laplace transform and Z transform to analyze the linear time invarient systems
C214	RVSP	CO1	Mathematically model the random phenomena and solve simple probabilistic problems.
		CO2	Identify different types of random variables and compute statistical averages of these random variables.
		CO3	Make use of the concepts of single random variable to study the behaviour of random phenomenon for a multi random variable

			case.
		CO4	Outline the Temporal characteristics of the Random processes.
		CO5	Apply the concepts of random processes to analyze the behaviour of LTI systems in the presence of different types of noise. And Explain the characteristics of the Random processes in spectral domain.
C215	OOPs Through JAVA	CO1	Show competence in the use of the Java programming language in the development of small to medium- sized application programs Demonstrate professionally acceptable coding and performance standard
		CO2	Illustrate the basic principles of the object-oriented programming
		CO3	Demonstrate an introductory understanding of graphical user interfaces,
		CO4	Ability to use I/O streams to read from and write to a file or standard I/O and any other interface
		CO5	Demonstrate an introductory understanding multithreaded programming, and event-driven programming.
C216	MEFA	CO1	utilize the knowledge of demand forecasting methods to predict demand of a product
		CO2	Analyze Production function & economies of scale and assess the BEP of their own business
		CO3	Identify the nature of competitive market situations along with the knowledge of different business units.
		CO4	Utilize various accounting tools to prevent loss for the organization
		CO5	Discover the sources of raising capital for business undertaking
	Constitution of India	CO1	Understand historical background of the constitution making and its importance for building a democratic India.
		CO2	Understand the functioning of three wings of the government ie., executive, legislative and judiciary
		CO3	Understand the value of the fundamental rights and duties for becoming good citizen of India.
		CO4	Analyze the decentralization of power between central, state and local self-government.
		CO5	Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.

Laboratory Courses

Course Code	Course Title	Experiment No	CO. No.	Course Outcomes
C217	STLD	1-5	CO1	Verify the functional behavior of different logic gates and realize the Boolean expressions using these gates.
		1-5	CO2	Build combinational circuits to implement higher order logic functions.
		1-12	CO3	Make use of Digital ICs to verify the functional behavior of combinational and sequential applications
		6,7,8	CO4	Demonstrate different flipflops in different modes.
		10,11	CO5	Construct sequential circuits like counters using flip-flops.
C218	EDC	1,2,3	CO1	Analyze the characteristics of P-N Junction Diode and Zener Diode to build the rectifier circuits and regulator circuits.
		4,5	CO2	Analyze the characteristics of BJT and FET to design amplifiers.
		7	CO3	Compare signals using Lissajous Patterns in Cathode Ray Oscilloscope.
		8	CO4	Examine the characteristics of Unipolar Junction transistor to understand its working.
		9,10,11	CO5	Design the biasing circuits to operate BJT and find the frequency response of transistor amplifiers to determine their bandwidth

4th Semester

Course Code	Course Title		Course Outcomes
C221	ECA	CO1	Compare small signal low & high frequency amplifiers using BJT and FET
		CO2	Compare multistage amplifiers based on the combination of different amplifier configurations
		CO3	Compare different types of feedback amplifiers
		CO4	Make use of baurkhasan criterion to design different types of oscillators
		CO5	Apply load line concept to examine different types of power amplifiers and analyze different tuned amplifiers
C222	LCS	CO1	Summarize the basic concepts involved in control systems and develop mathematical models of physical systems.
		CO2	Develop transfer function model and summarize the time domain specifications of LTI systems.

		CO3	Analyze the stability of LTI systems using Routh's stability criterion and the Root locus method.
		CO4	Analyze the stability of LTI systems using frequency response methods.
		CO5	Design compensators to improve system performance and develop system modeling & analyze using state-space.
C223	EWTL	CO1	Classify different types of transmission lines based on primary and secondary constants.
		CO2	Derive the expressions to determine different transmission line parameters and verify the same with the smith chart.
		CO3	Explain and illustrate the steady Electric fields in different media.
		CO4	Summarize magnetostatic fields for static case, and apply the Maxwell equations to study the time varying behaviour of EM waves.
		CO5	Interpret the characteristics and power flow mechanism of EM waves in different media.
C224	AC	CO1	Explain the basic concepts of analog communication system, as well as the methods of amplitude modulation and demodulation schemes
		CO2	Compare various amplitude modulation techniques and their spectral characteristics
		CO3	Explain the generation and detection schemes of angle modulation systems and compare with linear modulation techniques
		CO4	Identify the functioning of various modules of analog transmitters and receivers
		CO5	Identify the noise behavior of analog communication systems and compare all analog pulse modulation systems
C225	CAO	CO1	Outline the architecture, the performance measurement and the functions of an instruction set of a modern computer
		CO2	Extend the knowledge of registers, instructions, addressing modes and I/O operations in understanding the architecture of a digital computer
		CO3	Compare and Contrast different methods for computer I/O organization
		CO4	Classify read only memories, cache memories, Secondary storages

			in hierarchical memory system
		CO5	Summarize processing unit and Micro programmed control unit
C226	MOB	CO1	Acquire the knowledge on management functions, global leadership and organisational structure
		CO2	Will familiarize the concepts of functional management that is HRM and Marketing of new products developments
		CO3	To think in strategically through contemporary management practices
		CO4	To develop positive attitude through personality development and can equip with motivational theories
		CO5	Attain group performance and grievance handling in managing the organizational culture

Laboratory Courses

Course Code	*Course Title*	*Experiment No*	*CO. No.*	*Course Outcomes*
C227	ECA	1,4,5,6	CO1	Design and analyze various amplifiers (Multi stage amplifiers and Single tuned amplifier)
		2,3	CO2	Design and analyze various oscillators(RC phase shift oscillator and Colpitt's oscillator)
		7,8	CO3	Design and analyze feedback amplifiers (voltage series and current shunt feedback amplifiers)
		9,10	CO4	Design and analyze power amplifiers (Class A and Class B complimentary symmetry)
		All experiments	CO5	Become expert with computer skills (Multisim, OrCAD Pspice and Capture) for the analysis and design of circuits
C228	AC	AM,DSB,FM	CO1	Generate, detect and analyze different analog modulation techniques.
		AGC,PE &DE, PLL	CO2	Analyze AM radio receiver characteristics.
		Sampling	CO3	Demonstrate analog to discrete signal conversion and reconstruction process.
		PAM,PWM,PPM	CO4	Demonstrate various pulse modulation techniques.
		All	CO5	Make use of MATLAB Communication toolbox for

		Expere mnets		analyzing analog modulation techniques.

5th Semester

Course Code	Course Title	Course Outcomes	
C311	LICA	CO1	Outline the basic operation and performance parameters of differential amplifiers and OP-AMPs.
		CO2	Construct different linear and non-linear circuits using OP-AMPs
		CO3	Analyze and design amplifiers and active filters using OP-AMPs
		CO4	Develop applications by making use of different analog ICs.
		CO5	Construct different types of DAC's and ADC's using OP-AMP
C312	MPMC	CO1	Comprehend the architecture and working of 16 bit microprocessor 8086.
		CO2	Apply assembly language programming skills to perform arithmetic, logical and string operations with 8086.
		CO3	Develop applications involving interfacing of various peripherals with 8086 microprocessor.
		CO4	Develop microcontroller based standalone applications for societal needs.
		CO5	Illustrate the architecture and Programming model of ARM Cortex M3 Processor.
C313	DC	CO1	Illustrate the various types of baseband digital modulation techniques
		CO2	Explain band pass digital modulation and demodulation techniques
		CO3	Identify the error probability of various receivers using digital modulation techniques
		CO4	Apply the concepts of Information theory and analyze the different source coding schemes for efficient data representation
		CO5	Compare different error control coding schemes for the reliable transmission of digital information over the channel
C314	SCTPP	CO1	Demonstrate the principles of structured programming and be able to describe,design, implement, and test structured programs.
		CO2	Make use of the built-in data structures list, sets, tuples and

			dictionary.
		CO3	Identify real-world applications using oops, files and exceptionhandling provided by python. Formulate and implement a program to solve a real-world problem using GUI and Turtle graphics.
		CO4	Understand soft computing applications with Fuzzy Sytems
		CO5	Understand soft computing applications with Genetic Algorithms
C315	EMI	CO1	Understand the different characteristics of electronic measuring instruments
		CO2	Understand the different types of Signal generators and its applications.
		CO3	Understand the design and functioning of Oscilloscopes.
		CO4	Utilize AC bridges for measurement of inductance and capacitance and understand the operation of Q-meter and counters.
		CO5	Develop the transducers to measure the different physical parameters
C319	Mini Project with Hardware Development	CO1	Demonstrate the technical knowledge to identify problems in the field of Electronics & Communication Engineering and its allied areas.
		CO2	Analyze and formulate hardware projects with a comprehensive and systematic approach.
		CO3	Identify the modern tools to implement hardware projects.
		CO4	Design engineering solutions for solving complex engineering problems.
		CO5	Develop effective communication skills, professional behavior and team work.
	Essence of Indian Traditional Kn owledge	CO1	Understand the concept of traditional knowledge and its importance, evaluate the impact of social change on traditional knowledge
		CO2	Know the need and importance of protecting traditional knowledge, analyse the role of government and the value of traditional knowledge in global economy
		CO3	Analyse the legal framework of traditional knowledge, evaluate farmers right and plant variant protection act, Scheduled Tribes and other traditional forest dwellers act.

		CO4	Summarize enactments related to the protection of various systems of traditional knowledge, IPR and non IPR mechanisms of traditional knowledge protection,
		CO5	Apply traditional knowledge in various sectors like engineering, medicine, biotechnology, agriculture, sustainable development of environment, management of biodiversity and food security

Laboratory Courses

Course Code	*Course Title*	*Experiment No*	*CO. No.*	*Course Outcomes*
C316	LICA	1	CO1	Demonstrate the basic operation and performance parameters of various analog ICs.
		2,3	CO2	Design various linear applications using IC741 op-amp
		4,5,6,7, 8,10	CO3	Design various non-linear applications using IC741 op-amp
		9	CO4	Design various applications using IC555 timer
		11,12,13	CO5	Implement various applications using analog ICs other than IC 741 and 555
C317	DC	2,3,4,8	CO1	Demonstrate baseband digital modulation techniques.
		1	CO2	Analyze the signal transmission through multiplexing and modulation over wired channel
		5,6,7	CO3	Demonstrate various digital modulation techniques.
		9	CO4	Evaluate various source coding techniques.
		10,11,12	CO5	Evaluate various error control coding techniques.
C318	MPMC	1,2,3	CO1	Develop basic assembly language programs based on arithmetic, logical, and shift operations using 8086 microprocessor.
		4,5	CO2	Develop standalone applications by Interfacing I/O peripheral devices with 8086 microprocessor.
		6,7,8	CO3	Develop basic assembly language programs based on arithmetic, logical, and shift operations using 8051 microcontroller.
		9,10	CO4	Develop standalone applications for societal needs by Interfacing I/O peripheral devices with 8051 microcontroller.
		11,12	CO5	Develop basic assembly language programs based on arithmetic, logical, and shift operations using ARM processor.

6th Semester

Course Code	Course Title	Course Outcomes	
C321	WWTD	CO1	Formulate the field components in rectangular wave guides
		CO2	Define various Antenna parameters
		CO3	Apply Maxwell's equations to calculate fields from dynamic charge/current distributions and design basic types of antenna Arrays.
		CO4	Construct and analyze non resonant antennas and parasitic arrays.
		CO5	Identify the characteristics of radio wave propagation.
C322	VLSI Design	CO1	Illustrate the various fabrications steps of IC and come across basic electrical properties of MOSFET.
		CO2	Build MOS circuits with the help of Basic circuit concepts and analyze its characteristics based on the Scaling factors.
		CO3	Analyze the different amplifier circuits with various loads
		CO4	Design and analysis of Combinational and sequential MOS Circuits.
		CO5	Make use of FPGA architectures to realize digital circuits.
C323	DSP	CO1	Demonstrate engineering problems in terms of Digital signals, systems, and DSP operations.
		CO2	Develop frequency-domain representation of discrete-time signals.
		CO3	Apply the IIR Filter design procedures with different structures.
		CO4	Apply the FIR Filter design procedures with different structures.
		CO5	Outline the concepts of DSP Processor key architectures
C324	DICD	CO1	Illustrate concepts of MOS design
		CO2	Design and Analysis of Combinational MOS Logic Circuits
		CO3	Design and Analysis of Sequential MOS Logic Circuits and Extend CMOS Digital IC design to different applications
		CO4	Analyze Advanced Interconection Techniques
		CO5	Compare the concepts of Semiconductor Memories, Flash Memory and RAM array structures
C325	ANN	CO1	Demonstrate neural networks architecture, their characteristics

			and learning method.
		CO2	Apply learning rules on Single layer and multilayer neural network architecture and train artificial neural network using back propagation.
		CO3	Make use of Outstar, Vector Quantization learning rules in neural network for construction of competitive networks to perform unsupervised learning.
		CO4	Demonstrate clustering process using neural networks such as counter propagation networks, Adaptive Resonance Theory, etc.
		CO5	Discuss about various pattern associative networks and architecture of Bidirectional Associative Memory and Hopfield Network.
C326	IoT	CO1	Understand the design principles and capabilities of IoT
		CO2	Outline the architecture and instruction set of ARM embedded processors
		CO3	Summarize the Interfacing of I/O devices, sensors, communication modules and various protocols of IoT
		CO4	Explain the concept of data monitoring remotely and control devices at the application layer
		CO5	Illustrate the Design of real time IoT based applications
	IPR & Patents	CO1	Outline concept of Intellectual property rights, IPR tool kit and its importance in the global scenario
		CO2	Demonstrate an understanding about copyright protection, the registration process and legal remedies available in case of infringement
		CO3	Explain and gain knowledge on patents, steps for patent registration and recent developments in patent system.
		CO4	Utilize the concept of Trademark, their registration, infringement and related laws
		CO5	Apply the information gained on cyber laws and cyber - crimes in the domain of e-commerce, data security and understand the principles of trade secrets

Laboratory Courses

Course Code	Course Title	Experiment No	CO. No.	Course Outcomes
C327	VLSI	PartA 1-7	CO1	Develop data flow, behavioral and gate level models for digital circuits
		PartA 1-7	CO2	Simulate and verify the Verilog models of digital applications using CAD tool
		PartA 1-7	CO3	Implement and test various digital circuits on FPGA
		Part B 1-5	CO4	Develop transistor level digital design applications in Mentor Pyxis Schematic editor
		Part B 1-5	CO5	Verify the design by drawing Layout and check for DRC, LVS and Extract Parasitics for different applications
C328	DSP	1-10	CO1	Apply DSP tools such as Matlab and Code Composer Studio to analyze discrete systems and design digital filters.
		3, 10	CO2	Demonstrate the concept of discrete Fourier transform and fast Fourier transform algorithm.
		5-8	CO3	Analyze and Develop basic FIR and IIR digital filters
		4, 9	CO4	Demonstrate the basic concepts of sampling theorem and basic discrete time signals.
		1-10	CO5	Demonstrate implementation of digital signal processing concepts on DSP processors

7th Semester

Course Code	Course Title		Course Outcomes
C411	MWOC	CO1	Distinguish between Microwave tubes and Solid State Devices, calculation of efficiency devices.
		CO2	Examine different types waveguide junctions and components
		CO3	Understand and analyze the constructional parameters of optical fibers
		CO4	Identify and understand the operation of various optical sources and detectors
		CO5	Measure various microwave and fiber optical parameters using a Microwave testbench and fiber optic trainer module.
C412	DCCN	CO1	Outline the functions of various layers of OSI/TCP reference model ,the Categories and functions of various Data communication Networks
		CO2	Understand and explain various datalink layer protocals.
		CO3	Explain the network layer protocals& Demonstrate the mechanism of routing the data in networklayer
		CO4	Explain significance of transport layer and know the various Flow

			control and Congestion control Mechanisms
		CO5	Understand the Functioning of various Application layerProtocols.
C413	DIVP	CO1	Illustrate the fundamental concepts of Digital Image Processing and apply different transforms for image processing applications.
		CO2	Analyze the effect of spatial and frequency domain filtering of images and outline the concepts of Image restoration.
		CO3	Illustrate different image segmentation techniques and Apply various image compression techniques.
		CO4	Illustrate basic steps of video processing.
		CO5	Outline general methodologies for 2D motion estimation and various coding used in video processing.
C414	CSP	CO1	Understand modes of data communication and explain the significance of different Network topologies
		CO2	Outline the functions of various layers of OSI reference model
		CO3	Explain the features and application of various Wired Communication Protocols
		CO4	Explain the features and application of various Wireless Communication Protocols
		CO5	Understand the concepts required to establish Internetworking and network security
C415	ES	CO1	Classify the elements, characteristics, quality attributes and applications of typical embedded systems.
		CO2	Identify hardware components required for an embedded system and the design approach of an embedded hardware.
		CO3	Compare design approaches of embedded firmware on embedded environment.
		CO4	Explain Internals of Real-Time operating system and the fundamentals of RTOS based embedded firmware design and identify the need for hardware software Co-design.
		CO5	Make use of different IDEs for firmware development and outline the concepts of embedded system implementation and testing.
C418	Project Part-I	CO1	Extend the technical knowledge to select domain areas through extensive literature survey in the field of Electronics & Communication Engineering and its allied areas.
		CO2	Demonstrate the technical knowledge for the identifying and

			defining the problem statement in the field of Electronics & Communication Engineering and its allied areas.
		CO3	Outline the project abstract of the selected domain area, problem definition, and the tools to be used with required project outcomes.
		CO4	Develop effective communication skills, professional behaviour and team work.
		CO5	Show with precision & completeness the work organised with clear diagrams and sketches using efficient strategy and/or procedures in report writing.

Laboratory Courses

Course Code	*Course Title*	*Experiment No*	*CO. No.*	*Course Outcomes*
C416	IoT	2-10	CO1	Understand the working of Arduino and other sensor modules
		2-10	CO2	Learn the Installation of IDE, Arduino programming and debugging an application
		6,7,8,9, 10	CO3	Build applications by interfacing various sensors with Arduino
		3,4,5	CO4	Develop a wireless communication link between different devices.
C417	MWOC	1	CO1	Plot the necessary characteristics of microwave signals through experimentation
		3,6,7	CO2	Use a microwave test bench in analyzing various types of microwave measurements
		2,4,5	CO3	Determine various characteristics of microwave junctions
		9,10,11	CO4	Find optical parameters and losses using optical link system
		8,12	CO5	Plot the loss characteristics of optical fibers

To map Course Outcomes (COs) with Program Outcomes (POs)/ Program Specific Outcomes (PSOs), the correlation matrix given below is used to find the courses are representing each POs/PSOs.

Correlation matrix

Engineering graduate will be able to

PO#	Key Elements
PO-1	1. Apply knowledge of Mathematics and Science 2. Apply knowledge of Engineering fundamentals 3. Apply knowledge of Electronics and Communication Engineering fundamentals
PO-2	1. Apply research literature review 2. Identify and formulate complex problems in the area of ECE 3. Analyze and reaching substantiated conclusions using principles of mathematics 4. Reaching substantiated conclusions using engineering sciences
PO-3	1. Design and develop the system components & processes considering public health and safety. 2. Design and develop the system components & processes to meet the needs of society. 3. Design and develop the system components & processes by considering environmental issues.
PO-4	1. Conduct and explore the theoretical investigations in laboratories. 2. Analyze, interpret and validate the investigations of problems. 3. Apply the domain knowledge to validate experiments and projects.
PO-5	1. Select modern IT tools for understanding the complex engineering concepts. 2. Apply the modern IT tools for simulating the complex problems. 3. Apply the techniques, resources and modern engineering tools for the scope of understanding.
PO-6	1. Apply contextual knowledge towards health and safety of the society. 2. Demonstrate engineering skills towards legal and cultural issues.
PO-7	1. Overview and reduce the adverse effects by providing suitable engineering solutions for environment and societal problems. 2. Demonstrate the engineering knowledge for sustainable development.
PO-8	1. Apply engineering norms with professional ethics. 2. Accountable and responsible in exhibiting engineering skills.
PO-9	1. Implicate team work and leadership qualities.
PO-10	1. Effective reports writing skills. 2. Effective presentation skills to give and receive clear instructions.
PO-11	1. Apply managerial skills in understanding

	demonstrating the engineering activities in multi disciplinary environment. 2. Effective functional planning and implementation in handling the project
PO-12	1. Develop the real for self learning modern technologies 2. Engage themselves in lifelong learning for technology changes
PSO-1	1. Understand the concepts for the design of electronics and communication systems 2. Analyze and apply knowledge acquired in designing ECE system
PSO-2	1. Design and simulation of ECE essential modules in the area of ECE 2. Hardware implementation of validation of essential modules in the area of ECE

Mapping of Course Outcomes (COs) with Program Outcomes (POs)/ Program Specific Outcomes (PSOs)

1st Semester

Course Outcomes		Program Outcomes (POs)													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO 12	PSO1	PSO2
C111	CO1	-	-	-	-	-	3	-	-	-	3	3	3	-	-
	CO2	-	-	-	-	-	-	-	3	3	3	-	3	-	-
	CO3	-	-	-	-	-	3	-	-	-	3	-	3	-	-
	CO4	-	-	-	-	-	-	3	-	-	3	-	3	-	-
	CO5	-	-	-	-	-	-	-	3	-	3	-	3	-	-
	Avg	-	-	-	-	-	**3**	**3**	**3**	**3**	**3**	**3**	**3**	-	-
C112	CO1	3	2	-	-	-	-	-	-	-	-	-	2	-	-
	CO2	3	2	-	-	-	-	-	-	-	-	-	2	-	-
	CO3	3	2	-	-	-	-	-	-	-	-	-	2	-	-
	CO4	3	2	-	-	-	-	-	-	-	-	-	2	-	-
	CO5	3	2	-	-	-	-	-	-	-	-	-	2	-	-
	Avg	**3**	**2**	-	-	-	-	-	-	-	-	-	**2**	-	-

C113	CO1	2	-	-	-	-	2	2	1	-	-	-	-	-	-
	CO2	2	2	2	-	-	2	1	-		-	-	-	-	
	CO3	1	-	2	-	-	2	-	-	-	-	-	-	-	-
	CO4	2	2	1	-	-	2	-	-	-	-	-	1	-	-
	CO5	2	2	2	-	-	2	2	2	-	-	-	2	-	-
	Avg	**1.8**	**2**	**1.8**	**-**	**-**	**2**	**1.7**	**1.5**	**-**	**-**	**-**	**1.5**	**-**	**-**
C114	CO1	2	2	2	2	1	-	-	-	-	-	-	2	-	1
	CO2	2	2	2	2	2	-	-	-	-	-	-	2	1	1
	CO3	2	3	3	2	2	-	-	-	-	-	1	2	1	1
	CO4	2	2	3	2	1	-	-	-	-	-	1	2	-	1
	CO5	1	2	2	3	2	-	-	-	-	-	1	2	1	1
	Avg	**1.8**	**2.2**	**2.4**	**2.2**	**1.6**	**-**	**-**	**-**	**-**	**-**	**1**	**2**	**1**	**1**
C115	CO1	2	1	1	-	-	-	-	-	-	-	-	-	-	-
	CO2	2	1	1	-	-	-	-	-	-	-	-	-	-	-
	CO3	2	1	1	-	-	-	-	-	-	-	-	-	-	-
	CO4	2	1	2	-	-	-	-	-	-	-	-	-	-	-
	CO5	2	1	2	-	-	-	-	-	-	-	-	-	-	-
	Avg	**2**	**1**	**1.4**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
C116	CO1	-	-	-	-	-	-	-	-	-	3	-	3	-	-
	CO2	-	-	-	-	-	-	-	-	-	3	-	3	-	-
	CO3	-	-	-	-	-	-	-	-	-	3	-	3	-	-
	CO4	-	-	-	-	-	-	-	-	-	3	-	3	-	-
	CO5	-	-	-	-	-	-	-	-	-	3	-	3	-	-
	Avg	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**3**	**-**	**-**
C117	CO1	2	-	-	2	-	2	-	-	2	2	-	-	-	-
	CO2	2	2	2	1	-	2	1	-	1	-	-	-	-	-

	CO3	2	2	2	2	-	2	2	-	-	-	-	-	-	-
	CO4	2	2	3	2	-	2	-	-	-	1	-	-	-	-
	CO5	1	2	2	2	-	2	2	-	-	-	-	-	-	-
	Avg	**1.8**	**2**	**2.3**	**1.8**	**-**	**2**	**1.7**	**-**	**1.5**	**1.5**	**-**	**-**	**-**	**-**
C118	CO1	-	1	2	1	2	-	-	-	-	-	-	2	1	-
	CO2	2	3	2	2	3	-	-	-	-	-	-	2	1	1
	CO3	2	3	3	2	2	-	-	-	-	-	1	2	1	1
	CO4	2	2	3	2	2	-	-	-	-	-	1	2	1	1
	CO5	1	2	2	2	2	-	-	-	-	-	1	2	1	1
	Avg	**1.75**	**2.2**	**2.4**	**1.8**	**2.2**	**-**	**-**	**-**	**-**	**-**	**1**	**2**	**1**	**1**

2nd Semester

Course Outcomes		Program Outcomes (POs)													
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
C121	CO1	3	2	-	-	-	-	-	-	-	-	-	3	-	-
	CO2	3	2	-	-	-	-	-	-	-	-	-	2	-	-
	CO3	3	2	-	-	-	-	-	-	-	-	-	3	-	-
	CO4	3	2	-	-	-	-	-	-	-	-	-	2	-	-
	CO5	3	2	-	-	-	-	-	-	-	-	-	2	-	-
	Avg	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2.4**	**-**	**-**
C122	CO1	3	2	-	-	-	-	-	-	-	-	-	2	-	-
	CO2	3	2	-	-	-	-	-	-	-	-	-	2	-	-
	CO3	3	2	-	-	-	-	-	-	-	-	-	2	-	-
	CO4	3	2	-	-	-	-	-	-	-	-	-	2	-	-
	CO5	3	2	-	-	-	-	-	-	-	-	-	2	-	-
	Avg	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**
C123	CO1	3	2	1	-	-	-	-	-	-	-	-	1	-	-

	CO2	3	2	1	-	-	-	-	-	-	-	-	1	-	-
	CO3	3	2	1	-	-	-	-	-	-	-	-	1	-	-
	CO4	3	2	1	-	-	-	-	-	-	-	-	1	-	-
	CO5	3	2	1	-	-	-	-	-	-	-	-	1	-	-
	Avg	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
C124	CO1	3	3	2	-	-	-	2	-	-	-	-	-	2	2
	CO2	3	3	2	-	-	-	-	-	-	-	-	-	2	2
	CO3	3	3	2	-	-	-	2	-	-	-	-	-	2	2
	CO4	3	3	2	-	-	-	-	-	-	-	-	2	2	2
	CO5	3	3	2	-	-	-	-	-	-	-	-	-	2	2
	Avg	**3**	**3**	**2**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**2**	**2**	**2**
C125	CO1	3	3	-	2	3	-	-	-	2	2	-	2	2	-
	CO2	3	3	-	2	3	-	-	-	2	2	-	2	2	2
	CO3	3	3	-	2	-	-	-	-	-	2	-	-	2	-
	CO4	3	3	-	2	-	-	-	-	2	2	-	2	2	-
	CO5	3	2	-	2	-	-	-	-	2	2	-	2	2	2
	Avg	**3**	**2.8**		**2**	**3**	**-**	**-**	**-**	**2**	**2**	**-**	**2**	**2**	**2**
C126	CO1	-	-	-	-	-	-	-	-	-	-	-	-	2	-
	CO2	-	-	-	-	-	-	-	-	-	-	-	-	2	-
	CO3	-	-	-	-	-	-	-	-	-	-	-	-	2	-
	CO4	-	-	-	-	-	-	-	-	-	-	-	-	3	-
	CO5	-	-	-	-	-	-	-	-	-	-	-	-	3	-
	Avg	-	-	-	-	-	-	-	-	-	-	-	-	**2.4**	-
C127	CO1	3	3	-	2	3	-	-	-	2	2	-	2	2	-
	CO2	3	3	-	2	3	-	-	-	2	2	-	2	2	2
	CO3	3	3	-	2	-	-	-	-	-	2	-	-	2	-

	CO4	3	3	-	2	-	-	-	-	2	2	-	2	2	-
	CO5	3	2	-	2	-	-	-	-	2	2	-	2	2	2
	Avg	**3**	**2.8**	**-**	**2**	**3**	**-**	**-**	**-**	**2**	**2**	**-**	**2**	**2**	**2**
C128	CO1	3	1	-	-	-	-	-	-	-	-	-	-	-	-
	CO2	3	1	-	-	-	-	-	-	-	-	-	-	-	-
	CO3	3	1	-	-	-	-	-	-	-	-	-	-	-	-
	CO4	3	2	-	-	-	-	-	-	-	-	-	-	-	-
	CO5	3	2	-	-	-	-	-	-	-	-	-	-	-	-
	Avg	**3**	**1.4**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
C129	CO1	-	-	-	-	-	-	-	-	-	3	-	3	-	-
	CO2	-	-	-	-	-	-	-	-	-	3	-	3	-	-
	CO3	-	-	-	-	-	-	-	-	3	3	-	3	-	-
	CO4	-	-	-	-	-	-	-	-	3	3	-	3	-	-
	CO5	-	-	-	-	-	-	-	-	-	3	-	3	-	-
	Avg	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**-**	**3**	**-**	**-**
C12A	CO1	2	2	2	1	1	1	1	-	2	2	1	1	1	-
	CO2	2	3	2	2	1	1	1	-	2	2	1	1	1	-
	CO3	2	3	2	2	2	1	1	-	2	2	1	1	1	1
	CO4	2	3	3	2	2	1	2	-	2	2	1	2	1	1
	CO5	2	3	3	3	2	1	2	-	2	2	1	2	1	1
	Avg	**2**	**2.8**	**2.4**	**2**	**1.6**	**1**	**1.4**	**-**	**2**	**2**	**1**	**1.4**	**1**	**1**

3rd Semester

Course Outcomes		Program Outcomes (POs) and Program Specific Outcomes (PSOs)													
		PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
C211	CO1	2	2	1	1	-	-	-	-	-	-	-	2	2	1
	CO2	2	2	-	1	-	-	-	-	-	-	-	1	1	1
	CO3	2	2	-	2	-	-	-	-	-	-	-	2	2	1

	CO4	1	2	-	1	-	-	-	-	-	-	-	1	2	1
	CO5	2	2	-	2	-	-	-	-	-	-	-	2	2	1
	Avg	**1.8**	**2**	**1**	**1.4**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1.6**	**1.8**	**1**
C212	CO1	2	-	-	-	-	-	-	-	-	-	-	-	1	1
	CO2	1	2	1	-	-	-	-	-	-	-	-	-	2	1
	CO3	-	-	3	-	-	-	-	-	-	-	-	2	2	2
	CO4	-	2	2	-	-	-	-	-	-	-	-	1	2	3
	CO5	-	1	2	-	-	-	-	-	-	-	-	2	1	3
	Avg	**1.5**	**1.67**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1.67**	**1.6**	**2**
C213	CO1	2	1	-	-	-	-	-	-	-	-	-	2	1	1
	CO2	2	3	2	-	-	-	-	-	-	-	-	2	1	2
	CO3	2	2	2	-	-	-	-	-	-	-	-	3	3	2
	CO4	2	3	3	-	-	-	-	-	-	-	-	2	3	2
	CO5	2	3	2	-	-	-	-	-	-	-	-	2	1	2
	Avg	**2**	**2.4**	**2.25**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2.2**	**1.8**	**1.8**
C214	CO1	2	1	-	-	-	1	-	-	-	-	-	1	2	1
	CO2	2	2	-	-	-	1	-	-	-	-	-	1	2	1
	CO3	3	3	-	-	-	-	-	-	-	-	-	1	3	2
	CO4	2	1	-	-	-	-	-	-	-	-	-	1	2	1
	CO5	3	2	-	-	-	-	-	-	-	-	-	2	3	2
	Avg	**2.4**	**1.8**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**1.2**	**2.4**	**1.4**
C215	CO1	1	2	2	1	2	-	-	-	-	1	-	1	2	2
	CO2	1	2	2	1	3	-	-	-	-	1	-	1	2	2
	CO3	1	2	3	2	3	-	-	-	-	1	-	2	3	2
	CO4	1	2	3	2	3	-	-	-	-	1	-	2	3	3
	CO5	1	2	3	2	3	-	-	-	-	1	-	2	3	2
	Avg	**1**	**2**	**2.6**	**1.6**	**2.8**	**-**	**-**	**-**	**-**	**1**	**-**	**1.6**	**2.6**	**2.2**
C216	CO1	-	-	-	-	-	-	-	1	2	-	1	3	-	-
	CO2	-	-	-	-	-	-	-	-	-	1	2	3	-	-
	CO3	-	-	-	-	-	-	-	-	1	2	1	3	-	-
	CO4	-	-	-	-	-	-	-	-	-	1	3	3	-	-
	CO5	-	-	-	-	-	-	-	-	1	1	2	3	-	-
	Avg	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1.33**	**1.25**	**1.8**	**3**	**-**	**-**

C217	CO1	2	-	-	-	-	-	-	-	-	-	-	-	1	1
	CO2	-	-	3	-	-	-	-	-	-	-	-	2	2	2
	CO3	-	2	3	-	-	-	-	-	-	-	-	2	2	3
	CO4	-	1	1	-	-	-	-	-	-	-	-	1	1	2
	CO5	-	2	2	-	-	-	-	-	-	-	-	1	2	3
	Avg	**2**	**1.67**	**2.25**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1.5**	**1.6**	**2.2**
C218	CO1	2	3	3	1	-	-	-	-	-	-	-	2	2	2
	CO2	2	3	2	-	1	-	-	-	-	-	-	3	3	2
	CO3	3	2	3	1	-	-	-	-	-	-	-	2	2	2
	CO4	2	2	2	-	-	-	-	-	-	-	-	2	2	2
	CO5	2	3	1	1	-	-	-	-	-	-	-	3	3	2
	Avg	**2.2**	**2.6**	**2.2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**2.4**	**2.4**	**2**

4th Semester

Course Outcomes		Program Outcomes (POs) and Program Specific Outcomes (PSOs)													
		PO1	**PO2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**
C221	CO1	2	3	3	-	-	-	-	-	-	-	-	2	3	1
	CO2	2	3	3	-	-	-	-	-	-	-	-	2	2	3
	CO3	2	3	2	-	-	-	-	-	-	-	-	2	2	2
	CO4	2	3	2	-	-	-	-	-	-	-	-	2	2	3
	CO5	1	2	1	-	-	-	-	-	-	-	-	1	2	1
	Avg	**1.8**	**2.8**	**2.2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1.8**	**2.2**	**2**
C222	CO1	3	2	-	-	-	-	-	-	-	-	-	2	2	2
	CO2	3	2	-	-	-	-	-	-	-	-	-	2	2	2
	CO3	3	2	-	-	-	-	-	-	-	-	-	2	2	2
	CO4	3	2	-	-	-	-	-	-	-	-	-	2	2	2
	CO5	3	2	2	-	-	-	-	-	-	-	-	2	2	2
	Avg	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**2**
	CO2	1	1	1	-	-	-	-	-	-	-	-	2	2	1
	CO3	1	2	2	-	-	-	-	-	-	-	-	2	1	2
	CO4	1	1	-	-	-	-	-	-	-	-	-	2	3	1
	CO5	1	3	1	-	-	-	-	-	-	-	-	3	3	1
	Avg	**1**	**1.8**	**1.5**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2.2**	**2.2**	**1.4**
C224	CO1	2	1	-	-	-	-	-	-	-	-	-	-	2	1

	CO2	2	1	-	-	-	-	-	-	-	-	-	-	2	1
	CO3	2	2	-	-	-	-	-	-	-	-	-	-	2	1
	CO4	2	2	1		-	-	-	-	-	-	-	-	2	1
	CO5	2	2	-	-	-	-	-	-	-	-	-	-	2	1
	Avg	**2**	**1.6**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**1**
C225	CO1	2	-	-	-	-	-	-	-	-	-	-	-	1	-
	CO2	2	1	1	-	-	-	-	-	-	-	-	-	2	1
	CO3	2	2	2	-	-	-	-	-	-	-	-	1	2	1
	CO4	2	1	-	-	-	-	-	-	-	-	-	1	2	1
	CO5	2	1	1	-	-	-	-	-	-	-	-	1	2	1
	Avg	**2**	**1.25**	**1.33**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1.8**	**1**
C226	CO1	-	-	-	-	-	2	-	3	3	3	3	-	-	-
	CO2	-	-	-	-	-	-	-	-	3	3	3	-	-	-
	CO3	-	-	-	-	-	2	-	2	3	3	2	-	-	-
	CO4	-	-	-	-	-	-	-	-	3	3	-	-	-	-
	CO5	-	-	-	-	-	-	-	-	3	3	-	-	-	-
	Avg	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**2.5**	**3**	**3**	**2.67**	**-**	**-**	**-**
C227	CO1	3	3	-	3	-	-	-	-	-	-	-	2	2	3
	CO2	3	3	-	3	-	-	-	-	-	-	-	2	2	2
	CO3	2	2	-	3	-	-	-	-	-	-	-	3	2	3
	CO4	2	3	-	3	-	-	-	-	-	-	-	3	2	2
	CO5	2	1	-	2	2	-	-	-	-	-	-	2	1	2
	Avg	**2.4**	**2.4**	**-**	**2.8**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**2.4**	**1.8**	**2.4**
C228	CO1	1	-	-	2	-	-	-	-	1	-	-	-	2	1
	CO2	1	-	1	2	-	-	-	-	1	-	-	-	2	1
	CO3	1	-	-	2	-	-	-	-	1	-	-	-	1	1
	CO4	1	-	1	2	-	-	-	-	1	-	-	-	2	2
	CO5	1	-	-	2	2	-	-	-	1	-	-	1	1	2
	Avg	**1**	**-**	**1**	**2**	**2**	**-**	**-**	**-**	**1**	**-**	**-**	**1**	**1.6**	**1.4**

5th Semester

Course Outcomes		Program Outcomes (POs) and Program Specific Outcomes (PSOs)													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO 12	PSO1	PSO2
C311	CO1	2	1	1	-	-	-	-	-	-	-	-	-	2	1
	CO2	1	2	2	2	1	-	-	-	-	-	-	1	2	1
	CO3	1	2	3	2	1	-	1	-	-	-	-	1	2	1
	CO4	1	2	3	2	1	-	1	-	-	-	-	2	2	1
	CO5	1	2	3	2	1	-	1	-	-	-	-	2	2	1
	Avg	**1.2**	**1.8**	**2.4**	**2**	**1**	**-**	**1**	**-**	**-**	**-**	**-**	**1.5**	**2**	**1**
C312	CO1	1	-	-	-	-	-	-	-	-	-	-	-	2	1
	CO2	1	1	-	-	2	-	-	-	-	-	-	-	2	1
	CO3	-	2	2	-	-	-	-	-	-	-	-	-	1	2
	CO4	2	-	3	-	2	2	-	-	-	-	-	2	1	3
	CO5	-	-	-	1	-	-	-	-	-	-	-	2	2	1
	Avg	**1.33**	**1.5**	**2.5**	**1**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**2**	**1.6**	**1.6**
C313	CO1	1	2	1	-	-	-	-	-	-	-	-	1	2	2
	CO2	2	3	1	-	-	-	-	-	-	-	-	1	2	2
	CO3	2	3	1	-	-	-	-	-	-	-	-	1	2	2
	CO4	1	2	1	-	-	-	-	-	-	-	-	2	2	2
	CO5	2	2	1	-	-	-	-	-	-	-	-	2	2	2
	Avg	**1.6**	**2.4**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1.4**	**2**	**2**
C314	CO1	1	1	-	-	-	-	-	-	-	-	-	-	2	1
	CO2	1	1	-	-	-	-	-	-	-	-	-	-	2	1
	CO3	1	2	1	-	-	-	-	-	-	-	-	-	1	2
	CO4	1	1	1	-	-	-	-	-	-	-	-	-	1	2
	CO5	1	1	1	-	-	-	-	-	-	-	-	-	2	1
	Avg	**1**	**1.2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1.6**	**1.4**
C315	CO1	3	2	1	-	-	-	-	-	-	-	-	1	2	1
	CO2	3	2	1	-	-	-	-	-	-	-	-	1	2	1
	CO3	2	2	1	-	-	-	-	-	-	-	-	2	2	2
	CO4	3	3	2	-	-	-	-	-	-	-	-	3	3	3
	CO5	2	2	2	-	-	-	-	-	-	-	-	2	1	1
	Avg	**2.6**	**2.2**	**1.4**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1.8**	**2**	**1.6**
C316	CO1	-	1	1	1	-	-	-	-	-	-	-	1	1	1

	CO2	1	1	2	2	-	-	1	-	-	-	-	1	2	1
	CO3	1	1	2	2	-	-	1	-	-	-	-	1	2	1
	CO4	1	1	2	2	-	-	1	-	-	-	1	1	2	1
	CO5	1	1	2	2	-	-	1	-	-	-	1	1	2	1
	Avg	**1**	**1**	**1.8**	**1.8**	**-**	**-**	**1**	**-**	**-**	**-**	**1**	**1**	**1.8**	**1**
C317	CO1	1	2	2	3	-	-	-	-	2	2	1	-	2	2
	CO2	1	2	2	3	-	-	-	-	2	2	1	-	2	2
	CO3	2	2	2	3	-	-	-	-	2	2	1	-	2	3
	CO4	2	2	3	3	-	-	-	-	2	2	1	-	2	3
	CO5	2	2	3	3	-	-	-	-	2	2	1	-	2	3
	Avg	**1.6**	**2**	**2.4**	**3**	**-**	**-**	**-**	**-**	**2**	**2**	**1**	**-**	**2**	**2.6**
C318	CO1	1	1	1	2	2	-	-	-	1	-	-	-	2	1
	CO2	1	2	2	2	3	-	-	-	2	-	1	2	2	2
	CO3	1	1	1	2	2	-	-	-	1	-	-	-	2	1
	CO4	1	2	2	2	3	-	-	-	2	-	1	2	2	2
	CO5	1	1	1	2	2	-	-	-	1	-	-	2	2	1
	Avg	**1**	**1.4**	**1.4**	**2**	**2.4**	**-**	**-**	**-**	**1.4**	**-**	**1**	**2**	**2**	**1.4**
C319	CO1	3	3	-	-	-	-	-	-	-	-	-	-	3	1
	CO2	2	2	2	1	3	-	-	-	-	-	-	-	1	2
	CO3	-	-	-	-	3	-	-	-	-	-	1	2	-	2
	CO4	-	-	3	-	3	-	-	-	-	-	-	2	-	3
	CO5	-	-	-	-	-	-	-	2	3	3	3	2	-	-
	Avg	**2.5**	**2.5**	**2.5**	**1**	**3**	**-**	**-**	**2**	**3**	**3**	**2**	**2**	**2**	**2**

6th Semester

Course Outcomes		**Program Outcomes (POs) and Program Specific Outcomes (PSOs)**													
		PO1	**PO2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**
C321	CO1	2	2	1	-	-	1	-	-	-	-	-	-	1	2
	CO2	1	1	-	2	-	-	-	-	-	-	-	-	2	1
	CO3	1	-	1	-	-	-	-	-	-	-	-	-	2	1
	CO4	1	1	1	-	-	2	-	-	-	-	-	-	2	1
	CO5	1	1	-	-	1	1	-	-	-	-	-	-	1	2
	Avg	**1.2**	**1.25**	**1**	**2**	**1**	**1.3**	**-**	**-**	**-**	**-**	**-**	**-**	**1.6**	**1.4**
C322	CO1	2	1	1	-	-	-	-	-	-	-	-	-	2	1

	CO2	1	2	2	2	1	-	-	-	-	-	-	1	2	1
	CO3	1	2	3	2	1	-	1	-	-	-	-	1	2	1
	CO4	1	2	3	2	1	-	1	-	-	-	-	2	2	1
	CO5	1	2	3	2	1	-	1	-	-	-	-	2	2	1
	Avg	**1.2**	**1.8**	**2.4**	**2**	**1**	**-**	**1**	**-**	**-**	**-**	**-**	**1.5**	**2**	**1**
C323	CO1	3	1	1	-	-	-	-	-	-	-	-	1	2	1
	CO2	3	3	1	-	-	-	-	-	-	-	-	1	2	2
	CO3	2	3	3	-	2	-	-	-	-	-	-	2	3	3
	CO4	3	3	3	-	3	-	-	-	-	-	-	2	3	3
	CO5	1	2	3	-	2	-	-	-	-	-	-	2	3	3
	Avg	**2.4**	**2.4**	**2.2**	**-**	**2.33**	**-**	**-**	**-**	**-**	**-**	**-**	**1.6**	**2.6**	**2.4**
C324	CO1	1	3	1	-	-	-	-	-	-	-	2	2	2	2
	CO2	1	3	2	-	-	-	-	-	-	-	2	2	2	3
	CO3	1	3	2	-	-	-	-	-	-	-	2	2	2	3
	CO4	1	1	1	-	-	-	-	-	-	-	1	2	2	2
	CO5	1	3	3	-	-	-	-	-	-	-	2	2	2	3
	Avg	**1**	**2.6**	**1.8**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1.8**	**2**	**2**	**2.6**
C325	CO1	2	2	-	-	-	-	-	-	-	-	-	-	-	1
	CO2	3	3	2	-	-	-	-	-	-	-	-	-	-	2
	CO3	2	2	2	-	-	-	-	-	-	-	-	-	-	2
	CO4	2	2	2	-	-	-	-	-	-	-	-	-	-	2
	CO5	2	2	2	-	-	-	-	-	-	-	-	-	-	1
	Avg	**2.2**	**2.2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1.6**
C326	CO1	1	2	-	-	-	-	-	-	-	-	-	2	2	2
	CO2	1	-	2	1	-	-	-	-	-	-	-	2	2	3
	CO3	1	2	2	1	-	-	2	-	-	-	-	2	2	3
	CO4	1	2	-	-	-	-	-	-	-	-	-	2	2	2
	CO5	1	2	2	2	-	-	2	-	-	-	-	2	2	3
	Avg	**1**	**2**	**2**	**1.33**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**2**	**2**	**2.6**
C327	CO1	-	-	-	3	3	-	-	-	-	-	-	2	2	2
	CO2	-	-	-	3	3	-	-	-	-	-	-	2	1	3
	CO3	-	-	-	1	3	-	-	-	-	-	-	2	2	1
	CO4	2	2	2	3	-	-	-	-	-	-	-	2	2	2

	CO5	1	2	2	2	3	-	-	-	-	-	-	2	2	1
	Avg	**1.5**	**2**	**2**	**2.4**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**1.8**	**1.8**
C328	CO1	2	2	2	2	2	-	-	-	-	-	-	1	2	2
	CO2	3	2	2	3	3	-	-	-	-	-	-	1	3	3
	CO3	3	3	3	3	3	-	-	-	-	-	-	3	3	3
	CO4	2	1	1	3	1	-	-	-	-	-	-	2	2	3
	CO5	1	2	2	2	2	-	-	-	-	-	-	3	3	3
	Avg	**2.2**	**2**	**2**	**2.6**	**2.2**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**2.6**	**2.8**

7th Semester

Course Outcomes		**Program Outcomes (POs) and Program Specific Outcomes (PSOs)**													
		PO1	**PO2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**
C411	CO1	2	1	-	1	-	-	1	-	-	-	-	2	2	3
	CO2	1	2	2	2	-	1	-	-	-	-	-	3	2	2
	CO3	1	2	1	-	-		-	-	-	-	-	3	3	3
	CO4	2	1	-	1	-	-	-	-	-	-	-	2	3	2
	CO5	2	1	2	-	-	-	-	-	-	-	-	3	3	3
	Avg	**1.6**	**1.4**	**1.67**	**1.33**	**-**	**1**	**1**	**-**	**-**	**-**	**-**	**2.6**	**2.6**	**2.6**
C412	CO1	1	1	-	-	-	-	1	-	-	-	-	2	2	2
	CO2	1	1	-	-	-	-	-	-	-	-	-	1	1	1
	CO3	1	1	-	-	-	-	-	-	-	-	-	1	1	1
	CO4	1	1	-	-	-	-	-	-	-	-	-	1	1	1
	CO5	1	1	-	-	-	-	-	-	-	-	-	1	1	1
	Avg	**1**	**1**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**1.2**	**1.2**	**1.2**
C413	CO1	2	2	2	-	-	2	-	-	-	-	-	-	-	2
	CO2	2	2	2	-	-	3	-	-	-	-	-	-	-	3
	CO3	2	3	3	-	-	3	-	-	-	-	-	-	-	3
	CO4	1	1	1	-	-	1	-	-	-	-	-	-	-	1
	CO5	2	2	2	-	-	2	-	-	-	-	-	-	-	3
	Avg	**1.8**	**2**	**2**	**-**	**-**	**2.2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2.4**
C414	CO1	1	1	-	-	-	-	1	-	-	-	-	-	1	-
	CO2	1	1	-	-	-	-	-	-	-	-	-	-	1	-
	CO3	1	1	-	-	-	-	-	-	-	-	-	1	1	-

	CO4	1	1	-	-	-	-		-	-	-	-	1	1	2
	CO5	1	1	-	-	-	-	-	-	-	-	1	2	1	-
	Avg	**1**	**1**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**1**	**1.33**	**1**	**2**
C415	CO1	2	1	-	-	-	2	2	-	-	-	-	2	3	1
	CO2	3	2	2	1	-	2	2	-	-	-	-	3	3	3
	CO3	2	-	-	-	1	-	-	-	-	-	-	2	2	2
	CO4	3	-	3	-	-	2	-	-	-	-	-	3	3	2
	CO5	3	-	1	-	2	-	-	-	-	-	-	3	3	3
	Avg	**2.6**	**1.5**	**2**	**1**	**1.5**	**2**	**2**	**-**	**-**	**-**	**-**	**2.6**	**2.8**	**2.2**
C416	CO1	3	3	1	2	-	2	3	-	-	-	-	3	3	2
	CO2	2	1	-	-	3	-	-	-	-	-	-	3	3	2
	CO3	-	2	2	3	-	2	2	-	3	1	-	3	2	3
	CO4	-		2	3	-	2	2	-	3	1	-	3	2	3
	Avg	**2.5**	**2**	**1.67**	**2.67**	**3**	**2**	**2.3**	**-**	**3**	**1**	**-**	**3**	**2.5**	**2.5**
C417	CO1	2	2	1	1	-	1	-	-	-	-	-	2	1	2
	CO2	2	2	3	1	2	-	-	-	-	-	-	2	1	2
	CO3	1	1	1	2	-	-	-	-	-	-	-	2	1	1
	CO4	1	1	2	1	-	2	-	-	-	-	-	3	1	2
	CO5	3	2	2	1	-	-	-	-	-	-	-	2	1	2
	Avg	**1.8**	**1.6**	**1.8**	**1.2**	**2**	**1.5**	**-**	**-**	**-**	**-**	**-**	**2.2**	**1**	**1.8**
C418	CO1	3	3	-	-	-	2	2	-	3	-	2	3	3	1
	CO2	3	3	-	-	-	2	2	3	3	3	-	3	2	3
	CO3	3	3	-	-	2	3	3	3	3	3	-	3	3	2
	CO4	-	-	-	-	-	-	-	-	3	3	3	-	-	-
	CO5	-	-	-	-	-	-	-	3	3	-	3	3	3	-
	Avg	**3.00**	**3.00**	**-**	**-**	**2.00**	**2.33**	**2.33**	**3.00**	**3.00**	**3.00**	**2.67**	**3.00**	**2.75**	**2.00**

Enter correlation levels 1, 2 or 3 as defined below:
1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)
It there is no correlation, put "-"

Assessment of Course Outcomes

Assessment Process

The assessment process used for the evaluation of Course Outcome is listed below:

Direct Assessment process

- Internal Tests
- Assignment
- Online Quiz
- Internal Laboratory Tests
- Semester-End examination (Theory/ Practical)
- Mini Project/ Project work- Part I & II

Indirect Assessment process

- Course end survey

Direct Assessment Process:

The assessment process of course outcomes mainly depends on the performance of students in the examination as scheduled by JNTUK from time to time. As per the University regulations

a.) There are 2 MID-term Internal tests (each MID-term Internal test consists of 25 marks and it comprises of descriptive tests (10M), Online quiz (10) and assignment (5M). 80% of the best and 20% of the other is considered under R19 regulation. The university conducts External Semester End Examination that carries a weightage of 75 marks.

The subjective examination is for 90 minutes duration conducted for 10 marks. Each subjective type test question paper shall contain 3 questions and all questions need to be answered. The Objective examination conducted for 10 marks(Conducted at College level with 20 Multiple choice question with a weightage of ½ Mark each). The objective examination is for 20 minutes duration. As the syllabus is framed for 5 units, the 1st mid examination (both Objective and Subjective) is conducted from first two and half units and second test on the rest of the syllabus of each subject in a semester. The Objective examination conducted for 10 marks and subjective examination conducted for 10 marks are to be added to the assignment marks of 5 for finalizing internal marks for 25.

For ensuring the quality of the question paper of subjective examination, each departments Department Advisory Committee (DAC) checks the levels of questions given from each unit for the midterms. The Objective examination paper is given by the JNTUK and to evaluate the assignment marks, the following are the rubrics followed by all the departments:

ASSIGNMENT RUBRICS

The end semester examination is conducted by JNTUK covering the topics of all Units for 75 marks. End Exam Paper contains five questions for 15 marks each. For each question there will be an "either" "or" choice, which means that there will be two questions from each unit and the student should answer either of the two questions.

DIMENSIONS	SCALES			
	4	3	2	1
Understanding the Topic (1M)	Complete Understanding of the topic.	Part of the topic is misunderstood.	Most of the topic is misunderstood.	Complete misunderstanding of the topic.
Organization / Logic / Relevance (3M)	The solution is well written statements are mutually supporting and followed from one another to address the question. Achieves the Learning Objective.	Some parts are not clear, statements are usually mutually supporting and follow from one another but does not address the question explicitly to achieve the Learning Objective.	Most of the parts are not clear, statements hang together but other parts are unclear to address the question. Achieves Learning Objectives minimally.	It is hard or impossible to understand since answers of the question are either too vague or filled with trivial details. Fails tohieve the Learning Objectives.
On Time Submission (1M)	Submission of Assignment on time.	Submission of Assignment almost on time.	Submission of Assignment with little delay.	Submission of Assignment is late.

b.) Practical Examination

For the subjects having practical examinations, the maximum marks are 50 and is distributed as follows:

Internal Evaluation

i. Day to Day Evaluation (5M)
ii. Record work (5M)
iii. Internal Lab examination (10M)

External Evaluation

iv. External Lab Examination carries a weightage of 30M

The following rubric is used to evaluate **Lab internal Evaluation marks**:

Internals	Dimensions	Scales			
		4	**3**	**2**	**1**
Day to Day Performance	**Attendance (1)**	Attended and completed on the same day	Attended and partially completed on the same day	Attended but completed in the extra lab	Not attended but completed in the extra lab
	Understanding of the Experiment (1)	Complete understanding of the experiment with learning objectives	Partial understanding of the experiment with learning objectives	Most of the experiment misunderstood	Complete misunderstanding of the experiment
	Implementation with result analysis (2)	Complete implementation with result analysis and interpretation	Complete implementation with result analysis only	Complete implementation with result analysis and interpretation in extra lab	Complete implementation with result analysis only in extra lab
	Observation submission on time (1)	Submission of the observation on time	Submission of the observation almost on time	Submission of the observation immediately after the extra lab	Submission of the observation after the extra lab
Record	**Comprehensiveness & Legible (3)**	Write all the elements of the experiments which can be easily readable	Write all the elements of the experiments with poor handwriting	Some elements are missing but presented clearly	Some elements are missing and poor handwriting
	Timely Submission (2)	Submission of the record on time	Submission of the record almost on time	Submission of the record immediately after the extra lab	Submission of the record after the extra lab
Internals	**Aim of the experiment (2)**	Complete understanding of the learning objectives and outcomes	Complete understanding of the learning objectives only	Partial understanding of the learning objectives	Misunderstanding of the learning objectives
	Write up (3)	Write all the elements of the experiments which can be easily readable	Write all the elements of the experiments with poor handwriting	Some elements are missing but presented clearly	Some elements are missing and poor handwriting
	Implementation & result analysis (3)	Complete implementation with result analysis and interpretation	Complete implementation with result analysis only	Partial implementation with result analysis only	Partial implementation only
	Viva- Voce (2)	Experiment and subject knowledge with good oral presentation	Experiment and subject knowledge with poor oral presentation	Partial experiment knowledge with poor oral presentation	Partial subject knowledge with poor oral presentation

The end examination shall be conducted by the teacher concerned and external examiner.

c.) For the subject having design and / or drawing, (such as Engineering Graphics, Engineering Drawing, Machine Drawing) and estimation, the distribution shall be 25 marks for internal evaluation (15 marks for day – to – day work, and 10 marks for internal tests) and 75 marks for end examination. There shall be two internal tests in a Semester and the Marks for 10 can be calculated with 80% weightage for best of the two tests and 20% weightage for other test and these are to be added to the marks obtained in day to day work.

d.) The Project work I carries a total of 50 marks and of which 20 marks are internal and the rest 30 marks are awarded by the External.

- The project internal mark of 20 is distributed as follows:

Out of 20 marks, 10 marks are given by the internal guide according to the following parameters:

1) Day-to-Day Work (5 Marks)
2) Report (5 Marks)

The remaining 10 marks are allotted by conducting two internal reviews:

5) Review-1 (10 Marks)
6) Review-2 (10 Marks)

- The Final External Review carries 30 Marks and is conducted by External Faculty nominated by JNTUK together with Internal Project Review Committee.

The following rubric is used to evaluate **Project Work I**:

Project Internals	**Dimensions**	**Scales**			
		4	**3**	**2**	**1**
Day to Day Performance by Guide	**Day to Day work (2M)**	Successfully completed the work in time with result analysis and interpretation with required learning objectives	Successfully completed the work in time with validation of results and required learning objectives	Successfully completed the work in time but validations are used at some places only	Successfully completed the work with changes as suggested with delay
	Team work & Time Management (3 M)	Contribution towards completion of the assigned work in the team for timely submission	Contribution towards completion of the assigned work in the team with a delay	Independently completed the assigned work in the team but accepted with modifications	Independently completed the assigned work but team usually rejects

	Report **(5M)**	The work is organised with clear diagrams and sketches using efficient strategy and/or procedures	The work is organised with clear diagrams and sketches using almost effective strategy and/or procedures	Sometime uses effective strategy but with inconsistent diagrams and sketches	The work appears unorganised, rarely uses effective strategies with inconsistent diagrams and sketches
Project Review I	**Selection of area** **(2 M)**	Excellent literature survey and high demand in societal need.	Understanding of the literature survey and high demand in societal need.	Minimum Understanding of the literature survey and high demand in societal need.	Lack of understanding of the literature survey and high demand in societal need.
	Defining the Problem **(3 M)**	Excellent identification of Gap, Timeframe, Impact, and high Importance of the problem	identification of Gap, Timeframe, Impact, and moderate Importance of the problem	identification of Gap, Timeframe, Impact, and moderate less Importance of the problem	Lack of identification of Gap, Timeframe, Impact, and moderate less Importance of the problem
	Presentation **(5 M)**	Able to answer with precision & completeness; confident and professional	Able to answer with precision & completeness ; almost confident and professional	Able to answer with precision but lack of confidence and professional behaviour	Missing conceptual information with lack of confidence and professional behaviour
Project Review II	**Submission of Abstract** **(5 M)**	Excellent understanding of the problem and interpretation with required project outcomes	Understanding of the problem and lack of interpretation with required project outcomes	Minimum Understanding of the problem with required project outcomes	Lack of understanding of the problem and project outcomes
	Presentation **(5 M)**	Able to answer with precision & completeness; confident and professional	Able to answer with precision & completeness ; almost confident and professional	Able to answer with precision but lack of confidence and professional behaviour	Missing conceptual information with lack of confidence and professional behaviour

e.) The Project work II carries a total of 150 marks and of which 60 marks are internal and the rest 90 marks are awarded by the External.

- The project internal mark of 60 is distributed as follows:

Out of 60 marks, 30 marks are given by the internal guide according to the following parameters:

1) Day-to-Day Work (15 Marks)

2) Report (15 Marks)

The remaining 30 marks are allotted by conducting two internal reviews:

5) Review-1 (10 Marks)
6) Review-2 (20 Marks)

- The Final External Review carries 90 Marks and is conducted by External Faculty nominated by JNTUK together with Internal Project Review Committee.

The following rubric is used to evaluate **Project Work II**:

Project Internals	**Dimensions**	**Scales**			
		4	**3**	**2**	**1**
Day to Day Performance by Guide	**Day to Day work (10M)**	Successfully completed the work in time with result analysis and interpretation with required learning objectives	Successfully completed the work in time with validation of results and required learning objectives	Successfully completed the work in time but validations are used at some places only	Successfully completed the work with changes as suggested with delay
	Involvement (10M)	Able to handle all work related questions with illustrative explanation	Answered most questions correctly and with less illustrative explanation	Answered most questions correctly but sometimes needed clarifications	Answered few questions
	Team work & Time Management (5M)	Contribution towards completion of the assigned work in the team for timely submission	Contribution towards completion of the assigned work in the team with a delay	Independently completed the assigned work in the team but accepted with modifications	Independently completed the assigned work but team usually rejects
	Regularity (5M)	Students having more than 85% in the project attendance	Students having 80%- 85% in the project attendance	Students having 75%-80% in the project attendance	Students having 65%- 75% in the project attendance
Project Review I & II	**Understanding of the problem and applicability (5M)**	Excellent understanding of the problem and interpretation with required project outcomes	Understanding of the problem and lack of interpretation with required project outcomes	Minimum Understanding of the problem with required project outcomes	Lack of understanding of the problem and project outcomes
	Presentation (5M)	Excellent preparation, Well delivered and organised	Good delivery and preparation, presents idea in an effective manner	Preparation, organisation and delivery satisfactory	Lack of delivery and organisation, minimum preparation

	Analysis, Design and Implementation with valid results (5M)	Able to analyze, Design and implement with valid results of the given problem statement	Able to analyze, Design and implement with results of the given problem statement	Able to analyze and Design the given problem statement	Able to analyze the given problem statement
	Viva (5M)	Able to answer with precision & completeness; confident and professional	Able to answer with precision & completeness ; almost confident and professional	Able to answer with precision but lack of confidence and professional behaviour	Missing conceptual information with lack of confidence and professional behaviour
	Regularity (5M)	Students having more than 85% in the project attendance	Students having 80%- 85% in the project attendance	Students having 75%-80% in the project attendance	Students having 65%- 75% in the project attendance
	Project Progress (5M)	Completed 41%-50% of the project, In consultation with guide and team members	Completed 31%-40% of the project, In consultation with guide and team members	Completed 26%-30% of the project, In consultation with guide and team members	Completed 21%-25% of the project, In consultation with guide and team members
	Documentation (5M)	The work is organised with clear diagrams and sketches using efficient strategy and/or procedures	The work is organised with clear diagrams and sketches using almost effective strategy and/or procedures	Sometime uses effective strategy but with inconsistent diagrams and sketches	The work appears unorganised, rarely uses effective strategies with inconsistent diagrams and sketches

The following rubric is used to evaluate **Best Project**:

Factors	**3**	**2**	**1**
Objective and Problem Definition (10 M)	Objective and problem definitions are well defined. Extensive explanation on the limitations of the existing system. Advanced or Innovative idea.	Objective and problem definitions are well defined. Extensive explanation on the limitations of the existing system.	Objective and problem definitions are well defined. Good/ moderate explanation on the existing system.

Implementation and Results **(30 M)**	Implemented and obtained valid results. Comparison of the results with results of existing system.	Implemented and obtained valid results. Extensive Analysis and description of the obtained results.	Implemented and obtained valid results. Good/Moderate Analysis and description of the obtained results.
Usage of Modern Tools **(25 M)**	Effective usage of modern Software/Hardware for implementation	Moderate usage of modern Software/Hardware for implementation	usage of conventional Software/Hardware for implementation
Technical Report Writing **(25 M)**	Thesis is well written and organized as per the given template with clear diagrams and equations using toolboxes	Thesis is well written and organized as per the given template with clear diagrams and equations	Thesis is well written and appears unorganized as per the given template with inconsistent diagrams and equations
Useful for society **(5 M)**	Prototype is developed and can be upgraded for real time usage in society and recognized by external agencies	Prototype is developed and can be upgraded for real time usage in society	Prototype is developed and need further improvement to meet real time usage in society
Scope for publication (5 M)	The results and discussions presented are better than the existing system with use of new methods.	The results and discussions presented can be extended to improve the results than the existing system.	Need more analysis on results and discussions to know the derived results are better than the existing systems.

f.) Engineering Exploration Project carries a total of 50 marks out of which 20 are internal marks and 30 external marks.
- Two internal evaluations in the form of presentations are conducted. For a total of 20 marks, 80% of best one of the two evaluation and 20% of the other evaluation are added and finalized.
- For external carries 30 marks and is conducted by External Faculty nominated by JNTUK together with Internal Review Committee.

g.) Mini Project with Hardware development carries 50 external marks. It is conducted by External Faculty nominated by JNTUK together with Internal Review Committee.

Indirect Assessment process:

Course end survey

- At the end of each semester, students feedback is obtained on each CO for each course.
- They are advised to follow the template carefully and mark their feedback whether all COs are met with designated cognitive level.

Assessment Tool

The list of assessment tool for the attainment of course outcomes with the detailed explanation is given below.

Assessment tools for the attainment of course outcomes

<table>
<tr><th>Sl. No.</th><th>Distribution</th><th>Frequency</th><th>Description</th></tr>
<tr><td>1</td><td>Internal Tests</td><td>Twice in a semester</td><td>
<table>
<tr><td colspan="4">Internal test 1</td></tr>
<tr><td>Q. No.</td><td>1</td><td>2</td><td>3</td></tr>
<tr><td>Marks</td><td>08</td><td>08</td><td>04</td></tr>
<tr><td colspan="4">Internal test 2</td></tr>
<tr><td>Q. No.</td><td>1</td><td>2</td><td>3</td></tr>
<tr><td>Marks</td><td>08</td><td>08</td><td>04</td></tr>
</table>
• DAC will ensure the quality of question and scheme of evaluation
• The internal descriptive marks are reduced to 10 marks</td></tr>
<tr><td>2</td><td>Assignment</td><td>Twice in a semester</td><td>Assignment 1 questions covering Unit 1-3 is given to students before the internal test1 to evaluate for 5 marks as per the rubric.
Assignment 2 questions covering Unit 3-5 is given to students before the internal test2 to evaluate for 5 marks as per the rubric.</td></tr>
<tr><td>3</td><td>Online quiz</td><td>Twice in a semester</td><td>Quiz 1 of 20 questions covering unit 1-3 is conducted for the students during the internal test1 by JNTUK to evaluate for 10 marks.
Quiz 2 of 20 questions covering unit 3-5 is conducted for the students during the internal test2 by JNTUK to evaluate for 10 marks.</td></tr>
<tr><td colspan="4">• The total marks secured by the student in each mid-term examination are evaluated for 25 marks
• The marks secured by the students from the above internal tests 1 & 2 (Descriptive + Objective + Assignment) are finally considered as 80% of the best and 20% of the other
• Final internal Marks = (Best of (Mid-1/Mid-2) marks x 0.8 + Least of (Mid-1/Mid-2) marks x 0.2)</td></tr>
<tr><td>4</td><td>Internal Laboratory Tests</td><td>Twice in a semester</td><td>• Experiment wise evaluation/ Weekly evaluation of Day-to-Day and Record work for each experiment is evaluated for the marks 5 and 5 respectively
• Two internal tests are conducted for 10 marks each covering all the list of experiments as per JNTUK syllabus
• The rubrics developed for evaluation of Day-to-Day, Record work and internal marks are used.</td></tr>
<tr><td>5</td><td>Semester-End Examinations (Theory / Practical)</td><td>Once in a semester</td><td>• The external theory exam is conducted by JNTUK for 75 marks covering all 5 units
• The external lab exam is scheduled by JNTUK for 30 marks covering all experiments.</td></tr>
<tr><td>6</td><td>Project work</td><td>Twice in a curriculum</td><td>• The Project work I carries a total of 50 marks and of which 20 marks are internal and the rest 30 marks are awarded by the External
• The Project work II carries a total of 150 marks and of which 60 marks are internal and the rest 90 marks are awarded by the External</td></tr>
</table>

<table>
<tr>
<td></td>
<td></td>
<td></td>
<td>

project work I evaluation

<table>
<tr><td colspan="3">Internal Guide Evaluation</td></tr>
<tr><td>Rubrics</td><td>Day-to-Day Work</td><td>Report</td></tr>
<tr><td>Marks</td><td>05</td><td>05</td></tr>
<tr><td colspan="3">Internal Review</td></tr>
<tr><td colspan="3">10</td></tr>
</table>

project work II evaluation

<table>
<tr><td colspan="3">Internal Guide Evaluation</td></tr>
<tr><td>Rubrics</td><td>Day-to-Day Work</td><td>Report</td></tr>
<tr><td>Marks</td><td>15</td><td>15</td></tr>
<tr><td colspan="3">Internal Review</td></tr>
<tr><td colspan="3">30</td></tr>
</table>

The rubrics developed for evaluation of Guide and Review is used
Final External Review is conducted by External Faculty nominated by JNTUK together with Internal Project Review Committee
The rubrics are also developed for choosing the best projects by considering the total marks

</td>
</tr>
<tr>
<td>7</td>
<td>Engineering drawing</td>
<td>Once in a curriculum</td>
<td>

Internal marks are evaluated for 25 marks
15 marks for continuous Assessment (day–to–day work)
Two internal exams are conducted for 10 marks
Final internal Marks = (Best of (Mid-1/Mid-2) marks x 0.8 + Least of (Mid-1/Mid-2) marks x 0.2)
External exam is conducted by JNTUK for 75 marks

</td>
</tr>
<tr>
<td>8</td>
<td>For Socially Relevant Project</td>
<td>Once in a curriculum</td>
<td>

Two internal evaluations are conducted for 20 marks
Final Marks = (Best of evaluation marks x 0.8 + Least of evaluation marks x 0.2)
External Review is conducted by External Faculty nominated by JNTUK together with Internal Project Review Committee for 30 marks

</td>
</tr>
<tr>
<td>9</td>
<td>Engineering Exploration Course</td>
<td>Once in a curriculum</td>
<td>

Two internal evaluations are conducted for 20 marks
Final Internal Marks = (Best of evaluation marks x 0.8 + Least of evaluation marks x 0.2)
External Review is conducted by External Faculty nominated by JNTUK together with Internal Project Review Committee for 30 marks

</td>
</tr>
<tr>
<td>10</td>
<td>Mini Project/Internship/Industrial Training/Skill Development programmes/Research Project guidelines</td>
<td>Once in a curriculum</td>
<td>

External Review is conducted by External Faculty nominated by JNTUK together with Internal Project Review Committee for 50 marks

</td>
</tr>
</table>

Direct Assessment of theory course:

CO Attainment process for Theory course for each student

Internal Test 1					
CO1	**CO2**	**CO3**	**Assignment-1**	**Quiz-1**	**Evaluation Formula**
A	**B**	**C**	**D**	**E**	**F**
08	08	04	5	10	Internal.CO1=(A+D+E)/23*100*0.25
					Internal.CO2=(B+D+E)/ 23*100*0.25
Internal Test 2					Internal.CO3=(Internal test 1 C+ Internal test 2 A +D+E)/ 23*100*0.25
CO3	**CO4**	**CO5**	**Assignment-2**	**Quiz-2**	
A	**B**	**C**	**D**	**E**	
04	08	08	5	10	Internal.CO4=(B+D+E)/ 23*100*0.25
					Internal.CO5=(C+D+E)/ 23*100*0.25

Final CO attainment for a student	
CO_i	CO_i= Internal.CO_i+Semester-end exam; where i=1 to 5

Direct Assessment of a laboratory course

CO Attainment process for Laboratory course for each student

Evaluation Formula for CO1				
Observation	**Record**	**Internal Test**	**Semester-end Exam Mark**	**Final CO Attainment**
A (Average of set of experiments mapped to CO1)	**B (Average of set of experiments mapped to CO1)**	**C**	**D**	**CO1=(A+B+C+D)/50*100**
05	**05**	**10**	**30**	

Similar process is used for the remaining COs.

Direct Assessment of Project work

The process of attainment of COs and POs/PSOs for the project work is described below.
Step1: There are five COs defined for the main project and to calculate the attainment of defined COs the specially designed project ARCO sheet is used.
Step 2: The project evaluation process follows the JNTUK guideline for finalizing the marks of each student.
Step 3: The final marks of each student in the main project is decided on two categories such as internal and external evaluation is considered for the evaluation of CO attainment.
Step 4: The internal evaluation is a kind of continuous assessment and is going through several reviews like Internal Review-I of 30 marks, Internal Review-II of 30 marks, and Guide evaluation of 30 marks.
Step 5: The final Internal 60 marks is decided by considering $1/3^{rd}$ of Internal Review-I + $2/3^{rd}$ of Internal Review-II+ Guide marks. The external 140 marks are decided by the external examiner assigned by JNTUK.
Step 6: The mapping of COs to the performance indicators decided in the rubric is given in Table below.

Mapping of COs with performance indicators

Performance indicators	Assigned marks	Mapping of COs
Understanding of the problem and applicability (PI1)	(5M)	CO1,CO2,CO3
Presentation (PI2)	(5M)	CO5
Analysis, Design and Implementation with valid Results (PI3)	(5M)	CO2,CO3,CO4
VIVA(PI4)	(5M)	CO1,CO2,CO3,CO4,CO5
Regularity(PI5)	(5M)	CO5
Project Progress / Documentation (PI6)	(5M)	CO5

Note: The weighted values of performance indicators (PI1-PI6) are 4/3/2/1

Step 7:

Direct Assessment of Project work I

Overall marks for the attainment of COs

- $M.CO_i$= ((IR-1.CO_i + IR-2.CO_i)/2+ Guide marks+ External marks); where i=1 to 5

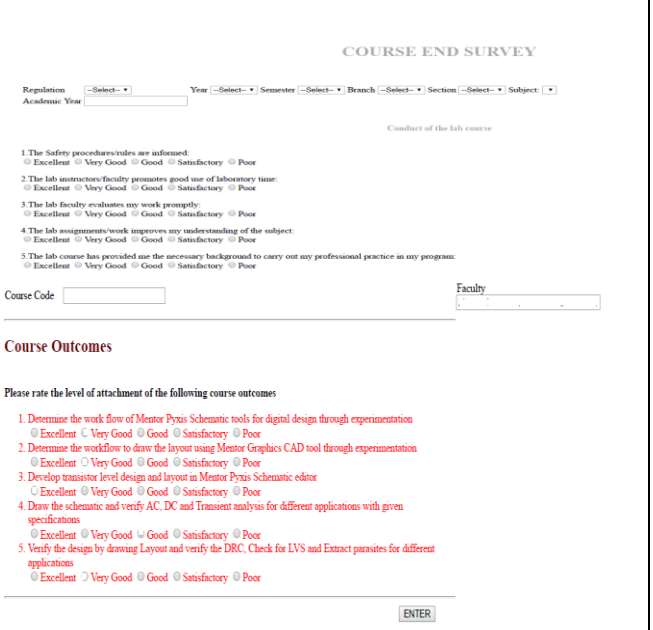
Direct Assessment of Project work II

The internal and external marks secured by a student are used to evaluate the overall attainment of COs.
Marks for the attainment of COs based on Internal Review-I
IR-1.CO1= ((PI1*5/4) + (PI4*5/4))/10*30
IR-1.CO2= ((PI1*5/4) + (PI3*5/4) + (PI4*5/4))/15*30
IR-1.CO3= ((PI1*5/4) + (PI3*5/4) + (PI4*5/4))/15*30
IR-1.CO4= ((PI3*5/4) + (PI4*5/4))/10*30
IR-1.CO5= ((PI2*5/4)+(PI4*5/4)+(PI5*5/4)+(PI6*5/4))/20*30
Marks for the attainment of COs based on Internal Review-II
IR-2.CO1= ((PI1*5/4)+(PI4*5/4))/10*30
IR-2.CO2= ((PI1*5/4)+(PI3*5/4)+(PI4*5/4))/15*30
IR-2.CO3= ((PI1*5/4)+(PI3*5/4)+(PI4*5/4))/15*30
IR-2.CO4= ((PI3*5/4)+(PI4*5/4))/10*30
IR-2.CO5= ((PI2*5/4)+(PI4*5/4)+(PI5*5/4)+(PI6*5/4))/20*30
Overall marks for the attainment of COs

- $M.CO_i$= ($1/3^{rd}$ of IR-1.CO_i + $2/3^{rd}$ of IR-2.CO_i + Guide marks+ External marks)/2; where i=1 to 5

Step 8: The final attainment of all COs is evaluated after recording all CO attainments of all students.

Indirect Assessment of a Theory/ Laboratory course
Template for course end survey

Course end survey of a Theory course	*Course end survey of a laboratory course*
	

Overall CO Attainment of a Theory/ laboratory course

A weigthage of 80 % is considered for direct assessment and 20% is considered for indirect assessment as per the guidelines given by DAC.

Attainment levels for all courses

The targets are set in terms of percentage of students getting more than the University average marks. The set target level is pass i.e 45% for every theory course where for a lab/ Seminar/ Project work, the set target level is 50%.

Measuring course outcomes attained through the combination of assessment tools for each student. The attainment levels for measuring COs for a course are defined as follows:

- If 60% or more of the students attain the set target, the attainment level is 1
- If 70% or more of the students attain the set target, the attainment level is 2
- If 80% or more of the students attain the set target, the attainment level is 3

Assessment of POs/PSOs

Assessment Process

The assessment process used for the evaluation of POs/PSOs is listed below:

Direct Assessment Methods

- Theory Subject CO attainment values
- Laboratory Subject CO attainment values
- Project work
- Seminar

Indirect Assessment Methods

- Student Exit Survey
- Employer Survey
- Alumni Survey
- Parent Survey

Assessment Tools and Processes

Sl. No.	Assessment Tool	Weightage %	Frequency	Stakeholder	Responsible	Description
Direct Assessment Methods						
1	Theory Subject CO attainment	80	End of each semester	Student	Course Coordinator/ Faculty member	CO attainment is calculated for every subject is considered as mentioned in 3.2
2	Laboratory Subject CO attainment		End of each semester	Student	Course Coordinator/ Faculty member	CO attainment is calculated for every laboratory is considered as mentioned in 3.2
3	Project work		IV-II	Student	PRC	CO attainment is calculated for the main project is considered as mentioned in 3.2
4	Seminar		III-II	Student	Faculty Coordinator/ Class Teacher	CO attainment is calculated for the seminar is considered as mentioned in 3.2
Indirect Assessment Methods						
1	Student Exit Survey	10	Annually for the out - going batch	Student	Program Coordinator	At the end of every academic year the present out-going batch is asked for feedback about all the four years of stay in the campus related to academic and other administrative issues
2	Employer Survey	5	Every two years	Employer	Program Coordinator	Whenever any industry person/ Employers during visits to our college we request them to fill the survey form related to the progress of knowledge, skill and attitude of our students.
3	Alumni	5	Every two	Alumni (3	Program	Whenever any Alumni visits to our

	Survey		years	years after the graduation)	Coordinator	campus or in Alumni meets, we ask to our distinguished alumni to fill the survey form related to their progress of knowledge, skill and attitude
4	Parent Survey	5	Annually	Parent	Program Coordinator	We are collecting filled forms from parents, whenever any parent visits to our campus or when required we are asking to our students to collect from the parent

Note: For PO8 and PO10, the percentage contribution of indirect assessment for Employer, Alumni and Parent Survey are 3, 3 and 4 respectively.

Direct Assessment Method

For assessing the attainment of POs/PSOs, the overall CO attainment levels of each course is recorded from ARCO sheets and the average of the attainment level for the course is calculated.

Overall CO attainment level of a course

JNTUK Course Code	NBA Course Code	Course Name	Course Outcomes	Course Outcomes Attainment in %	Course Outcomes Attainment in %	Course Outcomes Attainment in %	Attainment level
				ECE-1	ECE-2	Overall	
			CO-1				
			CO-2				
			CO-3				
			CO-4				
			CO-5				
			CO-6				
Average attainment level (X)=						$\sum_{1}^{6} CO_i /6$	

CO-POs/PSOs matrix defined for the course

Course Outcome	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO1														
CO2														
CO3														
CO4														
CO5														
CO6														
CO-PO/PSO avg (Y)														

The contribution of CO attainment values towards all POs and PSOs attainment are derived below

PO# = (X* Y)/3

where X is the average attainment level of a course and Y is the CO-POs/PSOs average value corresponding to the considered course for the particular POs/PSOs.

Indirect Assessment Methods

Feedback templates used for the attainment of POs and PSOs are shown below.

Sample Student Exit Survey

Exit Survey:

Name:

Email:

Branch:

Start

EXIT SURVEY

1. Indicate how well do you agree with Mission and Vision of the Department you Graduated from.

Strongly Agree Agree Partially Agree Disagree

2. Please Rate your opinion on the following aspects of Teaching - Learning process during four years of B.Tech program.

a. Program Outcomes (POs)

Qno	Question	Strongly Satisfied	Satisfied	Partially Satisfied	Dissatisfied
Q1	Apply Knowledge of mathematics, science and engineering fundamentals in the field of Electronics & Communication and its allied areas.				
Q2	Identify, formulate and analyze complex electronics and communication engineering problems using the principles of mathematics and engineering sciences to reach substantiated conclusions.				
Q3	Design system components or processes for the solutions of complex electronics and communication engineering problem to meet the needs of public health, safety, societal and environmental issues.				
Q4	Conduct experiments by using domain knowledge for analysis, interpretation and synthesis of the electronics and communication engineering problems to provide valid conclusions.				
Q5	Use appropriate techniques, resources and modern engineering & IT tools to model and simulate complex electronics and communication engineering problems.				
Q6	Apply contextual knowledge to assess societal, health, safety, legal & cultural issues and its consequent responsibilities relevant to electronics and communication engineering practices.				
Q7	Apply professional engineering solutions in societal and environmental issues for the sustainable development.				
Q8	Apply the principles of professional ethics and responsibilities to social issues.				
Q9	Function effectively as an individual and as a leader in diverse and multidisciplinary teams.				
Q10	Communicate proficiently through presentations and connect a range of audience with an effective oral and written communication.				
Q11	Apply the knowledge of engineering and management principles to manage projects in multidisciplinary environment.				
Q12	Develop and recognize the need for an ability to engage in life- long learning for the changing technological environment.				

Sample Parent form

GayatriVidyaParishad College of Engineering for Women
Madhurawada, Visakhapatnam
(Affiliated to JNTUK, Approved by AICTE, New Delhi)

FEEDBACK FROM PARENTS

We request you to assist us by answering a few questions/ suggestions listed below in connection with our services to your daughter / ward studying in our Institute. Your feedback would be invaluable to us in improving our teaching processes to serve the needs of our students better.

Name of the student: _____
Class: _____
JNTU Roll No. _____

Please tick the appropriate ratings:
4.Strongly Satisfied 3. Satisfied 2. PartiallySatisfied 1. Dissatisfied

		4	3	2	1
1	Learning experience provided to the students by college				
2	Knowledge gained by the student based on the academic ambience in the college				
3	Internal evaluation process in the college is fair and accurate.				
4	Improvement of your ward in written and oral communication skills				
5	Encouragement to students for participating in various co-curricular and extra-curricular activities				
6	Efforts taken for improving employability skills through training and placement activities.				
7	Books prescribed as per curriculum, relevant reference materials sufficiently available in the Library				
8	Infrastructural facilities like classrooms, laboratories, seminar halls, canteen and other facilities				
9	Transformation of the student into a good and responsible citizen with regard to societal and environmental issues.				
10	How strongly would you consider this Institute for admitting another student, if you have to				

For office use only:
Overall average:

Any other information for the improvement of the institute:_____

Name:
Date:

Signature of Parent / Guardian

Sample Employer form

Gayatri Vidya Parishad College of Engineering for Women
Madhurawada, Visakhapatnam
(Affiliated to JNTUK, Approved by AICTE, New Delhi)

EMPLOYER SURVEY

Your assessment of the following statements will help the programs at GVP College of Engineering for Women assess its Program Educational Objectives. The Department appreciates your response. Please rate your level of agreement with the following items.

Company or Organization: _____
What is your primary job function: _____
Position: _____
Total number of graduates that you currently supervise: _____

Based upon your professional experience and opportunities to observe graduates from the GVPCEW and from other institutions, what is your impression about the overall quality of the graduates?

Please "tick" the appropriate ratings:
4. Strongly Agree 3. Agree 2. Partially Agree 1. Disagree

Sl. No	Skills and Knowledge	4	3	2	1
1	Knowledge of mathematics, science and engineering fundamentals	□	□	□	□
2	Identify, formulate and analyze complex engineering problems using the principles of mathematics, science and engineering fundamentals	□	□	□	□
3	Design system components or processes for the solutions of complex engineering problem to meet the needs of public health, safety, societal and environmental issues.	□	□	□	□
4	Conduct experiments by using domain knowledge for analysis, interpretation and synthesis of engineering problems to provide valid conclusions.	□	□	□	□
5	Use appropriate techniques, resources and modern engineering & IT tools to model and simulate complex engineering problems.	□	□	□	□
6	Apply contextual knowledge to assess societal, health, safety, legal & cultural issues and its consequent responsibilities relevant to engineering practices.	□	□	□	□
7	Apply professional engineering solutions in societal and environmental issues for the sustainable development.	□	□	□	□
8	Apply the principles of professional ethics and responsibilities to social issues.	□	□	□	□
9	Function effectively as an individual and as a leader in diverse and multidisciplinary teams.	□	□	□	□
10	Communicate proficiently through presentations and connect a range of audience with an effective oral and written communication.	□	□	□	□
11	Apply the knowledge of engineering and management principles to manage projects in multidisciplinary environment.	□	□	□	□
12	Develop and recognize the need for an ability to engage in life- long learning for the changing technological environment.	□	□	□	□

What do you think are the strengths of the programs at GVPCEW?

What do you think are the weaknesses of the programs at GVPCEW? Any suggestions on how to improve?

Any other comments or suggestions?

Thank you for taking time to respond to this survey that is aimed at improving our teaching –learning process.

Authorized Signatory

Sample Alumni form

Gayatri Vidya Parishad College of Engineering for Women
Madhurawada, Visakhapatnam
(Affiliated to JNTUK, Approved by AICTE, New Delhi)

ALUMNI SURVEY

The information that you provide in this survey will help Gayatri Vidya Parishad College of Engineering for Women to improve the quality of teaching and learning.

Alumni Name	
Date of Birth (DD/MM/YY)	
Branch and Year of Passing	
Permanent Address :	Email: Contact No.: Working at: Designation
Details of Higher qualification after graduating from college	
Certified courses learned after graduation	
Years of work experience	□ 1-2 □ 3-4 □ 5-6 □ >7

Please grade the following attributes in the context of "how important are they to your employment":

Please "tick" the appropriate ratings:
4. Strongly Agree 3. Agree 2. Partially Agree 1. Disagree

Sl. No	Attributes	4	3	2	1
1	Ability to apply knowledge of mathematics, science, and fundamental engineering				
2	Ability to identify, formulate, and solve engineering problems, as well as to analyze and interpret data				
3	Ability to design and develop the solutions using innovative methodologies, interpreting and analyzing data to solve complex engineering problems to meet societal issues				
4	Ability to perform investigations, design and conduct experiments, analyze and interpret the results to provide valid conclusions.				
5	Ability to develop and apply appropriate techniques and IT tools for the design & analysis of the systems.				
6	Ability to assess societal, health, legal and cultural issues using professional engineering practice.				
7	Ability to demonstrate professional skills and contextual reasoning for sustainable development.				
8	Understanding the knowledge of professional and ethical practices				
9	Ability to demonstrate leadership roles				
10	Ability to comprehend and convey technical information				
11	Ability to demonstrate and apply engineering & management principles in multidisciplinary environment				
12	Ability to engage in independent and lifelong learning				
13.	Acquire knowledge required for designing electronics and communication systems.				
14.	Design, simulate and implement essential modules in the areas of Electronic circuits, VLSI, Embedded systems, Communication and Signal processing.				

Any suggestions for the improvement of the institute:_____

Date:

Signature

Results of evaluation of POs and PSOs

A weigthage of 80 % is considered from direct assessment and 20% is considered from indirect assessment to evaluate the final attainment of POs/PSOs.

% of Contribution of Indirect assessment towards attainment of POs and PSOs

Indirect Attainment in *% of contribution*	Program Outcomes (POs) and Program Specific Outcomes (PSOs)													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO01	PSO 02
student exit survey	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Employer Survey	5	5	5	5	5	5	5	3	5	3	5	5	5	5
Alumni Survey	5	5	5	5	5	5	5	3	5	3	5	5	5	5
Parent Survey								4		4				
% of contribution	20	20	20	20	20	20	20	20	20	20	20	20	20	20

The attainment process of COs of all courses and POs/PSOs will be evaluated by following the assessment process described above. The attainment values for the mentioned parameters will be evaluated and recorded in Part II of NBA Handbook for R19 regulation.