An Autonomous Institute

Shree Warana Vibhag Shikshan Mandal's

Tatyasaheb Kore Institute of Engineering And Technology, Warananagar

NBA Accredited Institute

Department of Electronics & Telecommunication Engineering

Syllabus for S.Y.B.Tech.

B. Tech. In Electronics &Telecommunication Engineering

Syllabus Structure and Curriculum under Autonomy

Tatyasaheb Kore Institute of Engineering and Technology, Warananagar

An Autonomous Institute

Department of Electronics & Telecommunication Engineering

❖ Vision

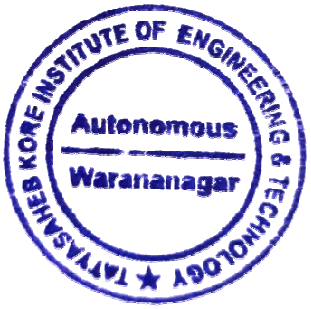
To become an academy of excellence in technical education and human resource development.

❖ Mission

- To develop engineering graduates of high repute with professional ethics.
- To excel in academics and research through innovative techniques.
- To facilitate the employability, entrepreneurship along with social responsibility.
- To collaborate with industries and institutes of national recognition.
- To inculcate lifelong learning and respect for the environment.

❖ Quality Policy

To promote excellence in academic and training activities by inspiring students for becoming competent professionals to cater industrial and social needs.



PROGRAM EDUCATIONAL OBJECTIVES

Graduates will be able:

[1] To excel in technical education and research in Electronics and Telecommunication engineering.

[2] To make the graduate competent with recent technological development in related field.

[3] To enable the graduates to innovate, design and develop new Electronics and Telecommunication systems.

[4] To provide excellent academic environment for life - long learning.

[5] To embed the Professional and ethical approach, effective communication and team work.

PROGRAM OUTCOMES:

PO1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

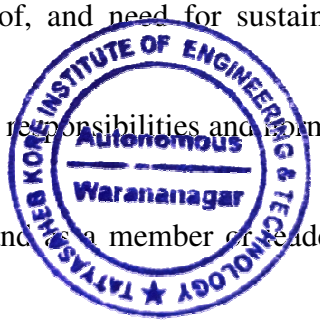
PO5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multi-disciplinary settings.



PO10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multi-disciplinary environments.

PO12. **Life-long learning**: 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.

PROGRAM SPECIFIC OUTCOMES:

After successful Electronics and Telecommunication engineering graduates will be able to:

PSO 1 (Engineering Knowledge and Analysis):
Analyze specific engineering problems relevant to Electronics & Telecommunication Engineering by applying the knowledge of basic sciences, engineering mathematics and fundamentals.

PSO 2 (System Design):
Design Electronics and Telecommunication systems containing devices, software, and hardware using the significant analytical knowledge and modern tools.

PSO 3 (Application of the knowledge on society/environment):
Apply the contextual knowledge of Electronics and Telecommunication Engineering to assess societal, environmental, health, safety, legal and cultural issues with professional ethics and function effectively as an individual or a leader in a team to manage different projects as the process of life-long learning.

SWVSM'S

Tatyasaheb Kore Institute of Engineering and Technology, Warananagar

An Autonomous Institute

Abbreviations

Sr. No.	Acronym	Definition
1	ISE	In-Semester Examination
2	ISE-I	In-Semester Examination-I
3	ISE-II	In-Semester Examination-II
4	ESE	End Semester Examination
5	ISA	In-Semester Assessment (Term Work)
6	L	Lecture
7	T	Tutorial
8	P	Practical
9	CH	Contact Hours
10	C	Credit

Course/ Subject Categories

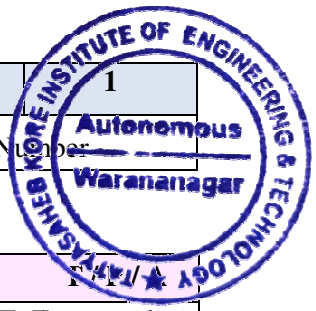
Sr. No.	Acronym	Definition
1	BSC	Basic Science Course
2	HSC	Humanity Science Course
3	ESC	Engineering Science Course
4	PCC	Professional Core Course
5	OEC	Open Elective Course
6	MC	Mandatory Course
7	PEC	Professional Elective Course
8	PW	Project Work (Mini and Major Project)
9	II	Industrial Internship

Course/ Subject Code

M	E	3	0	1
Branch Code		Semester	Course Number	

Course Term work and POE Code

M	E	3	0	1	T / P / A
Branch Code		Semester	Course Number		T- Term work P- POE A- Audit Course



Second Year B. Tech.

In Electronics & Telecommunication Engineering

Syllabus Structure under Autonomous Status of TKIET, Warananagar

2021-22

Tatyasaheb Kore Institute of Engineering and Technology, Warananagar

Second Year B. Tech. (Electronics & Telecommunication Engg.)

Semester-III

(To be implemented from 2021 - 22)

Credit Scheme

Course Code	Category	Course Title	Teaching and Credit Scheme					Examination & Evaluation Scheme			
			L	P	T	CH	C	Components	Marks	Min for Passing	
ETC301	BSC	Engineering Mathematics-III	3	--	--	3	3	ESE	60	24	40
								ISE	40	16	
ETC302	ESC	Electronic Devices & Circuits -I	4	--	--	4	3	ESE	60	24	40
								ISE	40	16	
ETC303	ESC	Digital Electronics & Microprocessor	3	--	--	3	3	ESE	60	24	40
								ISE	40	16	
ETC304	ESC	Electrical Circuits	3	--	--	3	3	ESE	60	24	40
								ISE	40	16	
ETC305	ESC	Transducers & Measurements	3	--	--	3	3	ESE	60	24	40
								ISE	40	16	
ETC306	ESC	Programming Lab – I (C++ & JAVA)	2	--	--	2	1	ESE	NA	NA	NA
								ISE	NA	NA	
ETC301T	BSC	Engineering Mathematics-III (Tutorial)	--	--	1	1	1	ISA	25	10	10
ETC302P	ESC	Electronic Devices & Circuits -I Lab	--	2	--	2	1	ISA	25	10	10
								POE	50	20	20
ETC303P	ESC	Digital Electronics & Microprocessor Lab	--	2	--	2	1	ISA	25	10	10
								POE	50	20	20
ETC304T	ESC	Electrical Circuits (Tutorial)	--	--	1	1	--	ISA	25	10	10
ETC305P	ESC	Transducers & Measurements Lab	--	2	--	2	1	ISA	25	10	10
ETC306P	ESC	Programming Lab – I (C++ & JAVA) Lab	--	2	--	2	1	ISA	25	10	10
								POE	50	20	20
ETC307A	--	**Audit Course - III**	2	--	--	2	--	--	--	-	-
			20	8	2	30	21	--	800	--	--

Note: In theory examination, there will be separate passing of ESE and ISE.

Tatyasaheb Kore Institute of Engineering and Technology, Warananagar

Second Year B. Tech. (Electronics & Telecommunication Engg.)

Semester-IV

(To be implemented from 2021 - 22)

Credit Scheme

Course Code	Category	Course Title	Teaching and Credit Scheme					Examination & Evaluation Scheme			
			L	P	T	CH	C	Components	Marks	Min for Passing	
ETC401	ESC	Electronic Devices & Circuits -II	4	--	--	4	3	ESE	60	24	40
								ISE	40	16	
ETC402	ESC	Communication Engineering	3	--	--	3	3	ESE	60	24	40
								ISE	40	16	
ETC403	ESC	Linear Integrated Circuits	3	--	--	3	3	ESE	60	24	40
								ISE	40	16	
ETC404	ESC	Control System Engineering	3	--	--	3	3	ESE	60	24	40
								ISE	40	16	
ETC405	ESC	Data Structure & Algorithms	3	--	--	3	3	ESE	60	24	40
								ISE	40	16	
ETC406	ESC	Programming Lab-II (Python)	2	--	--	2	1	ESE	NA	NA	NA
								ISE	NA	NA	
ETC401P	ESC	Electronic Devices & Circuits –II Lab	--	2	--	2	1	ISA	25	10	10
								POE	50	20	20
ETC402P	ESC	Communication Engineering Lab	--	2	--	2	1	ISA	25	10	10
ETC403P	ESC	Linear Integrated Circuits Lab	--	2	--	2	1	ISA	25	10	10
								POE	50	20	20
ETC404T	ESC	Control System Engineering (Tutorial)	--	--	1	1	--	ISA	25	10	10
ETC405T	ESC	Data Structure & Algorithms (Tutorial)	--	--	1	1	--	ISA	25	10	10
ETC406P	ESC	Programming Lab-II (Python) Lab	--	2	--	2	1	ISA	25	10	10
								POE	50	20	20
ETC407A	--	**Audit Course – IV**	2	--	--	2	--	--	--	-	-
			20	**08**	**02**	**30**	**20**	**--**	**800**	--	--

Note: In theory examination, there will be separate passing of ESE and ISE.

Second Year B. Tech.

(Electronics & Telecommunication Engg.)

First Semester Detailed Syllabus

ETC301- ENGINEERING MATHEMATICS - III

Lectures	**:**	3 Hrs/Week	**Evaluation Scheme**
Credit	**:**	3	**ISE : 40 Marks**
			ESE : 60 Marks

Course Objectives: The course aims to :	
1	To develop mathematical skills and enhance thinking power of students
2	To give the knowledge to the students of Linear Differential Equations, ,Laplace transforms ,Fourier series, probability, Vector Differential Calculus with an emphasis on the application of solving Engineering Problem.
3	To prepare students to formulate a mathematical model using engineering skills & interpret the solution in real world.

Course Outcomes:

COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Use of Linear Differential Equations to solve the Electrical Engineering problems.	Understanding, Application
CO2	Find Laplace transforms of given functions	Understanding
CO3	Use Laplace and Inverse Laplace to solve linear differential equations	Understanding, Application
CO4	Develop Fourier series expansion of a function over the given interval.	Understanding
CO5	Solve basic problems in probability theory, including problems involving the binomial, Poisson, and normal distributions.	Applying
CO6	Apply knowledge of vector differentiation to find directional derivatives, curl and divergence of vector field.	Understanding

Description:

Engineering Mathematics course is offered as the basic science course. This course contains Mathematical methods and techniques that are typically used in engineering to solve complex engineering problems. This course has six units namely i) Linear Differential Equations(LDE) and its Applications ii) Laplace Transformand iii) Inverse Laplace Transform and its Applications iv) Fourier Series v) Probability Distribution vi) Vector Differential Calculus

Prerequisites:	1	Trigonometric identities and Logarithmic identities
	2	Differentiation and integration formulae
	3	Basic knowledge of probability.

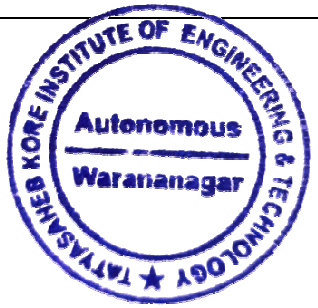
Course Contents		
Unit No:1	**Linear Differential Equations (LDE) and its Applications:** 1 Linear Differential equations with constant coefficients. 2 Rules to find complementary function. 3 Methods to find particular Integral ($e^{ax}, sinax\ or\ cosax, x^m, e^{ax}x^m,$) 4 Applications of linear differential equations with constant coefficients to Electrical Engineering.	**7 Hrs.**
Unit No:2	**Laplace Transform -I** 1 Laplace transform of elementary functions 2 Properties of Laplace transforms 2.1 Linearity Property 2.2 First Shifting property 2.3 Change of scale property 3 Laplace transforms of derivatives and integral. 4 Multiplication by t^n and division by t 5 Evaluation of integrals by Laplace transform.	**7 Hrs.**
Unit No:3	**Inverse Laplace Transform and its Applications:** 1 Definition and important formulae 2 First shifting property 3 Inverse Laplace transform by method of partial fraction 4 Convolution theorem (without proof) 5 Inverse Laplace transform of derivatives 6 Solution of Linear differential equation with constant coefficients using Laplace transform	**7 Hrs.**
Unit No:4	**Fourier Series:** 1 Definition, Euler's formulae, Dirichlet's conditions. 2 Fourier Series of periodic function with period 2π 3 Change of interval. 4 Expansions of odd and even functions. 5 Half range series.	**7 Hrs.**
Unit No:5	**Probability Distribution**: 1 Basic definitions , Conditional probability 2 Random variables. 3 Discrete Probability distribution. 4 Continuous probability distribution. 5 Binomial Distribution. 6 Poisson Distribution. 7 Normal Distribution.	**7 Hrs.**
Unit No:6	**Vector Differential Calculus:** 1 Differentiation of vectors. 2 Gradient of scalar point function. 3 Directional derivatives. 4 Divergence of vector point function. 5 Curl of a vector point function. 6 Irrotational, Solenoidal and Scalar potential function of a vector field	**7 Hrs.**

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	2											1			
CO2	2											1			
CO3	2											1			
CO4	2											1			
CO5	2											1			
CO6	2											1			

Text Books:	
1	Higher Engineering Mathematics, by B. S. Grewal (Khanna Publication Delhi.)

Reference Books:	
1	Advance Engineering Mathematics by Erwin Kreyszig (Wiley India.)
2	Advanced Engineering Mathematics, by H. K. Das (S. Chand Publication.)
3	A text book of Applied Mathematics: Vol. I, II and III by J. N. Wartikar & P. N. Wartikar, Vidyarthi Griha Prakashan, Pune.



ETC302- ELECTRONIC DEVICES & CIRCUITS -I

Lecture : 4 Hrs/Week
Credit : 3

Evaluation Schemes
ISE : 40 Marks
ESE : 60 Marks

Course Objectives: The course aims to :	
1	Provide an introduction and basic understanding of Semiconductor Devices viz. diodes and BJT, JFET.
2	Provide basic analog electronic circuit design techniques using diodes and bipolar junction transistors and to develop analytical skills.
3	Develop student ability to apply basic engineering sciences to understand the Operation & analysis of electronic circuits using diodes and bipolar junction transistors.

Course Outcomes:

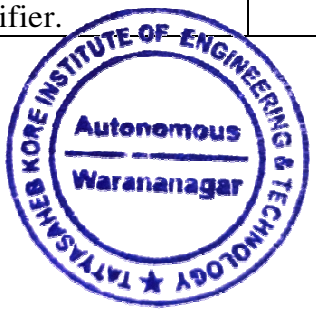
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Describe and design electronic circuits such as rectifiers & unregulated power supply.	Knowledge, Application
CO2	Solve the problems of electronic circuit design such as regulated power supply.	Analysis
CO3	Analyze & Design LPF, HPF, Clipper, Clampers, Multipliers	Knowledge
CO4	Explain operation of BJT & FET Biasing circuit.	Application
CO5	Summarize the hybrid model of transistor and analyze the transistor amplifier (CE, CB, and CC) using h-parameters.	Knowledge
CO6	Analysis of CE Amplifier for low frequency & High frequency response for sinusoidal & square wave input.	Application

Description:

Electronics Device and Circuit-I course is a core electronics course. This course describes the concept of electronics circuit design. It gives the concept of different electronics circuit for their detail operation and working principle. Also, it describes the specifications of devices and its use for different applications.

Prerequisites:	1	Semiconductor Physics
	2	Basic Electronics
	3	Electronics Measurement

Course Contents		
Unit No:1	**Unregulated Power Supplies:** Rectifiers: Half wave, full wave: center tap and bridge type, analysis for different parameters: PIV, TUF, efficiency, ripple factor, regulation, form factor etc. Filters: Need of filters, Types: capacitor, inductor, LC, CLC, and Analysis for ripple factor. Design of unregulated power supply with filter using full wave rectifier.	**8 Hrs.**
Unit No:2	**Voltage Regulators :** Need of voltage regulator, Stabilization factors, Analysis & Design of Shunt regulator (using Zener diode & BJT),emitter follower regulator, series pass voltage regulator (using BJT), Pre- regulator & Overload protection circuit.	**8 Hrs.**
Unit No:3	**Wave Shaping Circuits:** Low pass & high pass RC circuits (analysis for square, step, ramp, exponential input), High pass RC circuit as a differentiator, Low pass RC circuit as integrator. Clipping circuits: diode clippers, transistor clippers, Transfer characteristics, Clamping circuits: Classification, clamping operations, Clamping circuit theorem, practical clamping circuits, and voltage multipliers.	**8 Hrs.**
Unit No:4	**BJT & FET Biasing** Introduction to BJT, Need of Biasing, Generalized stability factor derivation, Biasing of CE configuration-Fixed Bias, Collector to Base Bias & Voltage Divider Bias (Analysis & Design of the same with & without Re). Introduction to JFET, Biasing of CS configuration- Fixed Bias, Self Bias (Analysis & Design of the same).MOSFET-EMOSFET & DMOSFET (Working & Characteristics)	**8 Hrs.**
Unit No:5	**Voltage Amplifiers:** H-Parameters, Hybrid model for transistor (CE, CB& CC configuration), amplifier equations for Voltage Gain, Current gain, Input resistance & Output resistance taking Rg of source into account.(Numerical are expected)	**8 Hrs.**
Unit No:6	**Frequency Response of Single Stage RC Coupled Amplifier:** Low frequency response: Effect of emitter bypass capacitor(CE) & Coupling capacitor(CC), Amplifier response to square wave, percentage Sag calculation, (Numerical are expected) High frequency response: Hybrid π model , Derivation for CE short circuit & resistive current gain cut off cutoff frequency, amplifier high freq. response to square wave, gain bandwidth product, (Numerical are expected). Design of single stage RC coupled amplifier.	**8 Hrs.**



Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	3			1				3			3				
CO2			2												
CO3		2							2						
CO4					3					3					
CO5	2		2				1								
CO6												2			

Text Books:	
1	Allen Mottershed, " Electronic devices & circuits", Prentice- Hall India
2	J. Millman & C. Halkias, " Electronic devices & circuits",Tata McGraw Hill Publication
3	Dr. R. S. Sedha, " A Text Book of Applied Electronics". S Chand and Company

Reference Books:	
1	David A. Bell, "Electronic devices & circuits", Oxford University
2	Salivahanan,N Suresh kumar,"Electronic devices & circuits",Tata McGraw Hill Publication
3	Robert L. Boylsted, Louis Nashelsky," Electronic devices & circuit theory", Pearson Education

ETC303- DIGITAL ELECTRONICS AND MICROPROCESSOR

Lectures : 3 Hrs/Week
Credit : 3

Evaluation Scheme
ISE : 40 Marks
ESE : 60 Marks

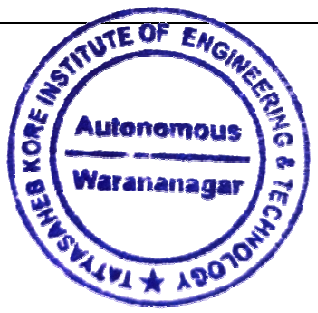
Course Objectives:	
The course aims to make the student understand :	
1	The fundamental principles of two-valued logic and various devices used to implement logical operations on variables.
2	Boolean algebra, Karnaugh maps and its application to the design and characterization of digital circuits.
3	To analyze logic processes and implement logical operations using combinational logic circuits.
4	The principles of logic design and use of simple memory devices, flip-flops, and sequential circuits.

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Use the basic logic gates and various reduction techniques of digital logic circuit.	Remembering
CO2	Analyze, design and implement combinational logic circuits.	Apply
CO3	Analyze, design and implement sequential circuits.	Apply
CO4	Explain microprocessor architecture and its instruction set	Understand
CO5	Explain interfacing of devices to microprocessor	Understand
CO6	Design Microprocessor based Systems	Create

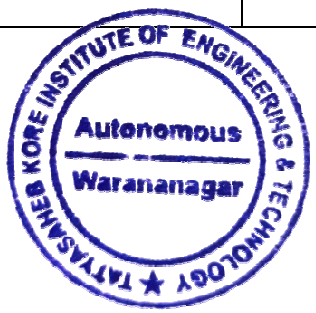
Description:

This is very important core course offered in Electronics and Telecommunication Engineering. Embedded Systems, VLSI Design, Robotics Systems, Communication Systems etc. are using Digital Systems like microprocessors and microcontrollers. Also to design any electronics system digital electronics is required. To understand digital transformation and design any System, this course plays very important role.

Prerequisites:	1	Logic gates, Number systems



Course Contents		
Unit No:1	**FUNDAMENTALS OF DIGITAL ELECTRONICS:** Number system and codes and their Arithmetic (Binary, HEX, BCD), Simplification of logical equation using Boolean and De-Morgan's theorem. Introduction to canonical forms, Standard representations for logic functions, k-map representation of logic functions (SOP and POS forms), minimization of logical functions for min-terms and max-terms (up to 4 variables), don't care conditions,	**6 Hrs.**
Unit No:2	**COMBINATIONAL LOGIC**: Definition of combinational logic, Design of arithmetic circuits – Adder, subtractor Look ahead carry adder, BCD adder, comparator, parity generator /checker, code converter, Multiplexer, Demultiplexer, Decoder, Encoder, BCD to seven segment decoders	**8 Hrs.**
Unit No:3	**SEQENTIAL LOGIC:** 1 Bit Memory Cell, Clocked SR, JK, MS J-K flip flop, D and T flip-flops. Use of preset and clear terminals, hold and setup time and metastability. Excitation Table for flip flop, Conversion of flip flops, Typical data sheet specifications of Flip flop Application of Flip flops. Registers, Shift registers, Counters-Asynchronous and synchronous counter design,	**6 Hrs.**
Unit No:4	**DIGITAL LOGIC FAMILIES AND SEMICONDUCTOR MEMORIES:** Classification and Characteristics of digital Logic Families: TTL logic, CMOS logic. Interfacing CMOS and TTL ,Memory organization and operation, expanding memory size, Classification and characteristics of memories, RAM ROM, EPROM, EEPROM, NVRAM, SRAM, and DRAM	**6 Hrs.**
Unit No:5	**FUNDAMENTALS OF MICROPROCESSORS :** 8085 architecture, programming model: pin functions, Addressing modes, Instruction set, Introduction to Timing diagram-T-state , Timing diagram of instructions stack operations and subroutines, Interrupt structure	**8 Hrs.**
Unit No:6	**PROGRAMMING AND INTERFACE:** Assembly language programming, Basic Interfacing Concepts, Introduction to Interfacing (8255, LED, 7-Seg. Display, Stepper motor, Relay)	**6 Hrs.**

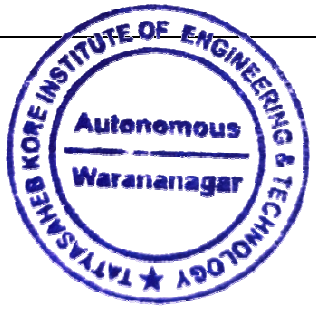


Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	2	2											1	3	2
CO2	1		3										3	3	3
CO3		2		3	3								2	1	3
CO4	1												2	1	2
CO5	1		2										3	3	2
CO6				2	3								1	3	1

Text Books:	
1	R.P. Jain, "Modern Digital Electronics", Tata McGraw Hill Publication, 3rd Edition
2	Anand Kumar, "Fundamentals of Digital Circuits", Prentice Hall of India, 1st Edition.
3	Ramesh Gaonkar, "Microprocessor Architecture Programming and Application with 8085", Penram International Publishing India.

Reference Books:	
1	M. Morris Mano, "Digital Logic and Computer Design", Prentice Hall of India, 4 th Edition.
2	K. Udaykumar, S Umashankar, "The 8085 Microprocessor-Architecture & programming and Interfacing", Pearson Publication.
3	Intel Data sheet (8085)



ETC304- ELECTRICAL CIRCUITS

Lectures : 3 Hrs/Week
Credit : 3

Evaluation Scheme
ISE : 40 Marks
ESE : 60 Marks

Course Objectives: The course aims to make the student understand :	
1	To Identify and draw network graphs and their parts.
2	To analyze DC & AC circuits using network theorems.
3	The types of two port network and their analysis.
4	The constructional details, characteristics, features and application areas of various types of electric motors.

Course Outcomes:

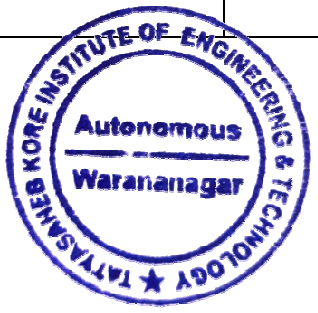
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Identify and apply the rules of network topology to various electric network	Understanding & Applying
CO2	Analyze the simple DC and AC circuit with circuit simplification techniques.	Analyzing
CO3	Formulate & Evaluate network parameters for given network and analyze the given network using Laplace Transform.	Evaluating
CO4	Understand & explain construction, working and applications of all types of motors.	Understanding

Description:

The course has been designed to introduce fundamental principles of circuit theory commonly used in engineering applications. It aims to establish a firm understanding of the laws of electric circuit which develops a working knowledge of the methods of analysis used most frequently in further topics of electronics engineering. The course deals with the DC and AC circuit analysis using network theorems, two port network & network functions. The course focuses on construction and working principles of different dc and ac motors.

Prerequisites:	1	Basic Electrical Engineering

Course Contents		
Unit No:1	**FUNDAMENTALS OF NETWORK THEORY:** Tree and Co-tree, Incidence Matrix, Tie-set Matrix, Cut-set Matrix, Mesh Analysis, Nodal Analysis. Series & parallel connection of passive elements(R,L,C) interconnection, source transformation	**6 Hrs.**
Unit No:2	**DC & AC CIRCUIT ANALYSIS USING NETWORK THEOREMS:** Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem, Duality theorem, Millman's Theorem. **STEADY STATE ANALYSIS:** Superposition Theorem, Thevenin's Theorem, Maximum Power Transfer Theorem.	**8 Hrs.**
Unit No:3	**TWO PORT NETWORKS:** Open circuit impedance (Z) parameters, Short circuit admittance (Y) parameters, Hybrid (H) parameter, Transmission parameters (ABCD), Interrelation of different parameters, Interconnections of two port network, T & pi representation. **NETWORK FUNCTIONS:** Transfer functions of two port network, poles and zeros, time domain response from pole zero plot.	**8 Hrs.**
Unit No:4	**FILTERS:** Introduction, Classification, Low pass, High pass, Band pass & Band reject filter, Design & analysis of constant K, M derived & composite filters (low pass, high pass, band pass & band stop filters): T & Pi	**8 Hrs.**
Unit No:5	**DC MOTORS:** Construction, Working, Types, Back EMF, Speed equation, Torque equation, Speed torque characteristics of Dc shunt and series motor, Speed control of D.C. Shunt and series motor, Need of starter, 3 point starter, 4 point starter. (Numerical treatment on speed control methods)	**6 Hrs.**
Unit No:6	**SPECIAL PURPOSE MOTOR :** Construction, Working principle, characteristics and applications of Single phase permanent split capacitor type Induction motor, AC servo motor, DC servo motor, Stepper motor (VR type and PM type) and BLDC motor.	**8 Hrs.**



Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	3	2	1		1									1	
CO2	3	2		1											
CO3	3	3	1												2
CO4	2	1													1

Text Books:	
1	A. Sudhakar ,Shyammohan S.Palli, "Circuit & Network – Analysis & Synthesis", Tata McGraw Hill Publication, IIIrd Edition
2	A.Chakrabarti, "Circuit Theory (Analysis & Synthesis)", Dhanpat Rai & Co, IIIrd Edition.
3	B. L. Theraja , "A Text book of Electrical Technology", Vol-II , S. Chand publication, 1st Edition.
4	I.J.Nagrath & D.P.Kothari, " Electric Machines", TMH, 2nd Edition

Reference Books:	
1	Ravish R Singh, "Network Analysis & Synthesis", McGraw-Hill Education.
2	U.A.Bakshi,"Electrical Technology",Technical Publication Pune,4th Edition ,2009.
3	V K Mehta and Rohit Mehta, "Principles of Electrical Machines", S Chand Publications

ETC305- TRANSDUCERS AND MEASUREMENTS

Lectures : 3 Hrs/Week
Credit : 3

Evaluation Scheme
ISE : 40 Marks
ESE : 60 Marks

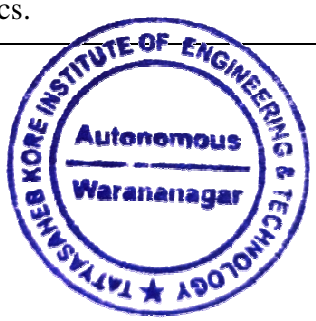
Course Objectives: The course aims to :	
1	Provide introduction to different types of Transducers with their classification, construction & application and Provide knowledge of different sensors and their applications
2	Provide knowledge of signal conditioning and instrumentation system and Provide basic knowledge of measurement system
3	Provide basic understanding of different Electronic instruments and Provide knowledge of different types of bridges

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Student will able to select appropriate transducer and sensors as per required	Apply
CO2	Students will get acquainted with different DAS	Analyze
CO3	Student will be able to design instrumentation system	Analyze
CO4	Student will able to understand measurement basics and select proper instrument for particular measurement of electrical parameter	Apply

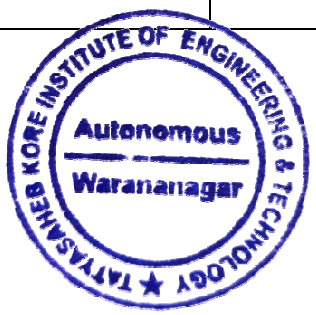
Description:

This course aims to impart fundamental knowledge of different types of sensors and Transducers .and Applied knowledge of signal conditioning Instrumentation amplifiers S,Data acquisition system, Different Display devices Signal generators ,Analyzers Different dc and AC Bridges.. Students will be expected to communicate knowledge to society and industry.

Prerequisites:	1	Students should have knowledge of Fundamental Electronics and different components,
	2	Students should have knowledge of laws in basic electronics.



Course Contents		
Unit No:1	**Introduction to Measurement:** Introduction,PerformanceCharacteristics,StaticCharacteristics,Errorin Measurement, Types of Static Error, Sources of Error, Dynamic Characteristics, Statistical Analysis, Electrical Standards, Atomic Frequency and Time Standards.	**7 Hrs.**
Unit No:2	**Transducers :** Definition, Various Types of Transducers, Classification of Transducers, Selection Factors and General Applications of Transducers, Detailed Study of Transducers: (i) Displacement (ii) Flow (iii) Pressure (iv) Temperature (v) Force and Torque (vi) Sound Transducer, Hall Effect Transducers, Digital Transducers: Shaft Encoder	**7 Hrs.**
Unit No:3	**Sensors:** Proximity Sensors, optical Sensors, IR sensors, Piezo – electric sensors Smart Sensors: Fiber optic sensors, Film sensors, Nano sensors, Electrochemical sensors, biosensors, MEMS	**6 Hrs.**
Unit No:4	**Bridges:** Measurement of Resistance with Bridges, Wheatstone's Bridge, Kelvin Double Bridge, AC Bridges such as Haye's Bridge, Wein Bridge, Maxwell's-Wein Bridge, Maxwell' L/C Bridge, Descourty's Bridge& Schering Bridge	**6 Hrs.**
Unit No:5	**Signal Conditioning & Data Acquisition System:** Introduction, AC & DC Signal Conditioning, , Instrumentation Amplifier, Isolation And Programmable Gain Amplifier, Grounding And Shielding, principles and working of different types of ADC and DAC. Digital voltmeters- Introduction, Types of DVM,general specifications of DVM, digital multimeter, digital measurements of time, digital frequency meter , Q meter.	**7 Hrs.**
Unit No:6	**Measurement & Display Devices:** CRO: Dual Beam, Dual Traces Sampling, Digital storage, measurement of phase and frequency using Lissajous pattern, CRO probes: active, passive, current, attenuators, LED, LCD, Graphics Display, Signal Generators, Function generators. Spectrum analyzer, logic analyzer	**7 Hrs.**



Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	2	--	2	1	--	--	1	--	--	--	3	3	2	1	2
CO2	1	2	2	1	1	1	1	1	--	--	--	1	2	1	3
CO3	1	1	3	3	1	--		--	--	1	--	1	1	1	3
CO4	--	2	3	--	--	2	1	--	--	2	--	1	2	2	2

Text Books:	
1	A.K.Sawhney, "A course in Electrical, Electronics measurement and Instrumentation",
2	H. S. Kalsi , "Electronic Instrumentation", McGraw-Hill, 3rd Edition

Reference Books:	
1	Welfrick Cooper, "Electronic Instrumentation and Measurement Techniques",
2	David A Bell, "Electronic Instrumentation and Measurements", Oxford, 3rd Edition
3	James W Dally, "Instrumentation for Engineering Measurements", Wiley,2nd Edition

ETC306- PROGRAMMING LAB.-I (C++ & JAVA)

Lectures : 2 Hrs/Week
Credit : 1

Evaluation Scheme
ISE : NA
ESE : NA

Course Objectives: The course aims to :	
1	To understand object oriented programming concept
2	To understand the implementations of concepts of objects in C++ and Java
3	To understand how to develop program in C++ and Java.

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Write program using C++.	Knowledge, Application
CO2	Write program using Java	Knowledge, Application
CO3	Develop small application using object oriented program in C++	Knowledge, Analysis
CO4	Develop small application using object oriented program in Java.	Knowledge, Analysis

Description:		
Programming Lab-I.(C++,Java) course is offered as Basic Programming course. Student should get basic knowledge of programming in C++ & Java which will be applicable in software industries.		
Prerequisites:	1	C Programming
	2	Mathematics
	3	Basics of Operating system
	4	Basics of Object Oriented Programming Language

Course Contents		
Unit No:1	**Review of C Programming** Basic programming, Data types , Operators, loops, conditional statements, functions, structures, pointers. **Introduction To Object Oriented Programming:** Difference between procedure oriented programming and object oriented programming, basic concepts and features of object oriented programming, structures and classes, declaration of class, member functions, defining the object of class, accessing member of class, array of class objects.	**4 Hrs.**
Unit No:2	**Overloading:** Function overloading, assignment operator overloading, binary operator overloading, unary operator overloading. **Inheritance**: Introduction , Single Inheritance, Types Of Base Classes- Direct, Indirect, Array Of Class Object And Single Inheritance, Multiple Inheritance.	**4 Hrs.**
Unit No:3	**Constructors** Constructors- copy constructor, default constructors, destructors, inline member function, friend function, dynamic memory allocation. **Polymorphism:** Polymorphism, constructor under inheritance, destructor under inheritance, virtual destructors, virtual base classes.	**4 Hrs.**
Unit No:4	**Introduction to Java Programming :** Java Programming Environment, Source File Declaration Rules, Comments, Data Types, Variables, Operators, Strings, Input and Output, Control Flow, Big Numbers, Array. Object-Oriented Programming Concepts, Declaring Classes, Declaring Member Variables, Defining Methods, Constructor, Passing Information to a Method or a Constructor, Creating and using objects, Controlling Access to Class Members, Static Fields and Methods, this keyword, Object Cloning, Class Design Hints.	**4 Hrs.**
Unit No:5	**Inheritance, Interface and Packaging**: **Inheritance:** Definition, Super classes, and Subclasses, Overriding and Hiding Methods, Polymorphism, Inheritance Hierarchies, Super keyword, Final Classes and Methods, Abstract Classes and Methods, casting, finalization and garbage collection. **Interfaces:** Defining an Interface, Implementing an Interface, Using an Interface as a Type, Evolving Interfaces, and Default Methods. **Packages:** Class importing, Creating a Package, Naming a Package, Using Package Members, Managing Source and Class Files. Developing and deploying (executable) Jar File.	**4 Hrs.**
Unit No:6	**Exception and I/O Streams**: **Exception:** Definition, Dealing with Errors, The Classification of Exceptions, Declaring Checked Exceptions, Throw an Exception, Creating Exception Classes, Catching Exceptions. **I/O Streams**: Byte Stream – Input Stream, Output Stream, Data Input Stream, Data Output Stream, File Input Stream.	**4 Hrs.**

Text Books:	
1	Cay Horstmann and Gary Cornell, “Core Java- Volume I Fundamentals”, Pearson, 8th Edition
2	Cay Horstmann and Gary Cornell. “Core Java- Volume II Advanced Features”, Pearson, 8th Edition
3	E.Balguruswamy, “Programming with C++”,McGraw Hill, 8th Edition

Reference Books:	
1	Herbert Schildt, “JAVA-The Complete Reference”,McGraw Hill, Oracle Press 9th Edition
2	Eric Freeman, Elisabeth Robson, Bert Bates Kathy, Sierra O, “ Head First Java”,Reilly Publication 3rd Edition
3	E.Balguruswamy, “Programming with ANSI C”,McGraw Hill, 8th Edition

ETC301T- ENGINEERING MATHEMATICS – III (Tutorial)

Tutorial : 1 Hr/Week
Credit : 1

Evaluation Scheme
ISA : 25 Marks

Course Objectives: The course aims to :	
1	To develop mathematical skills and enhance thinking power of students
2	To give the knowledge to the students of Linear Differential Equations, ,Laplace transforms ,Fourier series, probability, Vector Differential Calculus with an emphasis on the application of solving Engineering Problem.
3	To prepare students to formulate a mathematical model using engineering skills & interpret the solution in real world.

Course Outcomes:

COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Use of Linear Differential Equations to solve the Electrical Engineering problems.	Understanding, Application
CO2	Find Laplace transforms of given functions	Understanding
CO3	Use Laplace and Inverse Laplace to solve linear differential equations	Understanding, Application
CO4	Develop Fourier series expansion of a function over the given interval.	Understanding
CO5	Solve basic problems in probability theory, including problems involving the binomial, Poisson, and normal distributions.	Applying
CO6	Apply knowledge of vector differentiation to find directional derivatives, curl and divergence of vector field.	Understanding

Description:

Engineering Mathematics course is offered as the basic science course. This course contains Mathematical methods and techniques that are typically used in engineering to solve complex engineering problems. This course has six units namely i) Linear Differential Equations(LDE) and its Applications ii) Laplace Transformand iii) Inverse Laplace Transform and its Applications iv) Fourier Series v) Probability Distribution vi) Vector Differential Calculus

Prerequisites:	1	Trigonometric identities and Logarithmic identities
	2	Differentiation and integration formulae
	3	Basic knowledge of probability.

Tutorials:	
Sr. No.	**Title of Tutorial**
1	Solution of Linear differential equation with constant coefficient, Method of P. I. $e^{ax}, sinax\ or\ cosax, x^m$
2	Solution of Linear differential equation with constant coefficient, Method of P. I. $e^{ax}x^m$, and Application
3	Laplace Transform and its Properties
4	Inverse Laplace Transform by Shifting Property, Partial Fraction
5	Inverse Laplace Transform by Convolution Theorem and Application
6	Expansion of F(x) in $(0,2\pi)$, $(-\pi,\pi)$ as a Fourier Series
7	Expansion of f(x) with period other than 2π and Half rang Series
8	Probability Distribution
9	Divergence and Directional derivatives
10	Irrotational, Solenoidal and Scalar potential function of a vector field

ETC302P- ELECTRONIC DEVICES & CIRCUITS -I LAB

Practical : 2 Hrs/Week
Credit : 1

Evaluation Scheme
ISA : 25 Marks
POE : 50 Marks

Course Objectives: The course aims to :	
1	Provide an introduction and basic understanding of Semiconductor Devices viz. diodes and BJT, JFET.
2	Provide basic analog electronic circuit design techniques using diodes and bipolar junction transistors and to develop analytical skills.
3	Develop student ability to apply basic engineering sciences to understand the Operation & analysis of electronic circuits using diodes and bipolar junction transistors.

Course Outcomes:

COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Describe and design electronic circuits such as rectifiers & unregulated power supply.	Knowledge, Application
CO2	Solve the problems of electronic circuit design such as regulated power supply.	Analysis
CO3	Analyze & Design LPF, HPF, Clipper, Clampers, Multipliers	Knowledge
CO4	Explain operation of BJT & FET Biasing circuit.	Application
CO5	Summarize the hybrid model of transistor and analyze the transistor amplifier (CE, CB, and CC) using h-parameters.	Knowledge
CO6	Analysis of CE Amplifier for low frequency & High frequency response for sinusoidal & square wave input.	Application

Description:

Electronics Device and Circuit-I course is a core electronics course. This course describes the concept of electronics circuit design. It gives the concept of different electronics circuit for their detail operation and working principle. Also, it describes the specifications of devices and its use for different applications.

Prerequisites:	1	Semiconductor Physics
	2	Basic Electronics
	3	Electronics Measurement

List of Experiments			
Minimum 09 experiments + 01 Simulation:			
Sr. No.	**Name of the experiment**	**Hrs.**	**Cognitive levels of attainment as per Bloom's**
1	Design and study of Low pass filter a. Frequency response (sinusoidal) b. integrator (Square wave input)	2	Knowledge
2	Design and study of High pass filter a. Frequency response (sinusoidal) b. Differentiator (Square wave input)	2	Knowledge
3	Analysis of different types of clipper circuits.	2	Analysis
4	Analysis of different types of clamping circuits.	2	Analysis
5	Study of full wave rectifier with capacitive filter.	2	Knowledge
6	Study of full wave rectifier with inductive filter.	2	Knowledge
7	Design and analysis of zener shunt regulator	2	Knowledge
8	Design and analysis of transistorized shunt regulator	2	Application
9	Demonstration of emitter follower regulator	2	Application
10	Demonstration of series pass voltage regulator	2	Application
11	Determination of H-parameter for CE configuration using input and output characteristics.	2	Application
12	Simulation of FWR using C-filter	2	Application
13	Simulation of Single stage RC-Coupled Amplifier	2	Application
14	PCB Design a. Design of FWR (Different output voltages for different groups) with C filter. b. Design of Single Stage RC Coupled Amplifier (Different voltage Gain for different groups).	To be Completed in Extra Time	Knowledge Application

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	3			1				3			3				
CO2			2												
CO3		2							2						
CO4					3					3					
CO5	2		2				1								
CO6												2			

ETC303P- DIGITAL ELECTRONICS AND MICROPROCESSOR LAB

Practical : 2 Hrs/Week
Credit : 1

Evaluation Scheme
ISA : 25 Marks
POE : 50 Marks

Course Objectives:	
The course aims to make the student understand :	
1	The fundamental principles of two-valued logic and various devices used to implement logical operations on variables.
2	Boolean algebra, Karnaugh maps and its application to the design and characterization of digital circuits.
3	To analyze logic processes and implement logical operations using combinational logic circuits.
4	The principles of logic design and use of simple memory devices, flip-flops, and sequential circuits.

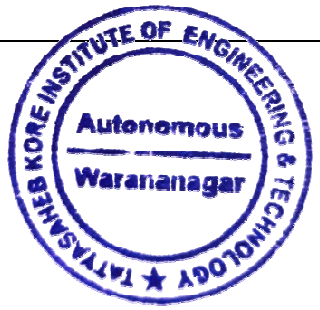
Course Outcomes:

COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Use the basic logic gates and various reduction techniques of digital logic circuit.	Remembering
CO2	Analyze, design and implement combinational logic circuits.	Apply
CO3	Analyze, design and implement sequential circuits.	Apply
CO4	Explain microprocessor architecture and its instruction set	Understand
CO5	Explain interfacing of devices to microprocessor	Understand
CO6	Design Microprocessor based Systems	Create

Description:

This is very important core course offered in Electronics and Telecommunication Engineering. Embedded Systems, VLSI Design, Robotics Systems, Communication Systems etc. are using Digital Systems like microprocessors and microcontrollers. Also to design any electronics system digital electronics is required. To understand digital transformation and design any System, this course plays very important role.

Prerequisites:	1	Logic gates, Number systems



List of Experiments			
Minimum 10 experiments:			
Sr. No.	**Name of the experiment**	**Hrs.**	**Cognitive levels of attainment As per Bloom's**
1	Realization of basic gates using universal gates	2	Knowledge
2	Design of Half adder and full adder using logic gates	2	Experiment
3	Design of Half subtractor and full subtractor using logic gates	2	Experiment
4	Design of 8:1 MUX using IC 74151	2	Demonstrate
5	Design 1:8 DEMUX using IC 74138	2	Experiment
6	Study of basic gates using TTL and CMOS IC	2	Describe
7	Study of D FF and JK FF	2	Describe
8	Design and test counter using Flip-flop	2	Demonstrate
9	Design and test MOD 4 counter using Flip-flop	2	Construct
10	Experiment Based on Arrays:- (Minimum one) Exchange, Addition, Finding Minimum / Maximum, Ascending /Descending, etc	2	Understand
11	Experiment Based on Arithmetic and Logical Operation:- (Minimum one) Multi-digit Addition, Multiplication / Division, Finding Even / Odd Numbers, Factorial, Fibonacci Series	2	Understand
12	8255 Based Experiments: (Minimum one) Display interface using 8255,Stepper motor interface, ADC, DAC	2	Apply

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	2	2											1	3	2
CO2	1		3										3	3	3
CO3		2		3	3								2	1	3
CO4	1												2	1	2
CO5	1		2										3	3	2
CO6				2	3								1	3	1

ETC304T- ELECTRICAL CIRCUITS (Tutorial)

Tutorial : 1 Hr/Week
Credit : NA

Evaluation Scheme
ISA : 25 Marks

Course Objectives: The course aims to make the student understand :	
1	To Identify and draw network graphs and their parts.
2	To analyze DC & AC circuits using network theorems.
3	The types of two port network and their analysis.
4	The constructional details, characteristics, features and application areas of various types of electric motors.

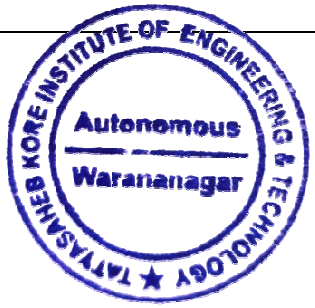
Course Outcomes:

COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Identify and apply the rules of network topology to various electric network	Understanding & Applying
CO2	Analyze the simple DC and AC circuit with circuit simplification techniques.	Analyzing
CO3	Formulate & Evaluate network parameters for given network and analyze the given network using Laplace Transform.	Evaluating
CO4	Understand & explain construction, working and applications of all types of motors.	Understanding

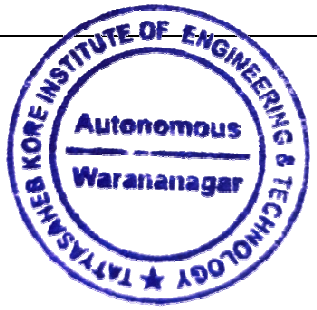
Description:

The course has been designed to introduce fundamental principles of circuit theory commonly used in engineering applications. It aims to establish a firm understanding of the laws of electric circuit which develops a working knowledge of the methods of analysis used most frequently in further topics of electronics engineering. The course deals with the DC and AC circuit analysis using network theorems, two port network & network functions. The course focuses on construction and working principles of different dc and ac motors.

Prerequisites:	1	Basic Electrical Engineering



Tutorials:	
Sr. No.	**Title of Tutorial**
1	Exercise based on KVL ,KCL
2	Finding equivalent resistance of network using various methods
3	Exercise based on network topology
4	Application of superposition theorems for DC circuit
5	Application of Thevenin's theorem and Norton's theorem for DC circuit
6	Application of network theorems for AC circuits
7	Exercise based on two port parameters.
8	Design of constant – K filters.
9	Design of m- derived filters
10	Exercise based on fundamentals of DC motors



ETC305P- TRANSDUCERS AND MEASUREMENTS LAB

Practical : 2 Hrs/Week
Credit : 1

Evaluation Scheme
ISA : 25 Marks
POE : NA

Course Objectives: The course aims to :	
1	Provide introduction to different types of Transducers with their classification, construction & application and Provide knowledge of different sensors and their applications
2	Provide knowledge of signal conditioning and instrumentation system and Provide basic knowledge of measurement system
3	Provide basic understanding of different Electronic instruments and Provide knowledge of different types of bridges

Course Outcomes:

COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Student will able to select appropriate transducer and sensors as per required	Apply
CO2	Students will get acquainted with different DAS	Analyze
CO3	Student will be able to design instrumentation system	Analyze
CO4	Student will able to understand measurement basics and select proper instrument for particular measurement of electrical parameter	Apply

Description:

This course aims to impart fundamental knowledge of different types of sensors and Transducers .and Applied knowledge of signal conditioning Instrumentation amplifiers S,Data acquisition system, Different Display devices Signal generators ,Analyzers Different dc and AC Bridges.. Students will be expected to communicate knowledge to society and industry.

Prerequisites:		
	1	Students should have knowledge of Fundamental Electronics and different components,
	2	Students should have knowledge of laws in basic electronics.

List of Experiments			
Minimum 10 experiments:			
Sr. No.	**Name of the experiment**	**Hrs.**	**Cognitive levels of attainment As per Bloom's**
1	To Study of Extension range of Voltmeter and Milliameter	2	Knowledge
2	To Study of Linear displacement using LVDT.	2	Knowledge, Application
3	To Study Characteristic of NTC Thermistor.	2	Knowledge, Application
4	To Study displacement measurement using LDR.	2	Knowledge, Application
6	To Study Maxwells Bridge	2	Analysis
7	To Study Thermocouple characteristics.	2	Knowledge
8	To Study Strain Gauge	2	Knowledge, Evaluation
9	To Study Frequency and Phase measurement using Lissajous figure.	2	Knowledge, Analysis
10	To Study Capacitance Bridge using VLAB	2	Analysis
11	To Study Hays Bridge using VLAB	2	Analysis
12	To Study Wheat Stones Bridge using VLAB	2	Analysis

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	2	--	2	1	--	--	1	--	--	--	3	3	2	1	2
CO2	1	2	2	1	1	1	1	1	--	--	--	1	2	1	3
CO3	1	1	3	3	1	--		--	--	1	--	1	1	1	3
CO4	--	2	3	--	--	2	1	--	--	2	--	1	2	2	2

ETC306P- PROGRAMMING LAB.-I (C++ & JAVA) LAB.

Practical : 2 Hrs/Week
Credit : 1

Evaluation Scheme
ISA : 25 Marks
POE : 50Marks

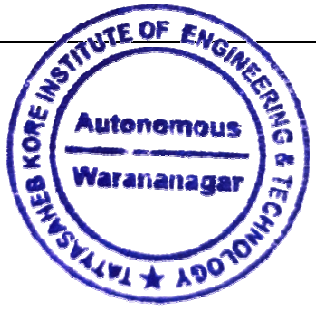
Course Objectives: The course aims to :	
1	To understand object oriented programming concept
2	To understand the implementations of concepts of objects in C++ and Java
3	To understand how to develop program in C++ and Java.

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Write program using C++.	Knowledge, Application
CO2	Write program using Java	Knowledge, Application
CO3	Develop small application using object oriented program in C++	Knowledge, Analysis
CO4	Develop small application using object oriented program in Java.	Knowledge, Analysis

Description:

Programming Lab-I.(C++,Java) course is offered as Basic Programming course. Student should get basic knowledge of programming in C++ & Java which will be applicable in software industries.

Prerequisites:	1	C Programming
	2	Mathematics
	3	Basics of Operating system
	4	Basics of Object Oriented Programming Language



List of Experiments			
(Minimum 09 experiments + 01 Mini Project compulsory):			
Sr. No.	**Name of the experiment**	**Hrs.**	**Cognitive levels of attainment As per Bloom's**
1	Develop a Program for implementation of simple arithmetic operations	2	Knowledge, Application
2	Develop a Program for implementation of array using a. One-dimensional array b. Multi-dimensional array	2	Knowledge, Application
3	Develop a Program for implementation of classes and Objects..	2	Knowledge, Application
4	Develop a Program for implementation of types of constructor a. Default constructor b. Parameterized constructor c. Copy constructor.	2	Knowledge, Analysis
5	Develop a Program for implementation of polymorphism	2	Knowledge, Application
6	Develop a Program for implementation of Friend Functions in Class	2	Knowledge Analysis
7	Develop a Program for implementation of types of inheritance a. Single level Inheritance b. Multi-level Inheritance c. Multiple Inheritance d. Hybrid Inheritance e. Hierarchical inheritance.	2	Knowledge Analysis
8	Develop an Object oriented Program for above experiment 2-4 using Java	2	Knowledge, Analysis
9	Develop an Object oriented Program to Insert the Number in an Array using Java	2	Knowledge, Analysis
10	Develop an Object oriented program on Linked list using Java	2	Knowledge, Application
11	Develop an Object oriented program on Linked list using Java	2	Knowledge, Application
12	Develop an Object oriented program to Perform Linear or binary search using Java	2	Knowledge, Application
13	Develop an Object oriented program to implement stack using Java	2	Knowledge, Application
14	Mini Project	2	Knowledge, Application

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable PSO1	PSO2	PSO3
CO1	3	3	1	1	1					1					
CO2	3	3	1	1	1					1					
CO3	2	3	1	1	1					1					
CO4	2	3	1	1	1					1					

ETC307A- AUDIT COURSE-III [ENVIRONMENTAL STUDIES]

Lectures : 2 hrs / week
Credits : Non-Credit

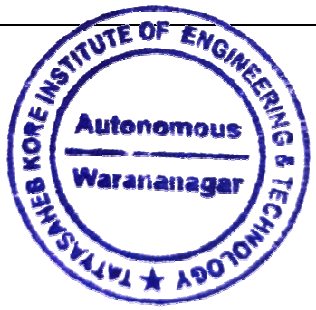
Examination Scheme:
ISE : NA
Audit Point : 2

Course Objectives: The course aims to :	
1	To understand environmental concepts
2	To understand the pollution causes and environment protection methodologies
3	To understand biodiversity and social issues of environment

Course Outcomes:		
COs	**Upon successful completion of this course, the students will be able to:**	**Blooms Taxonomy**
CO1	Relate the interdependency of environmental components	Analyzing
CO2	Identify the environmental problems and prevent environmental pollution	Understanding
CO3	Interpret impacts of waste on environmental components	Applying
CO4	Analyze environmental change and its social impacts	Analyzing

Description:

The syllabus of Environmental Studies provides an integrated, quantitative and interdisciplinary approach to the study of environmental systems. The students of Engineering undergoing this course would develop a better understanding of human relationships, perceptions and policies towards the environment and focus on design and technology for improving environmental quality. Their exposure to subjects like understanding of earth processes, evaluating alternative energy systems, pollution control and mitigation, natural resource management and the effects of global climate change, shall help the students to bring a systems approach to the analysis of environmental problems.



Course Contents		
Unit No:1	**Ecology:** Ecosystem, Ecological Pyramids, Food chain, food web, Ecological succession, Natural Resources and Associated Problems. Forest resources, Water resources, Mineral resources, Food resources, Energy resources, Land resources Role of individuals in conservation of natural resources.	**4 Hrs.**
Unit No:2	**Pollution:** Water pollution: causes, effects, control, drinking water quality standards, Arsenic, lead, cadmium, chromium, fluoride contamination & its effects, water treatment, wastewater treatment Air pollution: Causes, effects, control, Air pollution controlling equipments, Air quality standards, National air quality index, vehicular emission, alternative fuels, indoor air pollution, Thermal inversions, Photochemical Smog and Acid Precipitation Noise pollution: Causes, effects, control, noise standards recommended by CPCB, Environmental Protection Act , Air (Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act and International and National efforts for Environmental Protection	**10 Hrs.**
Unit No:3	**Waste management:** Solid waste management, biomedical waste management, E waste, plastic waste management, Hazardous waste management, carbon footprint, Recycling of waste, Role of Central Pollution Control Board (CPCB),State Pollution Control Board, Role of NGO's .	**4 Hrs.**
Unit No:4	**Social Issues and Environment:** Global Warming, Ozone layer depletion, urban problems related to energy, Alternative energy sources, Evolution of Sustainable development: timeline, Evolution of green movements in India, Disaster management: Flood, Earthquakes, Cyclones, Landslides, Draught, Tsunami etc., Swachh Bharat Mission, Role of Information technology in Environment and human health.	**6 Hrs.**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	3	1												1	
CO2	3	2		1											
CO3	3	2	1												1
CO4	2	1													

Text Books:	
1	Agarwal K.C.,2001 "Environmental Biology", Nidi publication ltd., Bikaner
2	D.K.Asthana, Meera Asthana, "A Textbook of Environmental Studies", S. Chand Publication Revised edition, 2006.
3	S. Deswal & A. Deswal, "Basic course in environmental Studies", Dhanpat Rai & Co Ltd., Delhi, Second revised edition, 2009.

Reference Books:	
1	Eldon D Enger, Bradley F. Smith, "Environmental science – a study of inter- relationships" Wm C Brown Publishers 1989
2	Francois Ramade , "Ecology of Natural resources" , John Wiley & Sons, 2009
3	Robert Leo Smith, "Ecology and field biology", Harper Collins Publishers, 1998
4	Gilbert M. Masters, "Introduction to Environmental Engineering & Science", Prentice Hall International Inc. Second Edition

Project Work:

Visit to Local Polluted site –Urban/Rural/Industrial/Agricultural
Or
Study of simple Ecosystems –Ponds, River, Hill slopes
Or
Preparation of small models or device to resolve the environment problem/issue
Project work shall be based on program

***Evaluation Guideline**:

- This course is non-credit Audit Course and at the end of semester, course exam will be conducted as per the guidelines received from Institute. Exam will be of 60 marks for Theory Paper and 40 marks for project report and same is to be converted in audit points by the program.
- Each group of Project should consist of maximum 4-5 students.
- Project work shall be based on program
- The project will be evaluated by respective branch HOD and project guide and senior faculty.
- There should be a presentation of project before the committee and a hard copy is to be submitted.

APPROVED BY

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BOS

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Board of Studies
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Warananagar, Dist. Kolhapur

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Warananagar, Dist. Kolhapur

TATYASAHEB KORE INSTITUTE OF ENGINEERING & TECHNOLOGY ★ Autonomous Warananagar

Second Year B. Tech.

(Electronics & Telecommunication Engg.)

Second Semester Detailed Syllabus

ETC401- ELECTRONIC DEVICES & CIRCUITS-II

Lectures : 4 Hrs/Week
Credit : 3

Evaluation Scheme
ISE : 40 Marks
ESE : 60 Marks

Course Objectives: The course aims to :	
1	Provide an introduction and basic understanding of feedback amplifiers, power amplifiers, oscillators, multivibrators.
2	Develop student ability to apply basic engineering sciences to understand the operation &analysis of electronic circuits using diodes, bipolar junction transistors and field effect transistors
3	Provide analog electronic circuit design techniques using diodes, bipolar junction Transistors and field effect transistors, and to develop analytical skills.

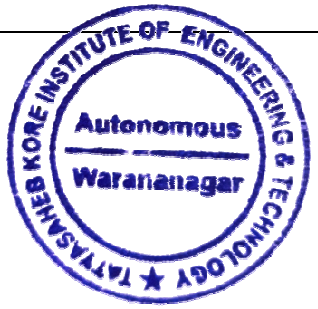
Course Outcomes:

COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Design Multistage Amplifier	Knowledge, Application
CO2	Analyze Feedback Amplifier	Analysis
CO3	study Power Amplifier	Knowledge
CO4	Describe & Design Different types of Oscillators using BJT	Application
CO5	Describe & Design Different types of Multivibrators using BJT	Knowledge
CO6	Study IC voltage Regulators	Application

Description:

Electronics Device and Circuit-II course is a core electronics course. This course describes the applications of electronics circuit design. It gives the detail design concept of different electronics circuit for their detail operation and working principle.

Prerequisites:	1	Electronics Devices and Circuits-I



Course Contents		
Unit No:1	**Multistage Amplifiers** **N**eed of cascading, Parameter evaluation such as Ri ,Ro, Av, Ai & bandwidth for general multistage amplifier, Design of two stage RC coupled amplifier, Direct coupled amplifier using BJT.	**6 Hrs.**
Unit No:2	**Feedback Amplifiers :** Introduction of feedback, reasons for negative feedback. Analysis of Voltage series, Current series, Voltage shunt, Current shunt feedback amplifiers, Design of two stage Voltage series feedback amplifier.	**8 Hrs.**
Unit No:3	**Power Amplifiers:** Need of Power amplifier, classification of power amplifier, Power considerations, Distortion in power amplifiers: Phase, Frequency, amplitude/ harmonic / nonlinear distortion, amplitude distortion using Three point method. analysis and design of Class A single ended transformer coupled amplifier& class A Push pull amplifiers, Class B amplifier & class B push pull amplifier , crossover distortion, class AB Push pull amplifiers. Complementary symmetry push pull power amplifier.	**10 Hrs.**
Unit No:4	**Oscillators:** Barkhausen's criteria, Frequency and amplitude stability, Classification, RC oscillators : analysis & design of RC phase shift & Wein bridge oscillator using BJT. LC oscillators: analysis & design of Colpit's & Hartely's oscillators using BJT, Crystal oscillator.	**8 Hrs.**
Unit No:5	**Multivibrators:** Transistor as a switch, Different transistor switching parameters, overdrive factor, classification of multivibrators, Analysis and design of collector coupled -Astable, Monostable, fixed bias and self-bias Bistable multivibrator and Schmitt trigger using BJT considering overdrive factor. Triggering circuits for Multivibrators	**10 Hrs.**
Unit No:6	**IC voltage regulator** Study and design of regulators using IC's :78XX, 79XX,LM723,LM317, LM337.	**6 Hrs.**

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1		1		1				3			3		2		1
CO2			2			3	2								
CO3	3	2							2					1	
CO4					3					3					2
CO5	2		2	3			1				2		1		
CO6					1							2			3

Text Books:	
1	N.C. Goyal & R.K. Khetan,"A Monograph on Electronics Design Principles", Khanna Publishers
2	Allen Mottershed, "Electronic devices & circuits",Prentice- Hall India
3	G. K. Mittal, "Electronic devices & circuits"
4	R.S.Sedha, "Applied Electronics",

Reference Books:	
1	David A. Bell, "Electronic devices & circuits", Oxford University
2	Salivahanan, N Sureshkumar,"Electronic devices & circuits",Tata McGraw Hill Publication
3	Robert L. Boylsted, Louis Nashelsky,"Electronic devices & circuit theory", Pearson Education

ETC402- COMMUNICATION ENGINEERING

Lectures : 3 Hrs/Week
Credit : 3

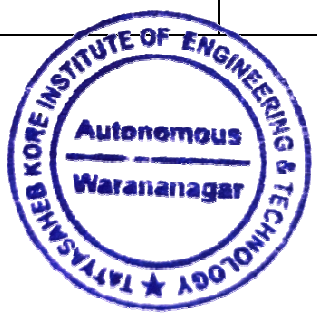
Evaluation Scheme
ISE : 40 Marks
ESE : 60 Marks

Course Objectives:	
The objective of the course is to:	
1	Understand the concept of analog communication systems and its types
2	Understand basic concepts of analog modulation and demodulation schemes
3	Study strengths and weakness of various communication systems.
4	Apply knowledge of analog communications systems under the presence of noise

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Understand the concept of analog communication systems and its types.	Understanding Knowledge,
CO2	Understand the baseband transmission and reception	Knowledge, Application
CO3	Evaluates problems on analog modulation and demodulation schemes	Knowledge, Application
CO4	Analyze analog communications systems under the presence of noise.	Analyze,

Description:		
Course deals with understanding the principles of Analog Communication, study of different types of Pulse modulation techniques, Noise in communication system .It describes the fundamentals of baseband transmission, modulation techniques.		
Prerequisites:	1	Electronic devices & circuits
	2	signals & system
	3	Basics of electronic communication

Course Contents		
Unit No: 1	**Amplitude Modulation:** Basic block diagram of communication system, Need for modulation, channel, frequency spectrum, time and frequency domain signals, Amplitude Modulation principles, AM envelope, frequency spectrum & BW, Modulation index, % modulation, AM transmitters: Block of low level DSBFC, High level DSBFC, Trapezoidal patterns. Evolution and descriptions of SSB, Suppression of carrier using balanced modulator, Suppression of unwanted sideband, Methods: Filter system, phase shift & third method Vestigial sideband(VSB)	**8 Hrs.**
Unit No: 2	**Angle Modulation:** Instantaneous frequency, Concept of angle modulation, frequency spectrum, Narrowband & Wide Band FM, Modulation Index, Bandwidth, Phase modulation, Generation of FM (Direct & Indirect Method)	**6 Hrs.**
Unit No: 3	**Noise:** Sources of noise, Types of noise White noise, shot noise, thermal noise, partition noise, low frequency or flicker noise, burst noise, avalanche noise, signal to noise ratio, Noise Figure, Noise Temperature.	**4 Hrs.**
Unit No: 4	**AM Receiver:** Simplified block diagram of AM receiver, receiver parameters: Sensitivity Selectivity, fidelity, Types of AM receiver: TRF and superheterodyne (block diagram), AM detection types: using diode detector, distortion in diode detector. Automatic Gain Control (AGC).	**6 Hrs.**
Unit No: 5	**FM Receiver:** Double conversion FM receiver block diagram, FM demodulator, tuned Circuit frequency discriminators, slope detectors, fosters seeley discriminators, ratio detectors	**6 Hrs.**
Unit No: 6	**Pulse Modulation :** Introduction, Sampling theorem: Occurrence of aliasing error, PAM: Channel BW for PAM, Natural Sampling, Flat-top Sampling, PAM & TDM, Signal Recovery, PWM, Uses of PWM, PPM, Generation of PAM, Generation of PWM, Generation of PPM	**6 Hrs.**

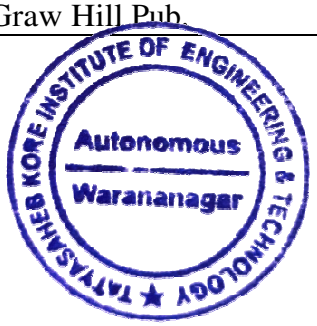


Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	1			1	2				1		2				
CO2	1	1									2				
CO3	2	2			2								1		
CO4		2	2	3					1					1	

Text Books:	
1	George Kennedy, "Electronic Communications", Tata McGraw Hill.
2	Wayne Tomasi "Electronics Communication System", Fundamentals through Advanced, Pearson Education, 5th Edition.
3	V. Chandra Sekar, "Analog Communication", OXFORD University press.

Reference Books:	
1	B.P. Lathi, "Analog and Digital Communication", OXFORD University press.
2	Simon Haykin, "An introduction to analog & digital communications", John Wiley & Sons
3	R. P. Singh, S D Sapre, "Communication System-Analog & Digital" ,Tata McGraw Hill Publication, 3rd Edition
4	Roy Blake, "Electronic Communication Systems", CENGAGE learning, 2nd Edition
5	Louis E. Frenzel, "Principals of electronic communication system", Tata McGraw Hill Pub.



ETC403- LINEAR INTEGRATED CIRCUITS

Lectures : 3 Hrs/Week
Credit : 3

Evaluation Scheme
ISE : 40 Marks
ESE : 60 Marks

Course Objectives: The course aims to :	
1	Understand need of differential amplifier To study the fundamentals /basics of differential amplifier by using transistor.
2	Study internal circuit & operation with different stages of op-amp.
3	Illustrate waveform generators and Timer using special ICs.
4	Study different PLL and VCO ICs and its applications.

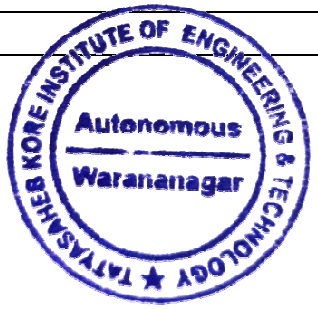
Course Outcomes:

COs	**Upon successful completion of this course, the students will be able to:**	**Blooms Taxonomy**
CO1	Distinguish and design differential amplifiers used in linear integrated circuits.	Analyzing
CO2	Design amplifiers and active filters.	Applying & creating
CO3	Identify and design different linear and non linear application using op-amp	Applying
CO4	Illustrate waveform generators and Timer using special ICs.	Applying
CO5	Describe different PLL and VCO ICs and their applications.	Understanding

Description:

This course deals with the study of basic transistor configuration used as basic building block for integrated circuit called op-amp. It aims t0 establish the firm understanding of linear and non linear application of op-amp. This course also focuses on design aspects of active filters, waveform generators and PLL circuits

Prerequisites:	1	The Basic Concept of circuit theory
	2	Basic Knowledge of electronics devices



Course Contents		
Unit No:1	**Introduction to op-amp** Block diagram of op-amp in detail, Differential Amplifier configurations, Differential amplifier analysis (AC and DC) for dual-input balanced-output configuration, level shifter, current mirror circuits, ideal parameters and Practical parameters of op-amp and their comparison. (Numerical expected)	**8 Hrs.**
Unit No:2	**Op-amp configurations & frequency response** Virtual ground concept, Open loop configuration, closed loop configuration, unity gain amplifier, frequency response of both configuration. slew rate equation	**7 Hrs.**
Unit No:3	**Applications of Op-amp** Summing, Scaling & Averaging Amplifiers using Op-amps, Differential amplifier using op-amp, Subtractor Circuit, Instrumentation amplifier, V to I & I to V Converter, Precision Rectifiers, Log & Anti-log Amplifiers, Study of comparator, Schmitt Trigger, Window Detector, Peak Detectors, Sample & Hold Circuits.	**7 Hrs.**
Unit No:4	**Active Filters** Introduction, Analysis & Design of Butterworth filters: High Pass filter, Low Pass filter (First & Second order), Band Pass filter, Band Reject filter, All Pass Filter (Numerical expected)	**6 Hrs.**
Unit No:5	**Waveform Generators** Analysis & Design of Square wave generator, Triangular wave generator, Saw tooth wave generator. Analysis & Design of RC phase shift oscillator, RC wein bridge oscillator, Quadrature oscillator.	**6 Hrs.**
Unit No:6	**Special linear ICs and its Industrial applications** Introduction, block diagram, operating principle and applications of IC555,IC 565,High precision performance operational amplifier (OP177), Instrumentation amplifier (AD620),Function generator (IC8038).	**7 Hrs.**

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	3	2	1											1	
CO2	3	2		1											
CO3	3	2	1												1
CO4	2	1													2
CO5	3	2	1										3		

Text Books:	
1	Ramakant A. Gaikwad, “Op Amps and Linear Integrated Circuits”, Pearson Education 2nd and latest edition
2	Sanjay Sharma, S K Kataria and Sons, “OP-AMPS and Linear Integrated Circuits”,2nd Edition.

Reference Books:	
1	S Salivahanan, V S Kanchana Bhaaskaran,“ Linear Integrated Circuits”, Tata McGraw-Hill, 7th Edition
2	David Bell, “Operational Amplifiers and Linear ICs”, Third edition, Oxford University Press, 3rd Edition.
3	B. Somanathan Nair, “Linear Integrated Circuits- Analysis, Design &Applications”, Wiley India.
4	Linear IC Datasheets

ETC404- CONTROL SYSTEM ENGINEERING

Lectures : 3 Hrs/Week
Credit : 3

Evaluation Scheme
ISE : 40 Marks
ESE : 60 Marks

Course Objectives: The course aims to :	
1	To provide an introduction and basic understanding of Control System
2	To develop time & frequency domain analysis
3	To analyze& compare different control systems and understand the concept of stability & state space variables

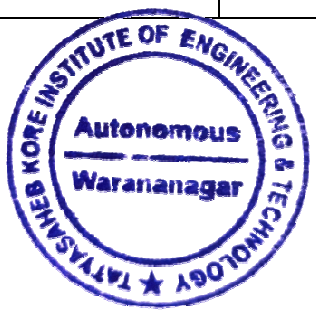
Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Apply knowledge of mathematics, science, and engineering to design, analyze and control the different systems	Apply
CO2	Explain time & frequency domain analysis for different control systems	Analyze
CO3	Demonstrate & compare different control systems and can check system stability.	Analyze
CO4	Describe state variables Design model for control system	Apply

Description:

This course aims to impart fundamental knowledge of different types of control systems and Applied knowledge of Electrical ,mechanical systems and their mathematical modeling .Transfer function ,Time domain analysis and frequency domain analysis, steady state error and error constants ,Stability analysis root locus ,bode plot polar plot ,Basics of compensators and controllers, Also students should get knowledge of State model and state variables.

Prerequisites:	1	Students should have knowledge of Fundamental Electronics and different components,
	2	Students should have knowledge of Mathematics

Course Contents		
Unit No:1	**Introduction** : Classification of control system, Effects of feedback, Mathematical models – (Mechanical & Electrical systems) Differential equations, Transfer function , Block diagram algebra – Block diagram reduction, Representation by Signal flow graph – Reduction using Mason's gain Formula.	**7 Hrs.**
Unit No:2	**Time Response Analysis :** Standard test signals-Time response of first & second order system-Design specification of 2^{nd} order system & error compensation, Characteristic Equation of Feedback control systems, Transient response of second order system- Time domain specifications, Steady state response- Steady state error and error constants.	**7 Hrs.**
Unit No:3	**Stability Analysis In S-Domain** The concept of stability – Routh's stability criterion – limitations of Routh's stability Root Locus Technique: The root locus concept – construction of root locieffects of adding poles and zeros to G(s) H(s) on the root locus.	**6 Hrs.**
Unit No:4	**Frequency Response Analysis** Introduction, Frequency domain specifications-Bode plots, Phase margin and Gain margin-Stability Analysis from Bode Plots, Polar Plots, Nyquist Stability Criterion, Nyquist plot & stability analysis.	**7 Hrs.**
Unit No:5	**Compensators And Controllers** Compensation techniques –Lag, Lead, Lead-Lag Controllers design in frequency Domain, ON-OFF Controller, PID control system. Programmable Logic Controller (PLC)	**7 Hrs.**
Unit No:6	**State Space Analysis** Concept of state, state variable & state model, state model for linear continuous time systems, Transfer function from state model, Computation of state transition matrix, Controllability & Observability.	**6 Hrs.**



Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	3	3	2	1	--	--	1	---	---	2	---	---	1	1	3
CO2	3	2	1	3	1	--	2	---	---	1	--	2	1	--	3
CO3	2	2	3	1	1	--	1	--	--	1	--	2	1	--	3
CO4	3	3	1	2	1	--	1	--	--	1	--	1	1	--	3

Text Books:	
1	I .J. Nagrath and M. Gopal, "Control Systems Engineering", Anshan Publishers, 5th Edition.
2	A.Anandkumar, "Control System Engineering",PHI Publication 2nd Edition.
3	R.Anandnatarajan,,P.Rameshbabu, "Control System Engineering", Scitech Publications.

Reference Books:	
1	Norman S Nise "Control System Engineering", Wiley Publication, 8th Edition.
2	SanarjjetGhosh , "Control System Theory & application", Pearson Education,1st Edition.
3	Kuo B.C., "Automatic Control System", Prentice Hall Publication, India

ETC405- DATA STRUCTURE & ALGORITHMS

Lectures : 3 Hrs/Week
Credit : 3

Evaluation Scheme
ISE : 40 Marks
ESE : 60 Marks

Course Objectives: The course aims to :	
1	To study the basic concept of data structure & it's types.
2	To understand the knowledge of linear data structure as well as relevant operations on it.
3	To understand knowledge of non linear data structure & relevant operations on it.
4	To apply knowledge of data structure applications in engineering field.

Course Outcomes:

COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Explain the basic concept of data structure & it's types.	Knowledge, Application
CO2	Solve problems on linear data structures.	Knowledge, Analysis
CO3	Solve problems on non linear data structures.	Knowledge, Analysis
CO4	Analyze knowledge of data structure applications in engineering field.	Knowledge, Application

Description:

Data Structure and Algorithms course is offered as Basic Computer Science & Engineering course. Student should get basic knowledge of algorithms in linear and non linear data structures which will be helpful for writing programming code using any language.(C,C++,Java)

Prerequisites:	1	C Programming
	2	Mathematics
	3	Basics of Operating system
	4	Basics of Algorithms and flowcharts

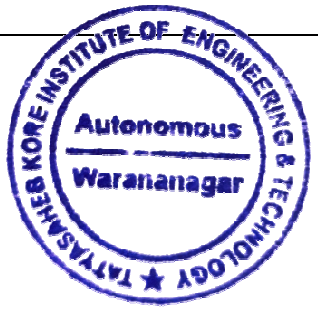
Course Contents		
Unit No: 1	**Introduction & Overview:** Introduction to theory of data structures, data types, Classification of data structure, Algorithms, types of Algorithms, complexity, time space trade-off with example.	**2 Hrs.**
Unit No: 2	**Arrays, Records & Pointers:** Introduction, linear arrays, representation of linear array in memory, Algorithm for traversing linear arrays, inserting & deleting, Sorting: bubble sort, searching: linear search, binary search, Multi-dimensional arrays, Pointers: pointer arrays, Records: Record structures, representation of records in memory, parallel arrays, Matrices, Sparse matrices	**6 Hrs.**
Unit No: 3	**Linked Lists:** Introduction, linked lists & its representation, Traversing & searching a linked list, memory allocation, Garbage collection, insertion & deletion of nodes of linked list, header linked list, two-way lists.	**6 Hrs.**
Unit No: 4	**Stacks & Queues:** Introduction to stacks, stack as an Abstract Data type, representation. Applications of stacks, stacks & recursion, Queue, representation of queue as an array and as a linked list, circular, double ended, priority, application of queues.	**7 Hrs.**
Unit No: 5	**Trees :** Binary Tree: introduction, types, definition, properties, representations, operations, binary tree traversal, reconstruction, counting number of binary trees, applications. Advanced trees: AVL trees or height balanced trees, representation, operation, Threaded binary trees, Expression trees. Multi way trees, multi way search trees, B+ trees	**7 Hrs.**
Unit No: 6	**Graphs &Hashing**: Introduction, Graph theory terminology, sequential representation of graphs: Adjacency Matrix, Path matrix, Warshall's Algorithm, shortest paths, Hashing, Hash functions, collision, chaining	**8 Hrs.**

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	2	2	1	1	2					1					
CO2	3	2	1	1	2					1					
CO3	3	3	1	1	2					1					
CO4	3	3	1	1	2					1					

Text Books:	
1	ISRD group, “Data structure using C”, Tata McGraw Hill, Publication
2	Seymour Lipschutz, “Data structures”, Tata McGraw Hill Publication

Reference Books:	
1	Mark Allen Weiss, “Data structure & algorithm analysis in C”, Pearson Publication Education (LPE)
2	A.N. Kathie ,“Introduction to Data structure in C”, Pearson Publication Education (LPE)



ETC406- PROGRAMMING LAB-II (PYTHON)

Lectures : 2 Hrs/Week
Credit : 1

Evaluation Scheme
ISE : NA
ESE : NA

Course Objectives: The course aims to :	
1	To develop problem solving skills and their implementation through basic Python.
2	To understand and implement concepts of decision making statements.
3	To implement programs based on looping statements.
4	To understand & implement programs based on built in functions.

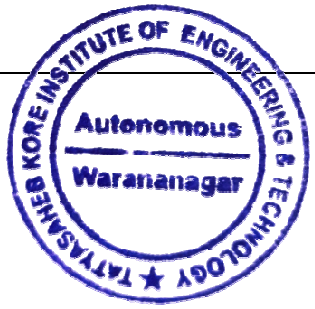
Course Outcomes:

COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Identify and use basic concepts of python programming in various data structure.	Remember
CO2	To solve programs on decision making & looping statements in python.	Knowledge, Application
CO3	Understand python list and tuple concepts.	Understand, Apply
CO4	Understand python set and dictionary collection concepts.	Understand, Apply

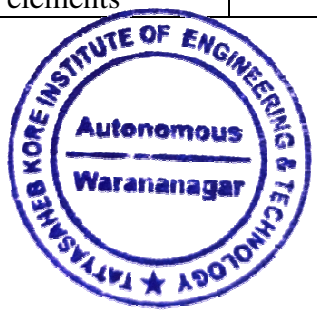
Description:

Programming Lab-II (Python) course is offered as the basic programming course. This course describes the scope of Python programming in various areas of engineering & research in academics as well as in software industries.

Prerequisites:	1	C Programming
	2	C++ Programming
	3	Data Structure and Algorithm



Course Contents		
Unit No: 1	**Introduction to Python:** Introduction to Python: High level language, Scope of python, interactive mode and script mode. Variables, Operators and Operands in Python. Arithmetic, relational and logical operators, Operator precedence, Taking input using raw input() and input() method and displaying output - print statement, Comments in Python.	**2 Hrs.**
Unit No: 2	**Conditional and Looping:** if - else statement and nested if – else while, for, use of range function in for, Nested loops, break, continue, pass statement Use of compound expression in conditional constructs, Nested conditional statements, Nested Looping structures	**2 Hrs.**
Unit No: 3	**Functions:** Built-In Function, Functions from math, random, time & date module. Composition User Define Function : Defining , invoking functions, passing parameters, Intra-package References, Packages in Multiple Directories	**2 Hrs.**
Unit No: 4	**List:** Lists Concept of mutable lists, creating, initializing and accessing the elements of list, List operations Concatenation, Membership, list slices, List comprehensions List functions & methods: len, insert, append, extend, sort, remove, reverse, pop functions	**2 Hrs.**
Unit No: 5	**Tuples & Sets**: Immutable concept, creating, initializing and accessing the elements in a tuple;Tuple functions: cmp(), len(), max(), min(), tuple(); Sets Concept of Sets , creating, initializing and accessing the elements of Sets operation Membership, union, intersection, difference, and symmetric difference	**2 Hrs.**
Unit No: 6	**Dictionaries:** Dictionaries Concept of key-value pair, creating, initializing and accessing the elements in a dictionary, Traversing, appending, updating and deleting elements	**2 Hrs.**



Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1			2				1	1							
CO2	3	1					1								
CO3	2	1	3	1	1	1						1			
CO4	2	2	3	2	1	1	1					1			

Text Books	
1	Martin C. Brown , "Python: The Complete Reference", Tata McGraw hill 2018.
2	Mark Lutz, "Learning Python" , O" Reilly Publication Edition 2013.
3	Michael Dawson, "Python Programming for Absolute Beginner", Cengage Learning Edition 2010.

Reference Books:	
1	David Beazley, "Python Essential Reference", Developers library 4th Edition.
2	Paul Barry, "Head First Python", O'Reilly Publication Edition 2011.
3	Yashavant Kanetkar, " Let Us Python ", BPB Publication, 2009

ETC401P- ELECTRONIC DEVICES & CIRCUITS -II LAB

Practical : 2 Hrs/Week
Credit : 1

Evaluation Scheme
ISA : 25 Marks
POE : 50 Marks

Course Objectives: The course aims to :	
1	Provide an introduction and basic understanding of feedback amplifiers, power amplifiers, oscillators, multivibrators.
2	Develop student ability to apply basic engineering sciences to understand the operation &analysis of electronic circuits using diodes, bipolar junction transistors and field effect transistors
3	Provide analog electronic circuit design techniques using diodes, bipolar junction Transistors and field effect transistors, and to develop analytical skills.

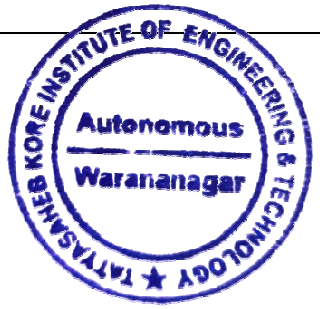
Course Outcomes:

COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Design Multistage Amplifier	Knowledge, Application
CO2	Analyze Feedback Amplifier	Analysis
CO3	study Power Amplifier	Knowledge
CO4	Describe & Design Different types of Oscillators using BJT	Application
CO5	Describe & Design Different types of Multivibrators using BJT	Knowledge
CO6	Study IC voltage Regulators	Application

Description:

Electronics Device and Circuit-II course is a core electronics course. This course describes the applications of electronics circuit design. It gives the detail design concept of different electronics circuit for their detail operation and working principle.

Prerequisites:	1	Electronics Devices and Circuits-I



List of Experiments			
(Minimum 09 experiments + 01 Simulation):			
Sr. No.	**Name of the experiment**	**Hrs.**	**Cognitive levels of attainment as per Bloom's**
1	Design and frequency response of direct coupled amplifier.	2	Knowledge
2	Study the frequency response of two stages RC coupled amplifier.	2	Knowledge
3	Analysis of frequency response of voltage series feedback amplifier.	2	Analysis
4	Design of transformer coupled class A amplifier.	2	Analysis
5	Understand the working principle of RC phase shift oscillator using BJT	2	Knowledge
6	Demonstration of Wein bridge oscillator using BJT	2	Knowledge
7	Analysis of Colpitts oscillator using BJT	2	Knowledge
8	Study of Hartley oscillator using BJT	2	Application
9	Design of Astable multivibrator	2	Application
10	Analysis of monostable multivibrator using BJT	2	Application
11	Design of bistable multivibrator using BJT	2	Application
12	Study of Schmitt trigger using BJT	2	Application
13	Design of voltage regulator using LM317	2	Application
14	Demonstration of voltage regulator using IC723	2	Knowledge
15	Simulation of Oscillator	2	Application
16	Simulation of Multivibrator	2	Application
17	PCB Design a.Design of Astable Multivibrator or Schmitt trigger. b.Design of Power Supply using IC voltage Regulator.	To be Completed in Extra Time	Knowledge Application

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1		1		1				3			3		2		1
CO2			2			3	2								
CO3	3	2							2					1	
CO4					3					3					2
CO5	2		2	3			1				2		1		
CO6					1							2			3

ETC402P- COMMUNICATION ENGINEERING LAB

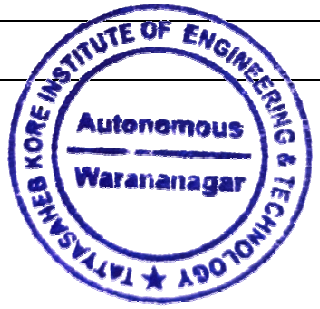
Practical : 2 Hrs/Week
Credit : 1

Evaluation Scheme
ISA : 25 Marks
POE : NA

Course Objectives:	
The objective of the course is to:	
1	Understand the concept of analog communication systems and its types
2	Understand basic concepts of analog modulation and demodulation schemes
3	Study strengths and weakness of various communication systems.
4	Apply knowledge of analog communications systems under the presence of noise

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Understand the concept of analog communication systems and its types.	Understanding Knowledge
CO2	Understand the baseband transmission and reception	Knowledge, Application
CO3	Evaluates problems on analog modulation and demodulation schemes	Knowledge, Application
CO4	Analyze analog communications systems under the presence of noise.	Analyze

Description:		
Course deals with understanding the principles of Analog Communication, study of different types of Pulse modulation techniques, Noise in communication system .It describes the fundamentals of baseband transmission, modulation techniques.		
Prerequisites:	1	Electronic devices & circuits
	2	signals & system
	3	Basics of electronic communication



List of Experiments			
Minimum 10 experiments:			
Sr. No.	**Name of the experiment**	**Hrs.**	**Cognitive levels of attainment As per Bloom's**
1	Practical implementation of Amplitude modulation and demodulation	2	Knowledge
2	Calculation of modulation index by graphical method of DSBFC signal & measurement of power of AM wave for different modulating signal.	2	Knowledge
3	SSB modulation using any method (filter method, Phase shift method) and its detection.	2	Knowledge, Application
4	Performance and analysis of AM system using trapezoidal method.	2	Knowledge, Analysis
5	Practical implementation of frequency modulation and demodulation	2	Knowledge
6	Experimenting Sampling and reconstruction and also observe aliasing effect by varying sampling frequency.	2	Analysis
7	Practical implementation of PAM system.	2	Analysis
8	Practical implementation of PWM system	2	Knowledge, Evaluation
9	Practical implementation of PAM-TDM systems	2	Knowledge, Analysis
10	Practical implementation of PPM system	2	Knowledge, Application
11	Envelope detector- Practical diode detector	2	Knowledge, Application
12	Study on Pre-emphasis and De-emphasis.	2	Knowledge
13	Visit to AIR		Knowledge, Application

Note:

1) There should be compulsory one industrial visit related to this subject.

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	1			1	2				1		2				
CO2	1	1									2				
CO3	2	2			2										
CO4		2	2	3					1						

ETC403P- LINEAR INTEGRATED CIRCUITS LAB

Practical : 2 Hrs/Week
Credit : 1

Evaluation Scheme
ISA : 25 Marks
POE : 50 Marks

Course Objectives:	
The course aims to :	
1	Understand need of differential amplifier To study the fundamentals /basics of differential amplifier by using transistor.
2	Study internal circuit & operation with different stages of op-amp.
3	Illustrate waveform generators and Timer using special ICs.
4	Study different PLL and VCO ICs and its applications.

Course Outcomes:

COs	**Upon successful completion of this course, the students will be able to:**	**Blooms Taxonomy**
CO1	Distinguish and design differential amplifiers used in linear integrated circuits.	Analyzing
CO2	Design amplifiers and active filters.	Applying & creating
CO3	Identify and design different linear and non linear application using op-amp	Applying
CO4	Illustrate waveform generators and Timer using special ICs.	Applying
CO5	Describe different PLL and VCO ICs and their applications.	Understanding

Description:

This course deals with the study of basic transistor configuration used as basic building block for integrated circuit called op-amp. It aims t0 establish the firm understanding of linear and non linear application of op-amp. This course also focuses on design aspects of active filters, waveform generators and PLL circuits

Prerequisites:	1	The Basic Concept of circuit theory
	2	Basic Knowledge of electronics devices

List of Experiments			
Minimum 10 experiments:			
Sr. No.	**Name of the experiment**	**Hrs.**	**Cognitive levels of attainment As per Bloom's**
1	Basic op-amp configuration -Inverting , Non inverting amplifier	2	Understanding
2	Study the frequency response of operational amplifier	2	Understanding
3	Design and implement differential amplifier and subtractor using op-amp	2	Understanding, Applying
4	Study the summing, scaling, and averaging amplifier	2	Understanding, Applying
5	Build and test precision half & full wave rectifier	2	Applying
6	Build and test Comparator and Schmitt trigger	2	Understanding, Applying
7	Design of Butterworth filters	2	Analyzing
8	Build and test square & triangular wave generator.	2	Understanding, Applying
9	Build and test Integrator and Differentiator	2	Evaluating
10	Design and implement oscillator using Op-Amp.	2	Analyzing
11	Study of multivibrator using IC555	2	Understanding, Applying

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	3	2	1											1	
CO2	3	2		1											
CO3	3	2	1												1
CO4	2	1													2
CO5	3	2	1										3		

ETC404T- CONTROL SYSTEM ENGINEERING (Tutorial)

Tutorial : 1 Hr/Week
Credit : NA

Evaluation Scheme
ISA : 25 Marks
POE : NA

Course Objectives: The course aims to :	
1	To provide an introduction and basic understanding of Control System
2	To develop time & frequency domain analysis
3	To analyze& compare different control systems and understand the concept of stability & state space variables

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Apply knowledge of mathematics, science, and engineering to design, analyze and control the different systems	Apply
CO2	Explain time & frequency domain analysis for different control systems	Analyze
CO3	Demonstrate & compare different control systems and can check system stability.	Analyze
CO4	Describe state variables Design model for control system	Apply

Description:

This course aims to impart fundamental knowledge of different types of control systems and Applied knowledge of Electrical ,mechanical systems and their mathematical modeling .Transfer function ,Time domain analysis and frequency domain analysis, steady state error and error constants ,Stability analysis root locus ,bode plot polar plot ,Basics of compensators and controllers, Also students should get knowledge of State model and state variables.

Prerequisites:	1	Students should have knowledge of Fundamental Electronics and different components,
	2	Students should have knowledge of Mathematics

Tutorials:	
Sr. No.	**Title of Tutorial**
1	To Study Transfer Function and derive transfer function if RLC Circuit
2	To Study Block Diagram Reduction Rules
3	Solve Examples on B lock Diagram Reduction
4	To Study Rules for Signal Flow Graph
5	Solve Examples on Signal Flow Graph
6	To Study Time Response of First Order System
7	To Study Time Response of Second Order System
8	To Study Steady State Error and Error Constants
9	To Stability using Routh's Criterion
10	To Study Root Locus And Bode Plot

ETC405T- DATA STRUCTURE & ALGORITHMS (Tutorial)

Tutorial : 1 Hr/Week
Credit : NA

Evaluation Scheme
ISA : 25 Marks
POE : NA

Course Objectives: The course aims to :	
1	To study the basic concept of data structure & it's types.
2	To understand the knowledge of linear data structure as well as relevant operations on it.
3	To understand knowledge of non linear data structure & relevant operations on it.
4	To apply knowledge of data structure applications in engineering field.

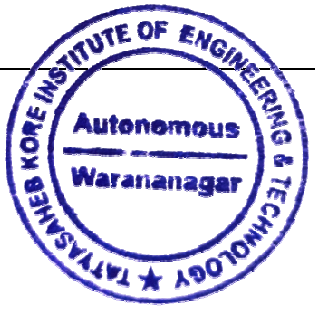
Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Explain the basic concept of data structure & it's types.	Knowledge, Application
CO2	Solve problems on linear data structures.	Knowledge, Analysis
CO3	Solve problems on non linear data structures.	Knowledge, Analysis
CO4	Analyze knowledge of data structure applications in engineering field..	Knowledge, Application

Description:

Data Structure and Algorithms course is offered as Basic Computer Science & Engineering course. Student should get basic knowledge of algorithms in linear and non linear data structures which will be helpful for writing programming code using any language.(C,C++,Java)

Prerequisites:	1	C Programming
	2	Mathematics
	3	Basics of Operating system
	4	Basics of Algorithms and flowcharts

Tutorials:	
Sr. No.	**Title of Tutorial**
1	Develop an algorithm for Matrix Multiplication
2	Develop an algorithm for Traversing a Linear arrays
3	Develop an algorithm for Inserting and deleting elements from linear arrays
4	Develop an algorithm for Linear search
5	Develop an algorithm for Binary Search
6	Develop an algorithm for Bubble sort
7	Develop a algorithm for Push and pop Operation on stack
8	Develop an algorithm for Inserting and deleting elements from queue.
9	Develop an algorithm for traversing a linked list
10	Develop an algorithm for traversing Binary trees
11	Develop an algorithm for Shortest path
12	Develop an algorithm for Merge sort



ETC406P- PROGRAMMING LAB-II (PYTHON) LAB

Practical : 2 Hrs/Week
Credit : 1

Evaluation Scheme
ISA : 25 Marks
POE : 50 Marks

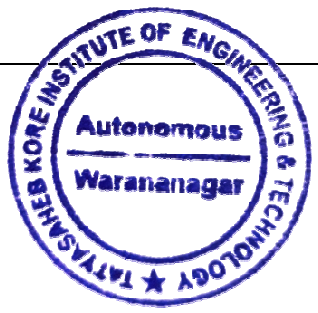
Course Objectives:	
The course aims to :	
1	To develop problem solving skills and their implementation through basic Python.
2	To understand and implement concepts of decision making statements.
3	To implement programs based on looping statements.
4	To understand & implement programs based on built in functions.

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Identify and use basic concepts of python programming in various data structure.	Remember
CO2	To solve programs on decision making & looping statements in python.	Knowledge, Application
CO3	Understand python list and tuple concepts.	Understand, Apply
CO4	Understand python set and dictionary collection concepts.	Understand, Apply

Description:

Programming Lab-II (Python) course is offered as the basic programming course. This course describes the scope of Python programming in various areas of engineering & research in academics as well as in software industries.

Prerequisites:	1	C Programming
	2	C++ Programming
	3	Data Structure and Algorithm



List of Experiments			
(Minimum 09 experiments + 01 Mini Project compulsory):			
Sr. No.	**Name of the experiment**	**Hrs.**	**Cognitive levels of attainment As per Bloom's**
1	Develop a python program to demonstrate basic data types in python.	2	Knowledge Analysis
2	Develop a python program to study Arithmetic, relational and logical operators and Operands in Python.	2	Knowledge Analysis
3	Develop a python programs to study if, if else , if else if statements.	2	Knowledge Analysis
4	Develop a Write python programs to study looping statements while & for.	2	Knowledge Analysis
5	Develop a Write python programs to study built in functions of string and math packages.	2	Knowledge Analysis
6	Develop a Write python programs to study list access using membership operators.	2	Knowledge , Application
7	Develop a Write python programs to study tuple using inbuilt functions.	2	Knowledge ,Application
8	Develop a Write python programs to study set operations.	2	Knowledge ,Application
9	Develop a Write python programs to study dictionary traversing.	2	Knowledge ,Application

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1			2				1	1							
CO2	3	1					1								
CO3	2	1	3	1	1	1						1			
CO4	2	2	3	2	1	1	1					1			

ETC407A- AUDIT COURSE-IV [GENERAL PROFICIENCY]

Lectures : 2 hrs / week
Credits : Non-Credit

Examination Scheme:
ISE : NA
Audit Point : 2

INTRUCTION FOR AUDIT COURSE:
Student has to undergo any one general proficiency course mentioned below. This course must have minimum Two Weeks duration. Student can do this course from the training institutes which are recommended and suggested by the department for respective academic year. At the end of semester, student has to submit the **COURSE CERTIFICATE** to the department.
Languages:
1. English Speaking Course 2.German Language Course 3.Japanese Language Course (Any one online/ offline Course Certificate course of Two Weeks.)

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