An Autonomous Institute

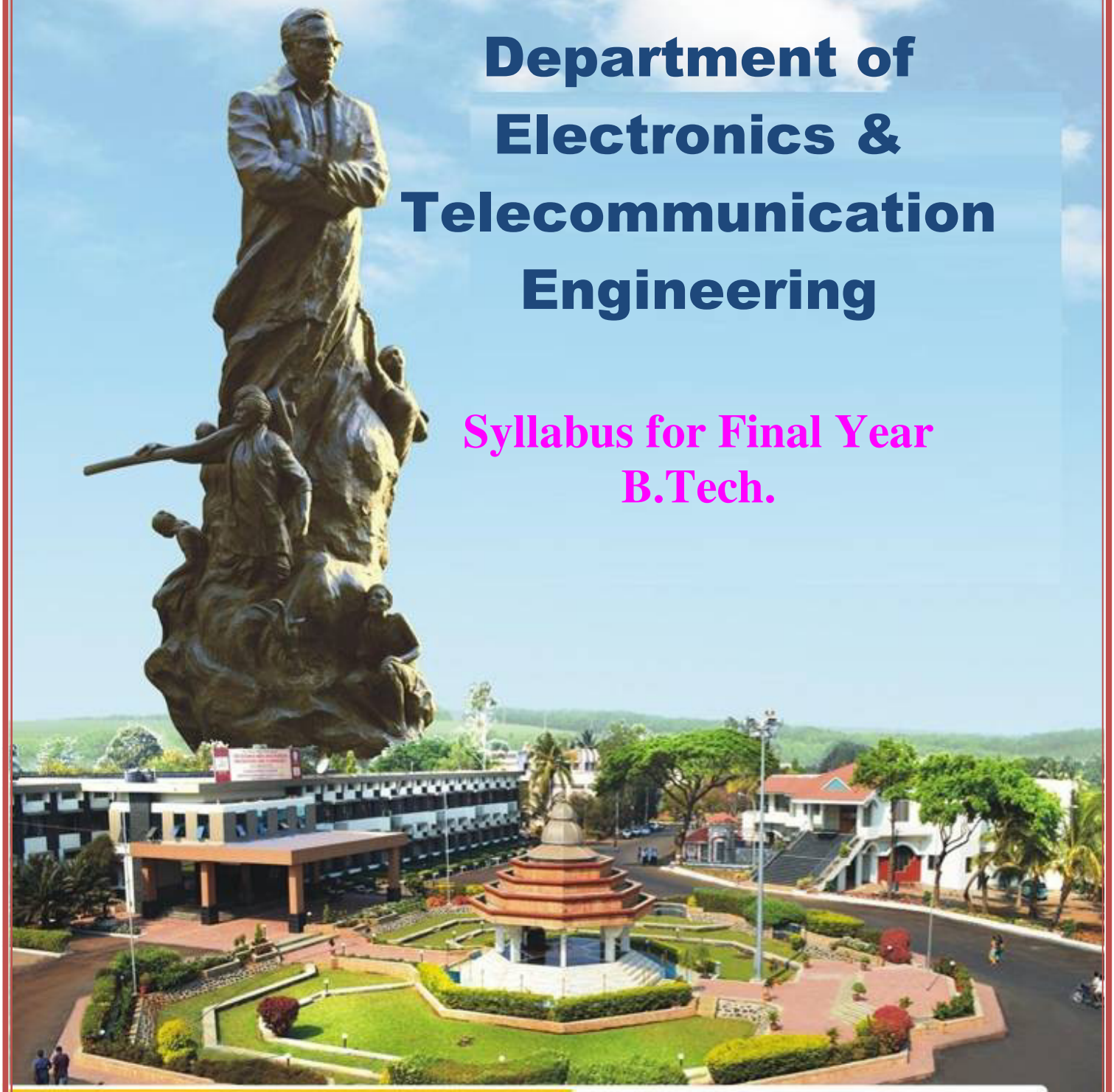
Shree Warana Vibhag Shikshan Mandal's

Tatyasaheb Kore Institute of Engineering And Technology, Warananagar

NBA Accredited Institute

Department of Electronics & Telecommunication Engineering

Syllabus for Final Year 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

E	T	C	7	0	1
Branch Code			Semester	Course Number	

Course Term work and POE Code

E	T	C	7	0	1	T / P / A
Branch Code			Semester	Course Number		T- Term work P- POE A- Audit Course

Final Year B. Tech.

In Electronics & Telecommunication Engineering

Syllabus Structure under Autonomous Status of TKIET, Warananagar

2023-24

Tatyasaheb Kore Institute of Engineering and Technology, Warananagar

An Autonomous Institute

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

Semester-VII

(Implemented from 2023 - 24)

Course Code	Category	Course Title	Teaching Scheme					Examination & Evaluation Scheme			
			L	T	P	CH	C	Component	Marks	Min for Passing	
ETC701	PCC	Computer Networks & Security	3	--	--	3	3	ESE	60	24	40
								ISE	40	16	
ETC702	PCC	Microwave Engineering	3	--	--	3	3	ESE	60	24	40
								ISE	40	16	
ETC703	PCC	Power Electronics & Drives	3	--	--	3	3	ESE	60	24	40
								ISE	40	16	
ETC704	PEC	Elective - I	3	--	--	3	2	ESE	60	24	40
								ISE	40	16	
ETC705	PEC	Elective – II	3	--	--	3	2	ESE	60	24	40
								ISE	40	16	
ETC701P	PCC	Computer Networks & Security Lab.	--	---	2	2	1	ISA	25	10	10
								OE	50	20	20
ETC702P	PCC	Microwave Engineering Lab	--	--	2	2	1	ISA	25	10	10
ETC703P	PCC	Power Electronics & Drives Lab	--	--	2	2	1	ISA	25	10	10
								POE	50	20	20
ETC704T	PEC	Elective - I	-	1	-	-	1	ISA	25	10	10
ETC705T	PEC	Elective – II	-	1	-	-	1	ISA	25	10	10
ETC706P	PW	Project Work & Seminar	--	--	4	6	2	ISA	50	20	20
								POE	25	10	10
ETC707A	--	Audit Course – VII Certificate Course from Edu skills (AWS academy, microchip, Blue prism, CISCO)	--	--	--	--	--	--	--	--	--
			15	**2**	**10**	**27**	**20**	**--**	**800**	**---**	**--**

Tatyasaheb Kore Institute of Engineering and Technology, Warananagar

An Autonomous Institute

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

Semester-VIII

(To be implemented from 2023 - 24)

Credit Scheme

Capstone Pattern / Academic Pattern

Course Code	Category	Course Title	Teaching Scheme					Examination & Evaluation Scheme			
			L	T	P	CH	C	Component	Marks	Min for Passing	
ETC801	PCC	Wireless Communication	4	--	--	4	4	ESE	60	24	40
								ISE	40	16	
ETC802	PCC	Audio & Video Engineering	4	--	--	4	4	ESE	60	24	40
								ISE	40	16	
ETC803	PEC	Elective – III	3	--	--	3	3	ESE	60	24	40
								ISE	40	16	
ETC804	PEC	Elective – IV	3	--	--	3	3	ESE	60	24	40
								ISE	40	16	
ETC801P	PCC	Wireless Communication Lab	--	-	2	2	1	ISA	25	10	10
								POE	50	20	20
ETC802P	PCC	Audio & Video Engineering Lab	--	--	2	2	1	ISA	25	10	10
								POE	50	20	20
ETC805P	PW	Project Work	--	--	8	8	4	ISA	100	40	40
								POE	150	60	60
ETC806A	--	Audit Course – VIII Paper Presentation/ Publication Project	--	--	--	--	--	--	--	--	--
			14	**--**	**12**	**26**	**20**	**--**	**800**	**---**	**--**

indicates the ISA will be based on assignments and hands on programming.

Note:

1] Weekly Contact hours are not mentioned for Industrial Internship Course , as student is expected to be in industryregularly for 12 weeks. However, Student needs to report to institute mentors as and when required.

2] The evaluation of industrial internship will be carried out in the final year examination.

Tatyasaheb Kore Institute of Engineering and Technology,Warananagar

An Autonomous Institute

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

Semester-VIII

(To be implemented from 2023 - 24)

Credit Scheme

Industrial Internship Pattern

Course Code	Category	Course Title	Teaching Scheme					Examination & Evaluation Scheme			
			L	T	P	CH	C	Component	Marks	Min for Passing	
ETC801	PCC	Wireless Communication	4	--	--	4	4	ESE	60	24	40
								ISE	40	16	
ETC802	PCC	Audio & Video Engineering	4	--	--	4	4	ESE	60	24	40
								ISE	40	16	
ETC801T	PCC	Wireless Communication	--	1	--	1	1	*ISA	50	20	20
ETC802T	PCC	Audio & Video Engineering	--	1	--	1	1	*ISA	50	20	20
ETC806P	PW	Project Work	--	--	8	--	4	ISA	100	40	40
								POE	150	60	60
ETC807P	II	Industrial Internship	--	--	--	--	6	ISA	100	40	40
								POE	150	60	60
ETC808A	--	Audit Course – VIII Paper Presentation/ Publication Project	--	--	--	--	--	--	--	--	--
			8	**2**	**8**	**10**	**20**	**--**	**800**	**---**	**--**

*indicates the ISA will be based on assignments and hands on programming.

Note:

1] Weekly Contact hours are not mentioned for Industrial Internship Course, as student is expected to be in industry regularly for 12 weeks. However, Student needs to report to institute mentors as and when required.

2] The evaluation of industrial internship will be carried out in the final year examination.

List of Professional Elective Course

Sr. No.	ELECTIVE –I	ELECTIVE -II	ELECTIVE -III	ELECTIVE -IV
1	ETC7041 **Image Processing**	ETC7051 **Digital CMOS design**	ETC8031 **Satellite communication**	ETC8041 **Biomedical instrumentation**
2	ETC7042 **Embedded systems & RTOS**	ETC7052 **PLC & Automation**	ETC8032 **Electric Vehicle**	ETC8042 **Advanced VLSI design**
3	ETC7043 **Artificial Intelligence**	ETC7053 **Internet of things (IOT)**	ETC8033 **ROBOTICS**	ETC8043 **Computer vision**

Final Year B. Tech.

(Electronics & Telecommunication Engg.)

VIIth Semester Detailed Syllabus

ETC701 - COMPUTER NETWORKS & SECURITY

Lectures : 3Hrs/Week
Credit : 3

Evaluation Scheme
ISE : 40 Marks
ESE : 60 Marks

Course Objectives: The course aims to make the student understand ::	
1	Understand different topologies and terminologies of computer networks.
2	Understand architecture of layered network.
3	Understand functionality, protocols and services of each layer.
4	Understand the need for providing security at different layers.

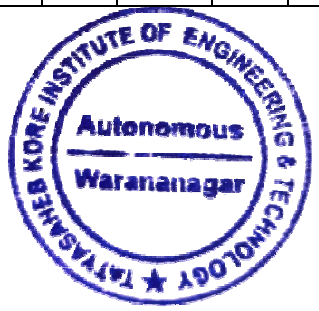
Course Outcomes:		
COs	**At the end of successful completion of the course the student will beable to**	**Blooms Taxonomy**
CO1	Explain the evolution, topologies and terminologies of computer network.	Understand
CO2	Explain the architecture of layered network.	Remember
CO3	List and explain different functionalities, protocols and services of each layer.	Remember
CO4	Elaborate the need for security in computer networks.	Analyze

Description:		
This course introduces basic architecture and topologies of computer networks discusses the different various functions and protocols at each layer of OSI and TCP/IP reference models. In this course, functions of each layer of OSI and TCP/IP model, required hardware components, configurations and layer to layer interfacing is included.		
Prerequisites:	1	Analog Communication

Course Contents		
Unit No:1	**Introduction to Computer Networks** Basics of Computer Networks, Network Topologies, Network Categories, Reference models-OSI &TCP/IP, Addressing types-Physical, Logical & port address, Network Devices Transmission media and types	**6 Hrs.**
Unit No:2	**DATA LINK LAYER** Framing, flow control and error control, DLL protocols, sliding window protocols, multiple access protocols, HDLC point to point protocol.	**6 Hrs.**
Unit No:3	**NETWORK LAYER** Design issues, Routing algorithms – shortest path, distance vector routing, DHCP, link state routing. Routing protocols - RIP, OSPF, IP Addressing, Subnetting /Supernetting, IPv4, IPv6 header format and basic address mode, Congestion control, traffic shaping algorithms.	**8 Hrs.**
Unit No:4	**TRANSPORT LAYER** Transport layer Protocols- TCP an UDP, Flow control, congestion control and Quality of Service.	**6 Hrs.**
Unit No:5	**APPLICATION LAYER** Application layer Protocols- DNS, HTTP, SMTP, Telnet, FTP	**6 Hrs.**
Unit No:6	**NETWORK SECURITY** Need for Security , Security Attacks ,Services and Mechanisms, IPSec Protocol, Virtual private Network(VPN)	**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	2	1	2	1				3	3			2		1
CO2	3	2	1	2	1				3	3			2		1
CO3	3	2	1	2	1				3	3			2		1
CO4	3	2	1	2	1				3	3			2		1



Text Books:	
1	“Data Communications and Networking”, Behrouz A. Forouzan, 4th Edition, TATA McGraw Hill.
2	“Computer Networks”, Andrew Tenenbaum, 4th Edition, Pearson Education .

Reference Books:	
1	“Introduction to Data communications and Networking”, Wayne Tomasi, Pearson Education.
2	“TCP/IP Protocol Suite”, Forouzan , IIIrd Edition Tata Mc-Graw Hill publication.

ETC702 - MICROWAVE ENGINEERING

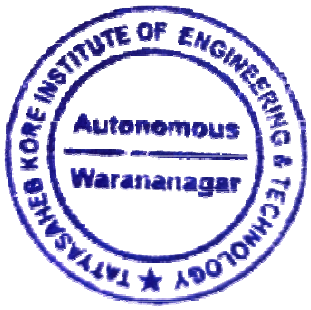
Lectures : 3 Hrs/Week
Credit : 3

Evaluation Scheme
ISE : 40 Marks
ESE : 60 Marks

Course Objectives: The course aims to make the student understand ::	
1	Various microwave Devices, amplifiers and oscillators to know theirapplications in various domains.
2	Make students aware of the fundamentals of microwave engineering in order to reach the desire industry skills sets.
3	Various microwave measurement techniques.
4	Aware students about different types of Microwave Hazards. Study manufacturing technique of MMIC.

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Illustrate different modes of propagation in waveguides.	Understand
CO2	Classify microwave component for various applications.	Analyze
CO3	Select different devices for microwave measurement techniques.	Analyze
CO4	Measure the output power, VSWR, impedance, frequency and wavelength of microwave signal	Apply

Description:		
Course deals with how microwave signal is transmitted using different microwavejunctions. Course discusses different types of Microwave devices and Components. Also it deals with applications of Microwave and measurement of different microwaveparameters...		
Prerequisites:	1	Electromagnetic Field Theory, Transmission lines.



Course Contents		
Unit No:1	**Microwave Wave Guides.** Rectangular wave guides: TE and TM modes in wave guides,power transmission in rectangular wave guide, power losses in rectangular wave guide, excitation modes in wave guide, microwave hybrid circuits, E plane Tee ,H plane Tee, directional coupler, Circulators and Isolators, microwave attenuators.	**6 Hrs.**
Unit No:2	**Microwave Tubes** Microwave linear beam Tubes: Klystrons, Reentrant Cavities, Velocity-Modulation Process, Bunching Process in Klystrons, reflex klystron, slow wave sutures, Traveling-Wave Tubes (TWTs).Microwave CROSSED-FIELD TUBES: Magnetron Oscillators, Forward and backward wave crossed field amplifier(CFA).	**6 Hrs.**
Unit No:3	**Monolithic Microwave Integrated Circuits and Hazards** Materials: substrate, conductor dielectric & resistive MMIC growth, thin film formation, hybrid microwave I.C. fabrication, Electromagnetic compatibility, plane wave propagation in shielded rooms, anechoic chambers, microwave clean rooms, microwave hazards.	**6 Hrs.**
Unit No:4	**Microwave Solid State Devices** Microwave bipolar transistor, microwave FETs, Microwave tunnel diodes, Gunn Effect diodes, RWH Theory, LSA diodes, InP diodes, CdTe diodes, IMPATT diodes, PIN diodes, MESFETs and HEMT.	**6 Hrs.**
Unit No:5	**Microwave Measurements and Microwave Applications**. Microwave Test bench, measurement of microwave: Bolometer method, power bridge circuit, Calorimeter method, Barraters. Measurement of wavelengths, Measurement of microwave frequency: wave meter ,Slotted section, measurement of VSWR, measurements of attenuation, free space attenuation, Microwave applications.	**6 Hrs.**
Unit No:6	**Microwave Antennas** Antenna parameters: antenna gain, directivity and beam width, Horn antenna, parabolic reflector with all types of feeding methods, slotted antenna, Lens antenna, Micro strip antennas Corner reflector. Equations for antenna gain, directivity and beam width of all above antenna types	**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	2	1		1									1	
CO2	3	2		1											
CO3	3	3	1												2
CO4	2	1													1

Text Books:	
1	“Microwave Devices and Circuit”, Samuel Liao, Prentice hall of India
2	“Microwave Engineering”,Annapurna Das, TMH Publication
3	“Microwave Engineering”, Sushrut Das, Oxford Publication

Reference Books:	
1	“Microwave Active Devices vacuum and solid state”, M.L. Sisodia
2	“Basic laboratory microwave techniques”, Manual, Sisodia and Raghuvanshi Wiley
3	“Foundation for Microwave Engg”, R.E.Collin, Wiley Publications
4	“Microwave Engineering”,David M. Pozer., Wiley Publications

ETC703 - POWER ELECTRONICS & DRIVES

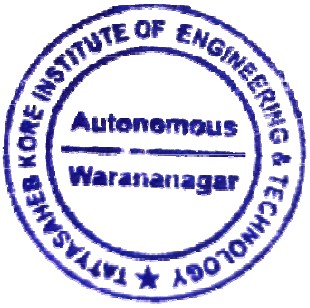
Lectures : 3 Hrs/Week
Credit : 3

Evaluation Scheme
ISE : 40 Marks
ESE : 60 Marks

Course Objectives: The course aims to make the student understand ::	
1	Various configurations of three phase-controlled rectifier.
2	Various configurations of three phase AC Voltage controller & cyclo-converter.
3	Various configurations of three phase inverter.
4	Gain knowledge and understanding of AC & DC drives.

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Ability to analyze and evaluate the three-phase controlled converter.	Analyze
CO2	Ability to build power electronic circuits using simulation tools.	Analyze
CO3	Ability to design, analyze and understand the operation of inverter & cyclo-converter.	Design
CO4	Understand the fundamental principles and applications AC drives &DC drives.	Understand

Description:		
This course provides different power converters which has applications in different industrial requirements. It also deals with 3 phase (AC-DC & DC-AC) converters with analysis and performance parameters. Students should have clear understanding of simulation & hardware implementation related to power converters.		
Prerequisites:	1	Electronics Circuit Design, Power Electronics



Course Contents		
Unit No:1	**3-PHASE CONTROLLED RECTIFIERS:** Concepts of 3-phase, half wave controlled rectifier with R load, half controlled and full controlled converter with RL load (continuous and discontinuous current mode of operation). Effect of source inductance on performance of 3-phase converters, mathematical analysis all above converter topologies are expected.	**8Hrs.**
Unit No:2	**3 PHASE INVERTERS:** IGBT based inverters: 3-phase bridge inverter (120 and 180 mode of conduction), comparison of VSI and CSI inverter.	**4Hrs.**
Unit No:3	**AC REGULATOR:** Single phase AC regulator, Three phase AC regulators. Introduction to cyclo-converters, 1-phase to 1-phase, 3-phase to 1-phase, 3-phase to 3- phase: bridge configuration and circulating and non-circulating mode of operation for 1 phase midpoint configuration.	**6 Hrs.**
Unit No:4	**FUNDAMENTALS OF ELECTRIC DRIVES :** Block diagram of an electric drive, parts of electric drive, and selection criteria of electric drives, comparison of D.C. and A.C. drive, adjustable speed drive. D.C. motor: starting and breaking, conventional speed control methods. A.C. Motor: starters for 3 phase induction motor –D.O.L., star-delta starter, autotransformer starter, rotor resistance starter.	**8Hrs.**
Unit No:5	**D.C. MOTOR CONTROL**: Equivalent circuit, operating modes, regenerative braking, dynamic braking, plugging, constant torque and constant power control, three phase controlled rectifier fed drives, four quadrant chopper drive. Numerical are expected on above mentioned chopper fed drive.	**5 Hrs.**
Unit No:6	**A.C. MOTOR CONTROL:** Starting, braking, speed control, Equivalent circuit, speed control methods: stator voltage control, rotor voltage control, frequency control(V/F); slip power recovery scheme-Scherbius drive, VSI Fed induction motor drive.	**5 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	“Power Electronics”, P.C.Sen, Tata McGraw-Hill Education.
2	“Power Electronics”, M.D. Singh, K.B. Khanchandani, 2nd Edition, Tata- McGraw Hill
3	“Fundamentals of Electrical Drives”, G.K.Dubey

Reference Books:	
1	“Power Electronics”, M.H. Rashid, 3rd Edition, Pearson
2	“Power Electronics ”, Ned Mohan, Wiely Publication
3	“Power Electonics& motor Control**”,** V.R.Moorthi, Shephard, 2ndEdition, Cambridge Publication

ETC7041 – IMAGE PROCESSING

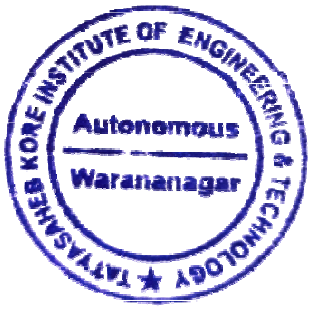
Lectures : 3 Hrs/Week
Credit : 3

Evaluation Scheme
ISE : 40 Marks
ESE : 60 Marks

Course Objectives: The course aims to make the student :	
1	To describe basic concepts of digital image processing.
2	To describe and implement various methods for image enhancement and recognition.
3	To explain concept of image segmentation and compression.
4	To acquaint with MATLAB image processing toolbox to implement image processing techniques.

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	**Explain** the fundamental concepts in digital image processing.	Understanding
CO2	**Apply** gray level transformations, spatial filters and histogram processing for image enhancement.	Application
CO3	**Select** morphological operators for extracting image features.	Application
CO4	**Examine** image segmentation and compression used in digital image processing.	Analyze

Description:		
The course introduces fundamentals of a digital image, its acquisition, enhancement, recognition and compression.		
Prerequisites:	1	Signal Processing Techniques, MATLAB Programming



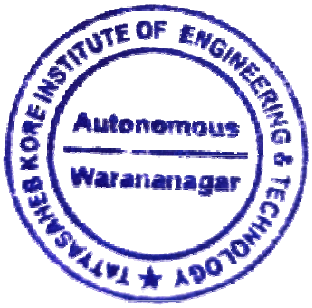
Course Contents		
Unit No:1	**INTRODUCTION :** Concept of digital image processing, steps in image processing, components of image processing system, Applications areas.	**6 Hrs.**
Unit No:2	**DIGITAL IMAGE FUNDAMENTALS :** Image sensing and acquisition, Basic concept of sampling and quantization, representations of digital image, spatial and gray level resolution, zooming and shrinking of image, Basic relationship between pixels.	**7 Hrs.**
Unit No:3	**IMAGE ENHANCEMENT IN SPATIAL DOMAIN :** Basic gray level transformations, image negation, log transformations, power law transformations, piece wise linear transformations, histogram processing, histogram equalization, histogram matching, Image enhancement using arithmetic and logical operations	**8 Hrs.**
Unit No:4	**SPATIAL FILTERS :** Smoothing spatial filters: smoothing linear, order statistic filters, sharpening spatial filters: Use of second derivatives for enhancement, Use of first derivatives for enhancement.	**8Hrs.**
Unit No:5	**MORPHOLOGICAL IMAGE PROCESSING :** Dilation & erosion, opening and closing operation, Hit- or –miss transformation, Morphological algorithms: Boundary extraction, region filling, thinning and thickening.	**6 Hrs.**
Unit No:6	**EDGE DETECTION AND SEGMENTATION :** Detection of discontinuities: point, line and edge detection, Thresholding, Region based segmentation	**5 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	3	2		2							1				
CO3	2	2	2		2	1									2
CO4	2	3	2	2	2	1						1			1

Text Books:	
1	“Digital Image Processing”, Rafael C Gonzalez, Richard E.Woods, Pearson Publication
2	“Fundamentals of Digital Image Processing”, Anil Jain
3	“Digital Image Processing and Analysis”,B. Chanda , D. Dutta Mujumder
4	“Digital Image Processing”, S. Sridhar Oxford

Reference Books:	
1	“Digital Image Processing using Matlab”, Rafael C Gonzalez.
2	“Fundamentals of Digital Image Processing”, S.Annadurai, R. Shanmugalaxmi, Pearson Publication



ETC7042 – EMBEDDED SYSTEM & RTOS

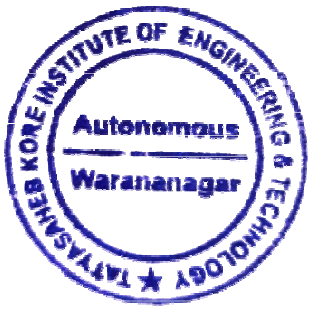
Lectures : 3 Hrs/Week
Credit : 3

Evaluation Scheme
ISE : 40 Marks
ESE : 60 Marks

Course Objectives: The course aims to make the student :	
1	To understand the Embedded system design issues.
2	To understand real time operating system concepts.
3	To understand the Embedded Linux environment
4	To understand embedded software development and

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Apply design metrics of Embedded systems to design real time applications to match recent	Understand
CO2	Apply Real time systems concepts.	Analyze
CO3	Evaluate µCOS operating system and its services.	Implement
CO4	Apply Embedded Linux Development Environment and testing tools.	Solve

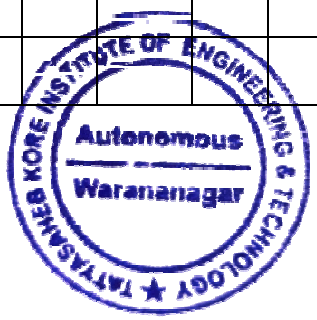
Description:		
To understand the Embedded system design issues., operating system concepts., real time operating system concepts, embedded software development and testing tools.		
Prerequisites:	1	Basics of Microcontroller, Knowledge of Operating system



Course Contents		
Unit No:1	**INTRODUCTION TO EMBEDDED SYSTEM** Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems.	**8Hrs.**
Unit No:2	**FUNDAMENTALS OF OS AND SYSTEM SOFTWARE:** Overview of all system software Operating system- I/O Manager- Assembler Compiler- Linker- Loader, OS services and components, multitasking, multiprogramming, time sharing, buffering, spooling	**6 Hrs.**
Unit No:3	**PROCESS AND THREAD MANAGEMENT:** Concept of process and threads , process states process management context, switching interaction between processes and OS , multithreading. .	**6 Hrs.**
Unit No:4	**MEMORY MANAGEMENT:** Memory partitioning , swapping, paging, segmentation, virtual memory - Concepts, Overlays, Demand paging, Performance of demand paging , page replacement algorithm, Allocation algorithms	**6 Hrs.**
Unit No:5	**INTRODUCTION TO RTOS :** Architecture of kernel, task and task scheduler, ISR, Semaphores, Mutex, Mailboxes and Pipes, Message Queues, Timers, Memory Management	**6 Hrs.**
Unit No:6	**EMBEDDED SOFTWARE DEVELOPMENT AND TRAINING** Embedded Software development process and tool chain, Host and Target Machines, Porting Embedded Software into the Target System, Testing on Host Machine, Simulators. Introduction to Development Platform Trends (only introduce IDE, board Details and Application) Arduino	**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	3	2		2									3	
CO2	1	2		3											
CO3	3	3	1												2
CO4	2	1													2



Text Books:	
1	"MicroC OS II, The Real-Time Kernel", Jean J. Labrosse, 2nd Edition, CMP Books.
2	"Embedded Linux Primer -A Practical, Real-World Approach", Christopher Hallinan, 2nd Edition, Prentice Hall.

Reference Books:	
1	"Embedded Systems – Architecture, Programming and Design", Raj Kamal, 2nd Edition, McGraw Hill.
2	"Embedded System Design – A Unified Hardware/Software Introduction" , Frank Vahid and Tony Givargis, 3rd Edition, Wiley.
3	"An Embedded Software Prime", David E. Simon, Pearson Education

ETC7043 – ARTIFICIAL INTELLIGENCE

Lectures : 3 Hrs/Week
Credit : 3

Evaluation Scheme
ISE : 40 Marks
ESE : 60 Marks

Course Objectives: The course aims to make the student :	
1	To learn various types of algorithms useful in Artificial Intelligence (AI).
2	To convey the ideas in AI research and programming language related to emerging technology.
3	To understand the concepts of machine learning, pattern recognition, and natural languageprocessing.
4	To understand the numerous applications and huge possibilities in the field of AI thatgobeyond the normal human imagination.

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Design and implement key components of intelligent agents and expert systems.	Understand
CO2	Apply knowledge representation techniques and problem solving strategies to commonAI applications.	Analyze
CO3	Apply and integrate various artificial intelligence techniques in intelligent system.	Implement
CO4	Build rule-based and other knowledge-intensive problem solvers.	Solve

Description:		
The course intend to make students understand and explore the techniques underlying the design of artificial Intelligence based systems.		
Prerequisites:	1	Computer and Programming Basics, Analysis of Algorithms, Discrete Mathematics.

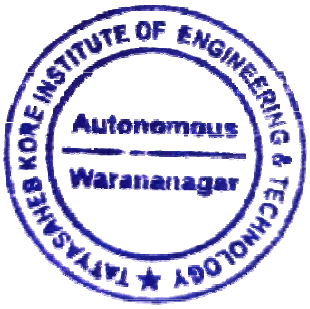
Course Contents		
Unit No:1	**FOUNDATION:** Intelligent Agents, Agents and environments, Good behavior, The nature of environments, structure of agents, Problem Solving, problem solving agents, example problems, Searching for solutions, uniformed search strategies, avoiding repeated states, searching with partial information.	**6 Hrs.**
Unit No:2	**SEARCHING :** Search and exploration, Informed search strategies, heuristic function, local search algorithms and optimistic problems, local search in continuous spaces, online search agents and unknown environments, Constraint satisfaction problems (CSP), Backtracking search and Local search for CSP, Structure of problems, Games: Optimal decisions in games, Alpha- Beta Pruning, imperfect real-time decision, games that include an element of chance.	**6 Hrs.**
Unit No:3	**KNOWLEDGE REPRESENTATION :** First order logic, representation revisited, Syntax and semantics for first order logic, Using firstorder logic, Knowledge engineering in first order logic, Inference in First order logic, prepositional versus first order logic, unification and lifting, forward chaining, backward chaining, Resolution, Knowledge representation, Uncertainty and methods, Bayesian Probability and Belief network, probabilistic Reasoning, Bayesian networks, inferences in Bayesian networks, Temporal models, Hidden Markov models.	**7 Hrs.**
Unit No:4	**LEARNING :** Learning from observations: forms of learning, Inductive learning, Learning decision trees, Ensemble learning, Knowledge in learning, Logical formulation of learning, Explanation based learning, Learning using relevant information, Inductive logic programming, Statistical learningmethods, Learning with complete data, Learning with hidden variable, EM algorithm, Instance based learning, Neural networks - Reinforcement learning, Passive reinforcement learning,Active reinforcement learning, Generalization in reinforcement learning.	**6 Hrs.**
Unit No:5	**PATTERN RECOGNITION & EXPERT SYSTEMS :** Basic steps of pattern recognition system, Feature Extraction- Principal Component Analysis, Linear Discriminate Analysis, Classification, Object Recognition- Template Matching theory, Prototype Matching Theory, Speech Recognition, Pattern Mining- Apriori Algorithm,	**6 Hrs.**
Unit No:6	**NATURAL LANGUAGE UNDERSTANGING :** Why NL, Formal grammar for a fragment of English, Syntactic analysis, Augmented grammars, Semantic interpretation, Ambiguity and disambiguation, Discourse understanding, Grammar induction, Probabilistic language processing, Probabilistic language models	**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	"Artificial Intelligence‖, A Modern Approach", Stuart Russell, Peter Norvig, Pearson Education, Prentice Hall of India.
2	"Artificial Intelligence", George F Luger, Low Price Edition, Pearson Education., Fourth edition.
3	"Artificial Intelligence‖", Elaine Rich and Kevin Knight, Third Edition, Tata McGraw-Hill Education Pvt. Ltd., 2008.

Reference Books:	
1	"A First Course in Artificial Intelligence", Deepak Khemani ,McGraw Hill Education (India)
2	"Artificial Intelligence and Intelligent Systems", N. P. Padhy, Oxford
3	"Artificial Intelligence", Rob Callan, Palgrave MacMillan
4	"Artificial Intelligence", Saroj Kaushik, Cengage Learning.



ETC7051- DIGITAL CMOS DESIGN

Lectures : 3Hrs/Week
Credit : 3

Evaluation Scheme
ISE : 40 Marks
ESE : 60 Marks

Course Objectives: The course aims to make the student understand ::	
1	To study of basic concept of CMOS VLSI Design technology.
2	To understand Design Implementation and working CMOS Inverter
3	To provide knowledge in designing of Semiconductor Memories.
4	To provide knowledge in designing data path for digital system.

Course Outcomes:

COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Explain the design issues of MOS devices and realize CMOS devices using layouts..	Understand
CO2	Analyzing Static and Dynamic parameters of CMOS inverter.	Analyze
CO3	Design of Semiconductor Memories.	Implement
CO4	Synthesize data path design for high speed Adders and Multipliers	Solve

Description:

This course brings circuit and system level views on design on the same platform. The course follows a design perspective, starts from basic specifications and ends with system level blocks

Prerequisites:	1	A basic course of Semiconductor Devices and Digital Electronics. A course on Computer Organization .Digital System Design Using FPGA

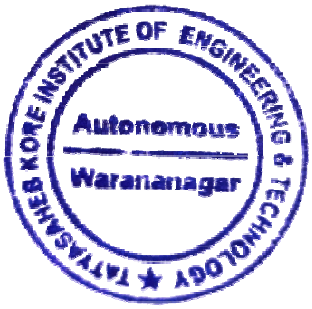
Course Contents		
Unit No:1	**Introduction to CMOS Technology:** Introduction to CMOS Technology, VLSI Circuits, Comparison of BJT, NMOS and CMOS technology. Fabrication process flow for NMOS, PMOS and CMOS. MOSFET characteristics, MOS modeling. Types of MOSFET scaling, Lambda based design rules, MOSFETcapacitances.	**5 Hrs.**
Unit No:2	**MOSFET Inverter: C**MOS inverter, Static and dynamic analysis such asnoise, Propagation delays/switching delays, power dissipation, etc. CMOS latch up, CMOS circuits and Logic design, transistor sizing, basic physical design of simple logic gates.MOS design styles, realization of universal gates and compound gates using MOS Transistors, Fundamentals of circuit characterization and performance estimation, Transmission gates, pass transistor logic.	**8 Hrs.**
Unit No:3	**Combinational Circuit Design :** Introduction, Circuit families: Ratioed circuits: Pseudo-nMOS, Cascode Voltage Switch Logic, Dynamic circuits, Domino Logic, Pass-transistor circuits, Bi-CMOS circuits.	**7 Hrs.**
Unit No:4	**Sequential Circuit Design:** Introduction, Static Latches and Registers, Dynamic Latches and Registers, Alternative registers Styles. Introduction, Behavior of bi-stable elements, SR latch circuits, clocked latch and flip flop circuits, CMOS D-latch and edge Triggered Flip-Flop.	**6 Hrs.**
Unit No:5	**Semiconductor Memories**: SRAM: 6T SRAM, operation, design strategy,leakage currents, read/write circuits, sense amplifier. DRAM: 1T_DRAM, operation modes, leakage currents, refresh operation, physical design. ROM Array: NAND and NOR PROM, Non volatile read/write memories classificationand programming techniques.	**6 Hrs.**
Unit No:6	**Data Path Design**: Adder: CLA adder, MODL, Manchester carry chain and high speed adders like carry skip, carry select and carry save. Multipliers andshifter: Array multiplier and barrel shifter/	**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	"CMOS Digital Integrated Circuits Analysis andDesign", Sung-Mo Kang and Yusuf Leblebici, Tata McGraw Hill, 3rd Edition
2	"Introduction to VLSI CIRCUITS AND SYSTEMS", John P. Uyemura, Wiley India Pvt. Ltd.
3	"Digital Integrated Circuits: ADesign Perspective", Jan M. Rabaey, Anantha Chandrakasan and Borivoje Nikolic Pearson Education, 2nd Edition & Additional Study Material
4	Basics of CMOS Cell Design", Etienne Sicard and Sonia Delmas Bendhia Tata McGraw Hill, First Edition.

Reference Books:	
1	"CMOS VLSI Design: A Circuits andSystems Perspective", Neil H. E. Weste, David Harris and Ayan Banerjee, Pearson Education, 3rd Edition
2	"VLSI Design", Debaprasad Das, Oxford, 1st Edition
3	"Low-Power CMOS VLSI Circuit Design", Kaushik Roy and Sharat C. Prasad, Wiley,Student Edition



ETC7052 - PLC AND AUTOMATION

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 understand the generic architecture and constituent components of a Programmable Logic Controller.
2	To develop a software program using modern engineering tools and techniques for PLC.
3	To apply knowledge gained about PLCs systems to identify few real-life industrial applications.
4	To troubleshoot different PLC based systems

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Describe working of various blocks of PLC System and their functions	Describe
CO2	Understand the fundamental of PLC Ladder Programming	Understand
CO3	Gain adequate knowledge about various basic and advanced Instruction in PLC	Understand
CO4	Identify and Troubleshoot PLC System faults	Applying

Description:		
This subject deals with fundamentals of automation, study of PLC Programming & use of PLC for industrial automation. Troubleshooting & wiring of PLC automation systems.		
Prerequisites:	1	Digital Systems, Transducers & Measurement

Course Contents		
Unit No:1	**Programmable Logic Controllers Introduction** Programmable Logic Controllers, Parts of a PLC Principles of Operation, Modifying the Operation, PLCs versus Computers, PLC Size and Application, Discrete I/O Modules, Analog I/O Modules, I/O Specifications	**8 Hrs.**
Unit No:2	**Basics of PLC Programming** Processor Memory Organization, Program Files, Data Files, Program Scan, PLC Programming Languages, Relay-Type Instructions, Instruction Addressing, Branch Instructions, Internal Relay Instructions, Programming Examine If Closed and Examine If Open Instructions	**7 Hrs.**
Unit No:3	**PLC Wiring Diagrams and Ladder Logic Programs** Contactors, Motor Starters. Output Control Devices, Seal-In Circuits, Latching Relays. , Converting Relay Schematics into PLC Ladder Programs. , Writing a Ladder Logic Program.	**7 Hrs.**
Unit No:4	**Programming Timers & Counters** Timer Instructions, On-Delay Timer Instruction, Off-Delay Timer Instruction, Retentive Timer, Cascading Timers Counter Instructions, Up-Counter, One-Shot Instruction. Down-Counter, Cascading Counters, Incremental Encoder-Counter Applications, Combining Counter and Timer Functions.	**6 Hrs.**
Unit No:5	**Advanced Instructions** Data Manipulation, Data Transfer Operations, Data Compare Instructions, Master Control Reset Instruction, Jump Instruction, and Subroutine Functions. Math Instructions, Addition Instruction, Subtraction Instruction, Multiplication Instruction, Division Instruction, Sequencer, Shift Instructions	**6 Hrs.**
Unit No:6	**PLC Installation Practices, Editing, and Troubleshooting** Voltage Variations and Surges. Program Editing and Commissioning, Programming and Monitoring Preventive Maintenance Troubleshooting	**7 Hrs.**

Note: Write 8 to 10 Tutorials based on above content

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							2		1
CO2	2			2			2						1	3	
CO3	1			1			3								3
CO4				3			3								

Text Books:	
1	"PLC Programming methods and applications", John R Hackworth Frederick D Hackworth Jr. , Pearson Education second and latest edition
2	"PLC Principles and Applications", John W Webb Ronald A. Reis , PHI,5th edition.

Reference Books:	
1	"Programmable logical controller" Frank D. Petruzella, The McGraw-Hill
2	"Mechatronics", W. Bolton, Pearson education
3	"Introduction to Programmable Logic Controllers", Gary Dunning, Thomson

ETC7053 - INTERNET OF THINGS (IOT)

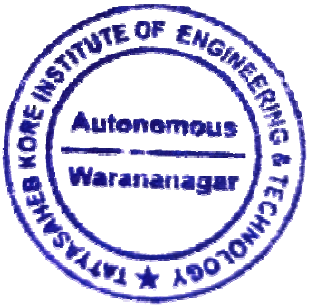
Lectures : 3 Hrs/Week
Credit : 3

Evaluation Scheme
ISE : 40 Marks
ESE : 60 Marks

Course Objectives: The course aims to make the student understand ::	
1	To introduce the fundamentals of sensors and actuators along with the basic concepts of an IoT & IoE
2	To give Insights into the Architecture and M2M technology for an IoT.
3	To Exposing students to the usage of Protocol Standardization for IoT with IoT Edge and Gateway Network with Communication protocols.
4	To develop design skills in industrial IoT.
5	To provide IoT Solutions with sensor-based application through embedded system platform

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Comprehend and analyze concepts of sensors, actuators, IoT and IoE.	Understand
CO2	Interpret IoT Architecture Design Aspects.	Analyze
CO3	Comprehend the operation of IoT protocols	Implement
CO4	Describe various IoT boards, interfacing, and programming for IoT..	Solve

Description:		
To introduce the fundamentals of sensors and actuators along with the basic concepts of an IoT & IoE. Study Architecture and M2M technology for an IoT.. Develop design skills in industrial IoT.Provide IoT Solutions with sensor-based application through embedded system platform		
Prerequisites:	1	Basic knowledge of Sensor, Knowledge of Interfacing Devices



Course Contents		
Unit No:1	**SENSORS, ACUATORS,IoT& IoE** IoT-An Architectural Overview, building architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations. M2M and IoT Technology FundamentalsDevices and gateways, Local and wide area networking,	**6Hrs.**
Unit No:2	**IoT ARCHITECTURE DESIGN ASPECTS** Building architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations. M2M and IoT Technology	**6 Hrs.**
Unit No:3	**IoT PROTOCOLS:** PHY/MAC Layer (3GPP MTC, IEEE 802.11, IEEE 802.15), Wireless HART, Z Wave, Bluetooth Low Energy, Zigbee Smart Energy, DASH7 - Network Layer- IPv4, IPv6, 6LoWPAN, 6TiSCH, ND, DHCP, ICMP, RPL, CORPL, CARP, Transport Layer Session Layer	**6Hrs.**
Unit No:4	**INTERFACING BOARDS AND PROGRAMMING** Introduction to IoT Boards, Interfacing with IoT Boards, IoT deployment for Raspberry Pi Arduino/Equivalent platform – Reading from Sensors, Communication: Connecting microcontroller with mobile devices	**6Hrs.**
Unit No:5	**INDUSTRIAL IoT** Introduction, Key IIOT technologies, Catalysts, and precursors of IoT, Innovation and the IoT, Applications of IoT Examples: Healthcare, Oil and Gas Industry, Logistics and the Industrial Internet, Retail applications, IoT innovations and design methodologies, Industrial Internet Architecture	**6 Hrs.**
Unit No:6	**APPLICATIONS OF IoT** Smart Environment: Forest Fire Detection, Air Pollution, Smart Cities: Parking, Structural Health, Noise Urban maps, Smart Metering: Smart Grid, Tank level, Photovoltaic Installations, Silos Stock Calculation, Health: Fall Detection	**6Hrs.**

Mapping of POs & COs:

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

Text Books:	
1	"Internet of Things From research and innovation to market Deployment", Ovidiu Vermesan, Peter Fresiss, River Publishers series in Communication, USA.
2	"The Internet of Things: Key Applications and Protocols", Olivier Hersent, David Boswarthick, and Omar Elloumi, 2nd Edition, Wiley Publications
3	"Electromagnetic Waves and Radiation Systems", Jordan and Balmain, 2nd edition, PHI publication
4	"Electronics Communication System", Kennedy Davis, 5th edition, Tata McGraw Hill Publication

Reference Books:	
1	"Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems", Dr. Ovidiu Vermesan, Dr. Peter Friess, River Publishers Series in Communication
2	"Internet of Things: Case Studies", Libelium Inc, White papers, Spain **http://www.libelium.com/resources/case-studies**

ETC701P- COMPUTER NETWORKS & SECURITY 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	Understand various internetworking needs.
2	Understand installation and maintenance of computer networks.
3	Understand network communication protocols and perform various experiments based on it.
4	Understand the design and implement various types of networks with the help of classes of networks and addressing schemes using modern simulation tools and provide security.

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	List the various networking components required for designing network.	Understand
CO2	Work on various layers and architectures of computer networks.	Solve
CO3	Explain network communication protocols and perform various experiments based on it.	Remember
CO4	Design and implement various security algorithms.	Analyze

Description:		
This course introduces basic architecture and topologies of computer networks discusses the different various functions and protocols at each layer of OSI and TCP/IP reference models. In this course, functions of each layer of OSI and TCP/IP model, required hardware components, configurations and layer to layer interfacing is included.		
Prerequisites:	1	Analog Communication, Digital Communication

List of Experiments			
Minimum 08 experiments:			
Sr. No.	**Name of the experiment**	**Hrs.**	**Cognitive levels of attainment as per Bloom's**
1	Study of network components.	2	Study
2	Network formation using networking cables.	2	Knowledge
3	Study of LAN topologies and their creation	2	Study
4	Implementation of different topologies using CISCO packet tracer.	2	Knowledge, Evaluation
5	Investigation of TCP packets using wire shark	2	Knowledge, Evaluation
6	Investigation of ARP packets using wire shark	2	Knowledge, Evaluation
7	Investigation ICMP packets using wireshark	2	Knowledge, Evaluation
8	Implementation and verification of IP classes	2	Knowledge, Evaluation
9	Implementation of distance vector routing algorithm	2	Knowledge, Evaluation
10	Study of basic network security.	2	Study

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	2	1				3	3			2		1
CO2	3	2	1	2	1				3	3			2		1
CO3	3	2	1	2	1				3	3			2		1
CO4	3	2	1	2	1				3	3			2		1

ETC702P- MICROWAVE ENGINEERING LAB

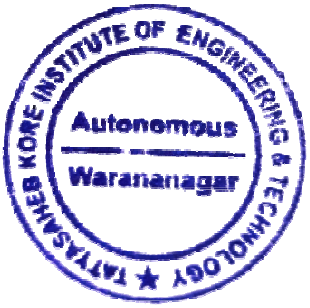
Practical : 2 Hrs/Week
Credit : 1

Evaluation Scheme
ISA : 25 Marks

Course Objectives: The course aims to make the student understand :	
1	Illustrate different microwave devices
2	Selection of different microwave devices for measurement techniques.
3	Understand to measure various microwave parameters
4	Understand microwave components for various applications.

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Measure the output power, VSWR, impedance, frequency and wavelength of microwave signal.	Analyze
CO2	Understand microwave components for various applications.	Understand
CO3	Analyze the microwave waveguides and passive circuit components.	Analyze
CO4	Apply the microwave antenna knowledge for industrial and scientific purposes	Apply

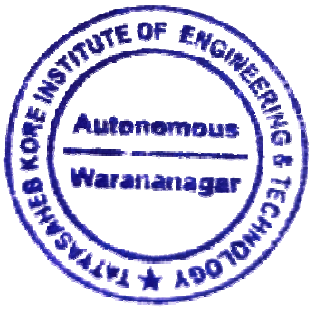
Description:		
Course deals with different types of Microwave tubes. Different types of wave components. It deals with various microwave measurement techniques .		
Prerequisites:	1	Electromagnetic Field Theory , Antenna theory



List of Experiments			
Minimum 08 experiments:			
Sr. No.	**Name of the experiment**	**Hrs.**	**Cognitive levels of attainment as per Bloom's**
1	Study of Microwave component	2	Knowledge
2	Study of characteristics of Klystron tube & to determine Electronic tuning Range	2	Knowledge
3	To Determine the frequency & wavelength in Rectangular Waveguide working on TE_{10} Mode	2	Knowledge,
4	To Determine the Standing wave ratio & Reflection coefficient	2	Knowledge, Evaluation
5	To Study V-I characteristic of Gunn Diode	2	Knowledge, Evaluation
6	To Measure Polar Pattern & the Gain of Waveguide Horn Antenna	2	Analysis, Evaluation
7	Study of Magic Tee	2	Simulation
8	Study of Circular/ Isolator	2	Simulation
9	Study of Attenuator (Fixed & Variable)	2	Study

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	1			
CO2	1	1									2	1			
CO3	2	2			2							2			
CO4		2	2	3					1						



ETC703P- POWER ELECTRONICS & DRIVES LAB

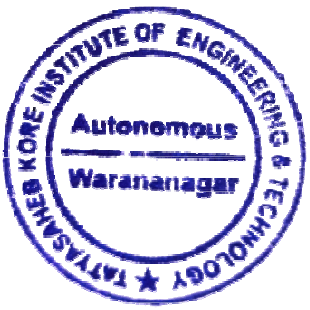
Practical : 2 Hrs/Week
Credit : 1

Evaluation Scheme
ISA : 25 Marks
POE : 50 Marks

Course Objectives: The course aims to make the student understand :	
1	Various configurations of three phase-controlled rectifier.
2	Various configurations of three phase AC Voltage controller & cycloconverter.
3	Various configurations of three phase inverter.
4	Gain knowledge and understanding of AC & DC drives.

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Ability to analyze and evaluate the three-phase controlled converter.	Analyze
CO2	Ability to build power electronic circuits using simulation tools.	Analyze
CO3	Ability to design, analyze and understand the operation of inverter & cyclo-converter.	Design
CO4	Understand the fundamental principles and applications AC drives & DC drives.	Understand

Description:		
This course provides different power converters which has applications in different industrial requirements. It also deals with 3 phase (AC-DC & DC-AC) converters with analysis and performance parameters. Students should have clear understanding of simulation & hardware implementation related to power converters.		
Prerequisites:	1	Electronics Circuit Design, Power Electronics



List of Experiments			
Minimum 08 experiments:			
Sr. No.	**Name of the experiment**	**Hrs.**	**Cognitive levels of attainment as per Bloom's**
1	Study of 3 phase full controlled converter with R load.	2	Knowledge
2	Study of 3 phase inverter.	2	Knowledge
3	Study of 3 phase AC voltage regulator.	2	Knowledge
4	Study of single phase to single phase cyclo-converter.	2	Knowledge
5	Study of speed control of DC motor.	2	Knowledge, Evaluation
6	Study of four quadrant chopper fed DC drive.	2	Knowledge, Evaluation
7	Study of 1 phase AC drives.	2	Knowledge, Evaluation
8	Simulation of 3 phase bridge rectifier.	2	Simulation
9	Simulation of 3 phase inverter.	2	Simulation
11	Simulation of 3 phase AC voltage regulator	2	Simulation
11	Simulation of Cyclo-converter.	2	Simulation

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	1	2		
CO2	1	1									2	1		3	
CO3	2	2			2							2			2
CO4		2	2	3											3

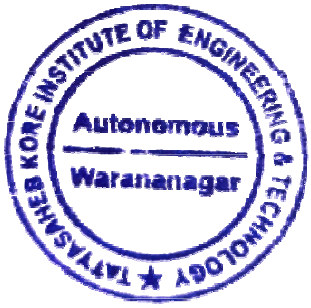
ETC7041T- IMAGE PROCESSING

Tutorial	**:**	1 Hrs/Week	**Evaluation Scheme**
Credit	**:**		**ISA : 25 Marks**

Course Objectives:	
The course aims to make the student understand :	
1	To describe basic concepts of digital image processing.
2	To describe and implement various methods for image enhancement and recognition.
3	To explain concept of image segmentation and compression.
4	To acquaint with MATLAB image processing toolbox to implement image processing techniques.

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	**Explain** the fundamental concepts in digital image processing.	Understanding
CO2	**Apply** gray level transformations, spatial filters and histogram processing for image enhancement**.**	Application
CO3	**Select** morphological operators for extracting image features.	Application
CO4	**Examine** image segmentation and compression used in digital image processing**.**	Analyze

Description:		
The course introduces fundamentals of a digital image, its acquisition, enhancement, recognition and compression		
Prerequisites:	1	Signal processing techniques . MATLAB Programming



Tutorials:	
Sr. No.	**Title of Tutorial**
1	Fundamental steps in digital image processing.
2	Image enhancement techniques in spatial domain..
3	Implement spatial and frequency domain filters for image filtering.
4	Write algorithms for morphological image processing.
5	Detect the image discontinuities and implement segmentation.
6	Exercise techniques for image compression.
7	Exercise techniques for image decompression.
8	Write a MATLAB/ program to read image, process ,image.

ETC7042T- EMBEDDED SYSTEM & RTOS

Tutorial : 1 Hrs/Week
Credit :

Evaluation Scheme
ISA : 25 Marks

Course Objectives:	
The course aims to make the student understand :	
1	To understand the Embedded system design issues.
2	To understand Operating system concepts
3	To understand Real time operating system concepts
4	To understand Embedded software development

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Apply embedded system design issues for development of Embedded system	Understand
CO2	Apply operating system concepts.	Analyze
CO3	Apply Real time systems concepts.	Understand
CO4	Apply Embedded software development & training tools.	solve

Description:		
To understand the Embedded system design issues., operating system concepts., real time operating system concepts, embedded software development and testing tools.		
Prerequisites:	1	Basics of Microcontroller, Basics of Operating system

Tutorials:	
Sr. No.	**Title of Tutorial**
1	Design small scale Embedded system
2	Design Medium scale Embedded system
3	Design Large scale Embedded system
4	Compare assembly with embedded c programming with example.
5	Understand working of DOS, LINUX, Windows operating system.
6	Design algorithms for implementation of FCFS techniques.
7	Design algorithms for implementation of Round robin techniques.
8	Design system with soft plus Hard real time operating system

ETC7043T- ARTIFICIAL INTELLIGENCE

Tutorial	**:**	1 Hrs/Week	**Evaluation Scheme**
Credit	**:**		**ISA : 25 Marks**

Course Objectives:	
The course aims to make the student understand :	
1	To learn various types of algorithms useful in Artificial Intelligence (AI).
2	To convey the ideas in AI research and programming language related to emerging technology.
3	To understand the concepts of machine learning, pattern recognition, and natural language processing.
4	To understand the numerous applications and huge possibilities in the field of AI thatgobeyond the normal human imagination.

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Design and implement key components of intelligent agents and expert systems.	Understand
CO2	Apply knowledge representation techniques and problem solving strategies to commonAI applications.	Analyze
CO3	Apply and integrate various artificial intelligence techniques in intelligent system.	Implement
CO4	Build rule-based and other knowledge-intensive problem solvers.	Solve

Description:		
The course intend to make students understand and explore the techniques underlying the design of artificial Intelligence based systems.		
Prerequisites:	1	Computer and Programming Basics, Analysis of Algorithms, Discrete Mathematics.

ETC7051T- DIGITAL CMOS DESIGN

Tutorial : 1 Hrs/Week
Credit :

Evaluation Scheme
ISA : 25 Marks

Course Objectives:	
The course aims to make the student understand :	
1	To study of basic concept of CMOS VLSI Design technology.
2	To understand Design Implementation and working CMOS Inverter
3	To provide knowledge in designing of Semiconductor Memories.
4	To provide knowledge in designing data path for digital system.

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Explain the design issues of MOS devices and realize CMOS devices using layouts..	Understand
CO2	Analyzing Static and Dynamic parameters of CMOS inverter.	Analyze
CO3	Design of Semiconductor Memories.	Implement
CO4	Synthesize data path design for high speed Adders and Multipliers	Solve

Description:		
This course brings circuit and system level views on design on the same platform. The course follows a design perspective, starts from basic specifications and ends with system level blocks		
Prerequisites:	1	A basic course of Semiconductor Devices and Digital Electronics. A course on Computer Organization .Digital System Design Using FPGA

Tutorials:	
Sr. No.	**Title of Tutorial**
1	Study of fabrication process flow for NMOS, PMOS and CMOS
2	Study of MOS modeling.
3	Discuss Fundamentals of circuit characterization and performance Estimation.
4	Design of basic physical simple logic gates
5	Study of Circuit families.
6	Design of Different Latches.
7	Design of Different Flip-flops.
8	Study of different semiconductor memories.
10	Study of different semiconductor memory classification.
11	Study of different data path designs

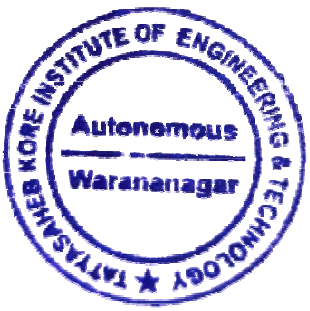
ETC7052T- PLC & AUTOMATION

Tutorial	**:** 1 Hrs/Week	**Evaluation Scheme**	
Credit	**:**	**ISA**	**:** 25 Marks

Course Objectives:	
The course aims to make the student understand :	
1	To understand the generic architecture and constituent components of a Programmable Logic Controller.
2	To develop a software program using modern engineering tools and technique for PLC.
3	To apply knowledge gained about PLCs systems to identify few real-life industrial applications.
4	To troubleshoot different PLC based systems

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Describe working of various blocks of PLC System and their functions	Describe
CO2	Understand the fundamental of PLC Ladder Programming	Understand
CO3	Gain adequate knowledge about various basic and advanced Instruction in PLC	Understand
CO4	Identify and Troubleshoot PLC System faults	Applying

Description:		
This subject deals with fundamentals of automation, study of PLC Programming & use of PLC for industrial automation. Troubleshooting & wiring of PLC automation systems.		
Prerequisites:	1	Digital Systems, Transducers & Measurement



Tutorials:	
Sr. No.	**Title of Tutorial**
1	To study Parts of a PLC and Principles of Operation
2	To study Processor Memory Organization, Program Files, Data Files
3	Study of PLC Programming Languages, Relay-Type Instructions, Instruction Addressing, Branch Instructions, Internal Relay Instructions
4	Study of Contactors, Motor Starters. Output Control Devices
5	Study of Converting Relay Schematics into PLC Ladder Programs. , Writing a Ladder Logic Program
6	Study of Timer and Counter in PLC
7	Study of Advanced Instructions
8	Study of Advanced Instructions
9	SOP for Preventive maintenance and troubleshooting

ETC7053T- INTERNET OF THINGS (IOT)

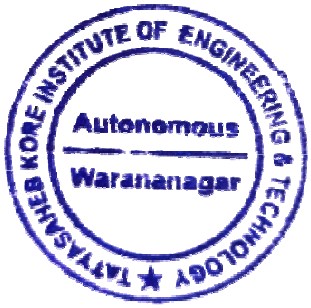
Tutorial : 1 Hrs/Week
Credit :

Evaluation Scheme
ISA : 25 Marks

Course Objectives:	
The course aims to make the student understand :	
1	To introduce the fundamentals of sensors and actuators along with the basic concepts of an IoT & IoE
2	To give Insights into the Architecture and M2M technology for an IoT.
3	To Exposing students to the usage of Protocol Standardization for IoT with IoT Edge and Gateway Network with Communication protocols.
4	To develop design skills in industrial IoT.
5	To provide IoT Solutions with sensor-based application through embedded system platform

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	**Comprehend** and analyze concepts of sensors, actuators, IoT and IoE.	Understand
CO2	**Interpret** IoT Architecture Design Aspects.	Analyze
CO3	**Comprehend** the operation of IoT protocols	Implement
CO4	**Describe** various IoT boards, interfacing, and programming for IoT..	Solve

Description:		
To introduce the fundamentals of sensors and actuators along with the basic concepts of an IoT & IoE. Study Architecture and M2M technology for an IoT.. Develop design skills in industrial IoT.Provide IoT Solutions with sensor-based application through embedded system platform		
Prerequisites:	1	Basic knowledge of Sensor, Knowledge of Interfacing Devices



Tutorials:	
Sr. No.	**Title of Tutorial**
1	Study of IOT architecture.
2	Basics of networking in internet of things.
3	Study of machine to machine communication in IOT.
4	Study and compare different protocols used in internet of things.
5	Integration of sensors and actuators with Arduino.
6	Implementation of IOT with Raspberry Pi.
7	Introduction, Application, Example and Challenges of IIOT.
8	Case study on Application of IOT.

ETC706P- PROJECT WORK & SEMINAR

Evaluation Scheme

Practical : 4 Hrs/Week — **ISA : 25 Marks**

Credit : 2 — **POE : 50 Marks**

Course Objectives: The objective of the course is :
To understand the basic concepts & broad principles of projects.
To understand the value of achieving perfection in project implementation & completion
To apply the theoretical concepts to solve real life problems with teamwork and Multidisciplinary approach.
To demonstrate professionalism with ethics; present effective communication skills and relate engineering issues to broader societal context.

Course Outcomes:

COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Demonstrate a sound technical knowledge in field of E&TC in the form of project.	Understand
CO2	Undertake real life problem identification, formulation and solution.	Analyze
CO3	Design engineering solutions to complex problems utilizing a systematic approach	Apply
CO4	Demonstrate the knowledge, effective communication skills and attitudes as professional engineer.	Understand

Description:

Project Description

Project phase 1 is an integral part of the project work. The project work shall be based on the knowledge acquired by the student during the graduation and preferably it should meet and contribute towards the needs of the society. The project aims to provide an opportunity of designing and building complete system or subsystems in the field of Electronics and communication where the student likes to acquire specialized skills. The student shall prepare the duly certified Fourth report of project work in standard format for satisfactory completion of the work by the concerned guide and head of the Department/Institute.

Guidelines: 1. Group Size: The student shall carry the project work individually or by a group of students. Optimum group size shall be 3 students. However, if project complexity demands a maximum group size of 4 students, the project committee should be convinced about such complexity and scope of the work. Projects selected should meet and contribute towards the needs of the society.

2. Selection and approval of topic: Topic should be related to real life application in the field of Electronics and Telecommunication engineering.
3. The topic may be based on : Investigation of the latest development in a specific field of Electronics or Communication / The investigation of practical problem in manufacture and / or testing of electronics or communication equipment/ Software based projects related to VHDL, Communication, Instrumentation, Signal Processing agriculture Engineering etc. with the justification for techniques used / any topic in the field of E&TC may be allowed.
4. Interdisciplinary projects should be encouraged. The examination of Interdisciplinary projects shall be conducted independently in respective departments.
5. The term work assessment of project phase 1 shall be based on Innovative Idea of selected project, literature survey, Depth of understanding, Applications, Individual contributions, presentation, project report, timely completion of work.
6. The department should prepare project planner and should follow accordingly
7. A log book of work carried out during the semester should be maintained with weekly review remarks by the guide and committee.
8. A certified copy of report preferably using LATEX is required to be presented to external examiner at the time of Fourth examination.
9. The project report must undergo by plagiarism check and the similarity index must be less than 15%. The plagiarism report should be included in the project report.

Member Secretary
Board of Studies

Chairman
Board of Studies

Chairman
Board of Studies
E & TC DEPT.
Tatyasaheb Kore Institute of Engg.
& Technology (Autonomous)
Warananagar, Dist. Kolhapur

Dean Academic
T.K.I.E.T., Warananagar

Tatyasaheb Kore Institute of Engg.
& Technology (Autonomous)
Warananagar, Dist. Kolhapur

TATYASAHEB KORE INSTITUTE OF ENGINEERING & TECHNOLOGY
Autonomous
Warananagar

Principal
T.K.I.E.T. Warananagar

PRINCIPAL
Tatyasaheb Kore Institute of Engg.
& Technology (Autonomous)
Warananagar, Dist. Kolhapur

56

Final Year B. Tech.
(Electronics & Telecommunication Engg.)
VIIIth Semester Detailed Syllabus

ETC801 - WIRELESS COMMUNICATION

Lectures : 4 Hrs/Week
Credit : 4

Evaluation Scheme
ISE : 40 Marks
ESE : 60 Marks

Course Objectives: The course aims to make the student understand ::	
1	Focus on basic fundamentals of wireless communication.
2	Explain radio wave propagation models.
3	Understand basic wireless technology.
4	Understand various wireless protocols .

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	List basic fundamentals of wireless communication	Understand
CO2	Analyze large & small scale radio wave propagation	Analyze
CO3	Able to understand basic wireless technologies	Understand
CO4	Able to understand and analyze wireless concepts	Understand ,Analyze

Description:		
This course discusses the wireless communication systems , design considerations, applications and protocols used in mobile communications. Students will have basic understanding of mobile technology, evolutions and various services provided by wireless communication systems.		
Prerequisites:	1	Communication Systems, Electromagnetic Engineering, Computer Networks

Course Contents		
Unit No:1	**FUNDAMENTALS OF WIRELESS COMMUNICATION:** Wireless communication system, Technologies in digital wireless communication, Types of wireless communication, challenges in WC. Cellular concept: Introduction, frequency reuse ,Channel Assignment strategies, Handoff strategies, interface and system capacity	**5Hrs.**
Unit No:2	**MOBILE RADIO PROPAGATION. LARGE SCALE PATH LOSS:** Introduction to Radio Wave propagation, Free Space propagation model, Relating Power to Electric Field, The three Basic Propagation Mechanisms, Reflection, Ground Reflection (Two-Ray) Model, Diffraction, Scattering, Outdoor Propagation Models, Indoor Propagation Models.	**7Hrs.**
Unit No:3	**MOBILE RADIO PROPAGATION SMALL-SCALE FADING AND MULTIPATH :** Small-Scale Multipath Propagation, Impulse Response Model of a Multipath Channel, Small-Scale Multipath Measurements, Types of small-Scale Fading.	**5 Hrs.**
Unit No:4	**WIRELESS NETWORKING: INTRODUCTION TO WIRELESS NETWORKS** Difference Between Wireless and Fixed Telephone Networks, Development of Wireless Networks, Fixed Network Transmission Hierarchy, Traffic Routing in Wireless Networks, Common Channel Signaling (CCS),Architecture of B-ISDN & services.	**7 Hrs.**
Unit No:5	**WIRELESS LAN & BLUETOOTH** Introduction, Infrared radio transmission infrastructure and adhoc networks, Detailed study of IEEE 802.11, Bluetooth, Wireless ATM.	**5 Hrs.**
Unit No:6	**WIRELESS ACCESS PROTOCOL** WAP (Wireless Application Protocol) architecture, Wireless Datagram, Wireless Transport layer security, wireless transaction, Wireless Session, Wireless Application Environment.	**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					
CO2		2		2						3					
CO3		2		1						3					
CO4	1	1							1	2	2				

Text Books:	
1	“Wireless Communications Principals & Practice”, Theodore S. Rappaport, (P.E.)
2	“Mobile Communications”, Jachen Schiller (Addison Westy)
3	“Wireless and Mobile Networks Concept and protocols”, Dr. Sunil kumar S Manvi Wiley India

Reference Books:	
1	“Wireless Networks”, P. Nicopolitidis, M. S. Obaidat, G. I. Papadimitriou, A. S. Pomportsis, Wiley Pub.
2	“Wireless Communication & Networks”, William Stallings, Pearson Edition
3	“Wireless communication and Networks”,Upena Dalal, Oxford

ETC802 - AUDIO VIDEO ENGINEERING

Lectures : 4 Hrs/Week
Credit : 4

Evaluation Scheme
ISE : 40 Marks
ESE : 60 Marks

Course Objectives: The course aims to make the student understand ::	
1	Provide basic information of TV system . Know color TV transmission and reception
2	Understand basic concept of digital TV system
3	Understand high definition TV
4	Know advanced TV systems like LCD, plasma, LED, CCTV

Course Outcomes:

COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Describe picture and sound transmission and reception. Explain color composite video signal	Understand
CO2	Describe principle of digital TV system . Explain high definition television system	Analyze
CO3	Elaborate concept of video conferencing and videophone	Understand
CO4	Describe advanced TV system like LCD, plasma, LED, CCTV, etc..	Understand

Description:

Introduce basic concepts of TV systems ,Describe picture and sound transmission. study composite video signal, To study digital TV and High Defination TV,to study all types of Picture tubes, to know about advanced TV systems like LCD, LED ,Plasma TV, CCTV.

Prerequisites:	1	Analog Communication Systems, Digital Communication, Electronics all basic circuits.

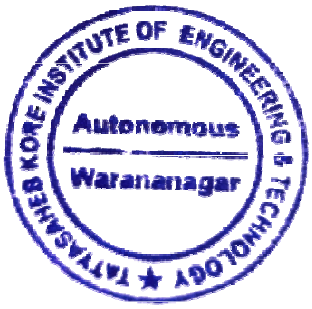
Course Contents		
Unit No:1	**ELEMENTS OF A TELEVISION SYSTEM** Modulation of picture and sound signals, positive and negative modulation, aspect ratio, kell factor, horizontal and vertical resolution, video bandwidth, progressive and interlaced scanning, composite video signal, horizontal & vertical sync details, vestigial sideband correction, channel bandwidth, CCIR-B standards, monochrome TV receiver block diagram	**8Hrs.**
Unit No:2	**COLOR SIGNAL TRANSMISSION AND RECEPTION** Color TV systems Color mixing theory (additive and subtractive), compatibility considerations, frequency interleaving process, luminance, hue and saturation, color difference signals, color composite video signals, chromaticity diagram, colour TV transmitter, Color TV receiver block diagram.	**6 Hrs.**
Unit No:3	**TV CAMERA TUBE, PICTURE TUBE AND COLOR TELEVISION STANDARDS NTSC, PAL & SECAM TV standards**: Introduction, Coder, decoders, Comparison, Simple PAL and delayed PAL,TV camera tubes Vidicon, Plumbicon; Color Picture Tubes- PIL, Delta gun, Trintron; picture tubes, purity & convergence,	**7 Hrs.**
Unit No:4	**DIGITAL TV & HDTV** Merits of digital technology, digital TV signals, digitized video parameters ,digital transmission and reception, codec functions, ITT Digit 2000 IC system, MAC signals, D2- MAC/Packet signals, advantages of MAC signals, HDTV systems, HDTV standards & compatibility	**6 Hrs.**
Unit No:5	**ADVANCED DISPLAY & STUDIO SYSTEMS** Stereo sound system, flat panel display TV receivers, 3-D TV picture, digital equipment for TV studios, construction & working of LED TV,	**5 Hrs.**
Unit No:6	**ADVANCED TELEVISION SYSTEM** LCD TV System :LCD Technology , LCD Matrix types & operations , Plasma TV System : Plasma & conduction of charge ,Plasma TV screen ,Signal processing in Plasma TV, Plasma color Receiver, LED TV, DTH Receiver System ,CCTV, working of block converter,: IR Remote control.	**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									1	
CO2	3	2		1											
CO3	3	3	1												2
CO4	2	1													1

Text Books:	
1	“Television and Video Engineering”, A.M. Dhake, 2nd Edition
2	“Monochrome and Color TV”, R.R. Gulati, 2nd revised edition, New Age International
3	“Modern Television Practice, Principles, Technology and Service”, R.R. Gulati, 4th edition, New Age International Publicatio

Reference Books:	
1	“Digital Video Processing”, A. Murat Tekalp, Prentice Hall Signal Processing Series, BS
2	“Audio-Video Engineering “, R.C.Jaiswal
3	“Television Engineering -Audio and Video Systems”, D. S. Bormane, P.B. Mane & R R Itkarkar, Wiley publication.
4	“Color TV Theory and Practice 2”, S. P. Bali



ETC8031 - SATELLITE COMMUNICATION

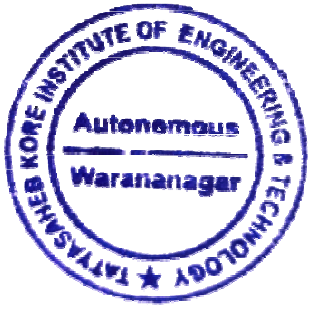
Lectures : 3Hrs/Week
Credit : 3

Evaluation Scheme
ISE : 40 Marks
ESE : 60 Marks

Course Objectives: The course aims to make the student understand ::	
1	To introduce the fundamental concept in the field of satellite communication
2	To provide understanding of satellite communication system operation, launching Techniques
3	To analyze, design and evaluate satellite communication subsystem
4	To examine concept of satellite networking

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Understand Orbital aspects involved in satellite communication	Understand
CO2	Understand various subsystems in satellite communication system	Analyze
CO3	Explain and Analyze Link budget calculation	Implement
CO4	Understand Satellite Network System	Apply

Description:		
Course deals with how microwave signal is transmitted using satellite communication. Course discusses various sub systems of satellite communication. Also it deals with link budget calculations and applications in different field.		
Prerequisites:	1	Communication System, Computer networking



Course Contents		
Unit No:1	**INTRODUCTION OF SATELLITE COMMUNICATION:** Introduction, basic concept of satellite communication, Orbital Mechanics, Look angle determination, Orbital perturbation, Orbital determination Launchers and Launch vehicles, Orbital effects in communication system performance	**6 Hrs.**
Unit No:2	**SATELLITE SUBSYSTEM:** Introduction, Attitude and control system(AOCS),Telemetry, Tracking, Command and Monitoring, Power systems, Communication subsystem, Satellite antennas, Equipment reliability and space qualification	**6 Hrs.**
Unit No:3	**SATELLITE LINK DESIGN:** Introduction, Basic transmission Theory, System temperature and G/T Ration, Design of Downlinks, Uplink Design, Design of specified C/N : Combining C/N and C/I valuesin Satellite Links.	**6 Hrs.**
Unit No:4	**SATELLITE NETWORKS**: Reference architecture for satellite networks, basic characteristics of satellite networks, Onboard connectivity with transparent processing, analogue transparent switching, Frame organization, Window organization, On board connectivity with beam scanning.	**6 Hrs.**
Unit No:5	**LOW EARTH ORBIT AND NON GEO-STATIONARY SATELLITE SYSTEM:** Introduction, Orbit considerations, Coverage and Frequency Consideration, Delay and Throughput Consideration, OperationalNGSO constellation design: Iridium, Teledesic	**6 Hrs.**
Unit No:6	**SATELLITE APPLICATIONS:** Communication Satellite-Digital DBS TV, Satellite Radio Broadcasting, Navigation Satellite, GPS Position Location Principles, GPS Receivers and codes. Military Satellite- Directed Energy Laser Weapons, Weather Forecasting Satellite Application	**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	2	1		1									1	
CO2	3	2		1											
CO3	3	3	1												2
CO4	2	1													1

Text Books:	
1	"Satellite Communications",Timothy Pratt, Charles Bostian, Jeremy Allnut John, Wiley&Sons (II Edition) (For Unit 1,2,3,5)
2	"Satellite Communications", Anil k. Maine and Varsha Agaraval, Wiley Publications(All Units)
3	"Satellite Technology Principles and Applications", Anil K. Maini andVarshaAgarawal, Wiley Publications, Third Edition (Unit 6)

Reference Books:	
1	"Satellite Communications", Dennis Roody McGraw Hill Fourth Edition (All Units)
2	"Satellite Communications", Gerard Maral and Michel Bousquet, Wiley Publication (5^{th}Edition For Unit 4)
3	"Satellite Communications systems Engineering", Wilbur L. Pritchard,Henri G.Suyderhoud and Robert A. Nelson. 2nd edition (Unit I)

ETC8032- ELECTRIC VEHICLE

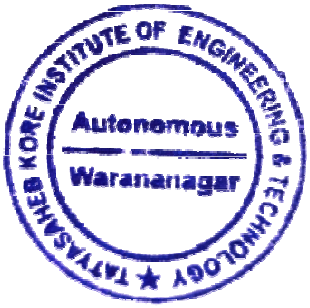
Lectures : 3 Hrs/Week
Credit : 3

Evaluation Scheme
ISE : 40 Marks
ESE : 60 Marks

Course Objectives: The course aims to make the student understand ::	
1	To learn the basics of Electric vehicles and its classification.
2	To understand the Configurations, Performance and architecture of EV.
3	To learn the Modelling and design of Electric vehicles as a system.
4	To understand electric components used in electric vehicles and their details and Energy Storage Systems and energy management strategies for EVs.

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Compare Electric Vehicle against the Internal combustion Engine.	Understand
CO2	Discuss Electric and Plug-in Electric Vehicle and their performance.	Understand
CO3	Model and design EVs as a system and explain the complete Electric Propulsion unit of Electric vehicles	Analyze
CO4	Relate the Energy Storage Systems and energy management strategies for EVs	Understand

Description:		
This course is aimed to know the concept of Electric Vehicles, its classification and architecture. Also to learn modeling and energy management strategies for electric vehicle.		
Prerequisites:	1	Basic Electrical & Electronics, Power Electronics



Course Contents		
Unit No:1	**Introduction to Electric Vehicles:** Components of Electric Vehicle, Comparison with Internal combustion Engine: Technology, Benefits and Challenges, EV classification and their electrification levels.	**6 Hrs.**
Unit No:2	**Electric and Plug-in Electric Vehicle:** Configurations of Electric Vehicles (EV), Performance of EV, Architectures of EV, Vehicle batteries and its modeling, Battery operated EV, Plug-in EV	**6 Hrs.**
Unit No:3	**Controls Modeling and Design for EV:** System and sub-systems, Modeling and design of EVs as a system, principles of controls engineering for EV.	**6 Hrs.**
Unit No:4	**Electric Propulsion unit:** Introduction to electric components used in electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives, configuration and control of Permanent Magnet Motor drives, Configuration and control of Switch Reluctance Motor drives, drive efficiency.	**6 Hrs.**
Unit No:5	**Energy Storage Systems:** Energy storage systems used, Battery electrochemistry, battery design and construction, charging and discharging, power density, Battery interface with motive sources	**6 Hrs.**
Unit No:6	**Energy Management Strategies:** Introduction to energy management strategies used in hybrid and electric vehicles, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy management strategies.	**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	2		2			2		2		1		2	1	
CO2	3	2		2			1		2		1		2	1	
CO3	2	2	3				2					2			2
CO4	2	1		2			2		1			2	2	1	

Text Books:	
1	"Electric and Hybrid Vehicles –Design Fundamentals", Iqbal Husain, CRC Press
2	" Vehicle Propulsion Systems: Introduction to modeling and Optimization", L. Guzzella and A. Sciarretta Springer 2007, Third Edition

Reference Books:	
1	"Modern Electric, Hybrid Electric and Fuel Cell vehicles-Fundamentals - Theory and Design", Mehrdad Ehsani, Yimin Gao, Sebastian E.Gsay, Ali Emadi, CRC Press.
2	"Bosch' Automotive Handbook", 8th Edition.
3	"Electric Vehicle Technology Explained" , James Larminie,John Lowry, John Wiley & Sons.
4	"The Electric Car: Development & Future of Battery, Hybrid & Fuel-Cell Cars",. Dr.Mike Westbrook, M H Westbrook

ETC8033- ROBOTICS

Lectures : 3Hrs/Week
Credit : 3

Evaluation Scheme
ISE : 40 Marks
ESE : 60 Marks

Course Objectives: The course aims to make the student understand ::	
1	To introduce the fundamentals of sensors and actuators.
2	To Introduce robot kinematics and its control methods.
3	To study classification of various sensors used in robotics.
4	To develop design skills in industrial robot
5	To study various industrial and non-industrial applications of robots

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	List and explain the basic elements of industrial robots	Understand
CO2	Analyses robot kinematics and its control methods	Analyze
CO3	Classify the various sensors used in robots for better performance.	Understand
CO4	Summarize various industrial and non-industrial applications of robots	Solve

Description:		
To introduce the fundamentals of sensors and actuators. Study robot kinematics and its control methods., classification of various sensors. Develop design skills in Industrial ROBOT..		
Prerequisites:	1	Basic knowledge of Sensor, Knowledge of Interfacing Devices

Course Contents		
Unit No:1	**FUNDAMENTALS OF ROBOT** Robot–Definition–RobotAnatomy–Co-ordinateSystems,WorkEnvelope,typesand classification–Specifications–Pitch, Yaw, Roll, Joint Notations, Speed of Motion, Pay Load – Robot Parts and Functions– Need for Robots– Different Applications	**6Hrs.**
Unit No:2	**SENSORS** Requirements of a sensor, Principles and Applications of the following types of sensors-Piezoelectric sensors, Proximity sensors, Touch sensors, wrist sensors, Compliance sensors, slip sensors, vision sensors	**8Hrs.**
Unit No:3	**ELECTRIC DRIVES FOR ROBOT CONTROL** Introduction, General aspects of robot control, Types, DC electric motor AC electric motor, Stepper motor ,types of stepper motor, Computer controlled servo motor system	**8Hrs.**
Unit No:4	**ROBOT KINEMATICS AND CONTROL** Robot kinematics – Basics of direct and inverse kinematics, Robot trajectories, 2D and 3D Transformation-Scaling, Rotation, Translation Homogeneous transformation. Control of robot manipulators – Point to point, Continuous Path Control, Robot programming	**6Hrs.**
Unit No:5	**INTRODUCTION TO AI AND PROBLEM SOLVING** History, state of the art, Need of AI in robotics, Thinking and acting humanly, Intellegent agents, structure of agents, Problem solving, Solving problems by searching knowledge and reasoning-knowledge presentation-first order logic	**5 Hrs.**
Unit No:6	**ROBOT APPLICATIONS** Industrial applications of robots, Medical, Household, Entertainment, Space, Underwater, Defense, Disaster management. Applications, Micro and Nano robots, Future Applications.	**6Hrs.**

Mapping of POs & COs:

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

Text Books:	
1	"Industrial Robotics–Technology, Programming and Applications", M. P. Groover, McGraw-Hill,2001
2	"Fundamentals of Robotics: Analysis and Control", Robert J. Schilling, PHI Publication
3	"Artificial Intelligence: A modern Approach", Stuart Russell, PeterNorvig Pearson Education,India 2003.
4	"Introduction to Robotics Analysis Control and Applications", Saeed B Niku, Wiley
5	"Robotic Engineering-An Integrated Approach", Klafter R.D., Chmielewski T.A and Negin M., Prentice Hall, 2003

Reference Books:	
1	"Introduction to AI Robotics", Robin R Murphy PH Publication.
2	"Artificial Intelligence:A guide to Intelligent Systems", Negnevitsky,M Harlow: Addison Wesley,2002
3	"Artificial Intelligence Robotics and Machine Evolution", David Jefferis Crabtree Publishing Company, 1992.

ETC8041- BIOMEDICAL INSTRUMENTATION

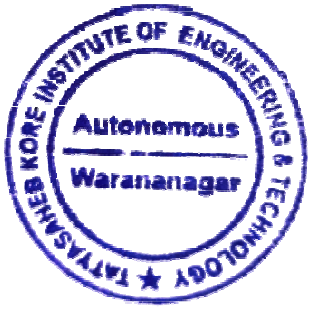
Lectures : 3Hrs/Week
Credit : 3

Evaluation Scheme
ISE : 40 Marks
ESE : 60 Marks

Course Objectives: The course aims to make the student understand ::	
1	Understand the anatomy and physiology of Human body subsystems
2	Understand the different diagnostic and therapeutic equipment
3	Understand working principles of bioelectric signal recording machine.
4	Analyze the safety aspects of medical instrumentation

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Understand fundamentals of human physiology system..	Understand
CO2	Classify and indentify the different diagnostic and therapeutic equipment.	Analyze
CO3	Design the basic instrumentation system for measurement of different bio potentials.	Implement
CO4	Learn about the safety measurements for designing of biomedical instrumentation	Solve

Description:		
This course is merging of biological systems of human body and electronics instrumentation suitable for acquiring ,measuring and analyzing bio potentials for diagnosis of abnormalities of physiological systems of human body at primary level.		
Prerequisites:	1	Sensors , transducers and measurement, Communication Engineering



Course Contents		
Unit No:1	**ANATOMY AND PHYSIOLOGY** : Elementary ideas of cell structure, heart and circulatory system, central nervous system, Musclo-skeletal system, Respiratory system Body temperature .Artifacts in Bio signal Acquisition: Noise, Power line, Baseline, Skin Impedance and Motion Artifacts, Techniques to reduce the artifacts.	**6 Hrs.**
Unit No:2	**CLASSIFICATION OF BIOMEDICALEQUIPMENT** Diagnostic, therapeutic and clinical laboratory equipment. Physiological pre-amplifier and specialized amplifiers, ECG lead systems details of ECG, EMG, and EEG machines	**7 Hrs.**
Unit No:3	**BIOELECTRIC SIGNALS AND THEIR RECORDING** Bioelectric signals (ECG, EMG, ECG, EOG & ERG) and their characteristics, Bio electrodes, electrodes tissue interface, contact impedance, effects of high contactimpedance, types of electrodes, electrodes for ECG, EEG and EMG.	**8 Hrs.**
Unit No:4	**TRANSDUCERS FOR BIOMEDICAL APPLICATION** Resistive transducers - Muscle force and Stress (Strain gauge), spirometer (Potentionmeter) , humidity, Respiration (Thermistor) Inductive Transducers - Flow measurements, muscle movement (LVDT) Capacitive Transducers - Heart sound measurement, Pulse pick up Photoelectric Transducers - Pulse transducers, Blood pressure, oxygen Analyses ,Piezoelectric Transducers - Pulse pickup, ultrasonic blood flow meter, Chemical Transducer	**8Hrs.**
Unit No:5	**MEDICAL INSTRUMENTS:** Introduction To Blood Pressure Measurement (noninvasive), Life saving Devices Pacemakers and Defibrillators, Bedside Monitors, Central Monitoring system, Stress Test System, X Ray, CT scan , Dental instruments	**6 Hrs.**
Unit No:6	**SAFETY ASPECTS OF MEDICAL** : Gross current, Micro Current shock, safety standards rays and considerations, safety testing instruments, biological effectsof X-rays and precautions	**5 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	“Introduction to Biomedical Equipment Technology”, Joseph J. Carr and John M. Brown, 4th Edition, Prentice Hall, 2000.
2	“Biomedical Signal Analysis‖”, R. Rangayan, Wiley 2002.
3	“Handbook of Biomedical Instrumentation”, R.S.Khandpur, Tata McGraw Hill, New Delhi, 2003, Edition-II.
4	“ Principles of Applied Biomedical Instrumentation”, Goddes & Baker, John Wiley publication.

Reference Books:	
1	“Bio-signal and Biomedical Image Processing “,John L Semmlow, Marcel Dekker
2	“Introduction to Biomedical Equipment Technology “,Joseph J. Carr and John M. Brown, 4thEdition, Prentice Hall, 2000.

ETC8042- ADVANCED VLSI DESIGN

Lectures : 3Hrs/Week
Credit : 3

Evaluation Scheme
ISE : 40 Marks
ESE : 60 Marks

Course Objectives: The course aims to make the student understand ::	
1	To understand the Dynamic CMOS design
2	To provide knowledge in timing issues and clocking in system design
3	To understand the design and testing of Low voltage CMOS circuits.
4	To understand Design Implementation and working CMOS Inverter

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Design of Dynamic CMOS Design	Understand
CO2	Explain the design timing and clock issues for Low power circuits.	Analyze
CO3	Design and test Low Voltage CMOS circuits.	Implement
CO4	Test and verify digital circuits in the VLSI design flow.	Solve

Description:

The course intend to give students a clear understanding of the fundamental concepts of modern CMOS VLSI design. Students will learn the design of complex and high performance CMOS systems from system level to circuit level.

Prerequisites:	1	Digital System Design

Course Contents		
Unit No:1	**Dynamic CMOS Design**: Basic Principles Pre-charge, Evaluation, Properties of Dynamic Logic Gate, Speed and Power Dissipation of Dynamic Logic Gate, Signal Integrity Issues in Dynamic Design Charge Leakage, Charge Sharing, Capacitive Coupling, Feed-through Cascading Dynamic Gates, Domino Logic and its properties, Dealing with non-inverting problem of Domino Logic np- CMOS.	**5 Hrs.**
Unit No:2	**Logical Efforts**:- Introduction Basics of Logical effort Calculation of Logical Efforts for Logic Gates Multi Stage Logic Network Design Example for Multi-Stage Network Choosing the length of the path FORK Design Logical Efforts for Asymmetric Gates	**8 Hrs.**
Unit No:3	**Timing Issues in Digital Circuits**: Introduction, Timing Classification of Digital Systems, Synchronous Interconnect, Mesochronous interconnect, Plesiochronous Interconnect, Asynchronous Interconnect, Synchronous Design — An In-depth Perspective, Synchronous Timing Basics, Sources of Skew and Jitter,Clock-Distribution Techniques, Synchronizers and Arbiters, Synchronizers—Concept and Implementation, Arbiters, Clock Synthesis and Synchronization Using a Phase-Locked Loop, Basic Concept, Building Blocks of a PLL.	**7 Hrs.**
Unit No:4	**VLSI Clocking and System Design:** Clocking: CMOS clocking styles, Clock generation, stabilization and distribution Low Power CMOS Circuits: Various components of power dissipation in CMOS, Limits on low power design, low power design through voltage scaling. I/O pads and Power Distribution: ESD protection, input circuits, output circuits, simultaneous switching noise, power distribution scheme .	**6 Hrs.**
Unit No:5	**Design And Test of Low-Voltage CMOS Circuits:** Introduction, Design style, Leakage current in Deep sub-micron transistors, device design issues, minimizing short channel effect, Low voltage design techniques using reverse V, steep sub threshold swing and multiple threshold voltages, Testing with elevated intrinsic leakage, multiple supply	**6 Hrs.**
Unit No:6	**VLSI Testing and verification** : Testing Philosophy and Role of Testing, Test economics and product quality. Fault models, path sensitizing, random test, design for testability, Built-in self test and Boundary scan. (5h) Design flow and the role of Design Verification in the flow. Difference between verification, testing, and post silicon validation. Types of Design Verification - Functional Verification, Performance Verification. Simulation, Emulation, Formal and Semi-formal verification. Black box, White box and Grey box verification.(4h)	**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	"CMOS Digital Integrated Circuits Analysis and Design", Sung-Mo Kang and Yusuf Leblebici, Tata McGraw Hill, 3rd Edition
2	"Introduction to VLSI CIRCUITS AND SYSTEMS", John P. Uyemura, Wiley India Pvt.Ltd.
3	"Digital Integrated Circuits: ADesign Perspective", Jan M. Rabaey, Anantha Chandrakasan and BorivojeNikolic, Pearson Education, 2nd Edition. & Additional Study Material
4	"Basics of CMOS Cell Design", Etienne Sicard and Sonia Delmas Bendhia, Tata McGraw Hill, First Edition.

Reference Books:	
1	"CMOS VLSI Design: A Circuits andSystems Perspective", Neil H. E. Weste, David Harris and Ayan Banerjee, Pearson Education, 3rd Edition
2	"VLSI Design", Debaprasad Das, Oxford, 1st Edition
3	"Low-Power CMOS VLSI Circuit Design", Kaushik Roy and Sharat C. Prasad, Wiley,Student Edition
4	"Analysis and Design of DigitalIntegrated Cicuits", David A Hodges, Horace G Jackson and Resve A Saleh, TMH, 3rd Edition

ETC8043- COMPUTER VISION

Lectures : 3Hrs/Week
Credit : 3

Evaluation Scheme
ISE : 40 Marks
ESE : 60 Marks

Course Objectives: The course aims to make the student understand ::	
1	To introduce students the fundamentals of image processing
2	To introduce students the major ideas, methods, and techniques of image description andfeature extraction
3	To develop an appreciation for various issues in the design of pattern recognition.
4	To provide the student with programming experience from implementing computer visionand object recognition applications

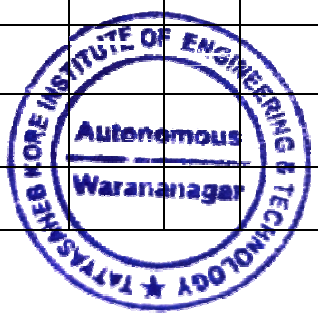
Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Explain the fundamental techniques used in image representation, description, featureextraction etc.	Understand
CO2	Explain and master basic knowledge, theories and methods in image processing andcomputer vision.	Analyze
CO3	Identify, formulate and solve problems in image processing and computer vision.	Implement
CO4	Communicate effectively and work in teams to develop a working computer vision system	Solve

Description:		
The purpose of this course is to gain a basic understanding of computer vision and image analysis for 2D computer vision. The course will focus on problem solving based on this technology and industrial applications. Sample issues of industry in format Practical projects during the course will be reviewed and resolved by students.		
Prerequisites:	1	MATLAB Programming

Course Contents		
Unit No:1	**IMAGE REPRESENTATION :** Introduction to Boundary, Chain Code, Polygonal Approximation, signature, boundary Segments, skeletons	**5 Hrs.**
Unit No:2	**IMAGE DESCRIPTION :** Boundary Descriptors: Simple Descriptor, shape numbers, Fourier descriptors, statistical moments, Regional Descriptors: Simple Descriptors, Topological Descriptors and Relational Descriptors, Introduction to texture, Statistical texture description, Syntactic texture description	**8 Hrs.**
Unit No:3	**FEATURE EXTRACTION :** Edges - Canny, LOG, DOG; Line detectors (Hough Transform), Corners - Harris and Hessian Affine, Orientation Histogram, SIFT, SURF, HOG, GLOH, Scale-Space Analysis- Image Pyramids and Gaussian derivative filters, Gabor Filters and DWT.	**7 Hrs.**
Unit No:4	**MOTION ANALYSIS:** Background Subtraction and Modeling, Optical Flow, KLT, Spatio-Temporal Analysis, Dynamic Stereo; Motion parameter estimation,case studies	**6 Hrs.**
Unit No:5	**OBJECT RECOGNITION AND CLASSIFIER :** Patterns and Pattern classes, Decision Function, Matching by minimum Distance classifier, matching by correlation, Bayes Classifier, Cluster Analysis, nearest neighbor classifier, case studies.	**6 Hrs.**
Unit No:6	**ARTIFICIAL NEURAL NETWORK :** Overview of Artificial Neural Networks, Multilayer Feed forward Neural networks with Sigmoidal activation functions; Back propagation Algorithm; Representational abilities of feed forward networks Back propagation in Practice , Radial Basis Function Networks; Gaussian RBF networks, Learning Weights in RBF networks; K- means clustering algorithm, Introduction to Deep learning	**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	"Digital Image Processing", R.C. Gonzalez and R.E. Woods , Pearson
2	"Digital Image Processing and Pattern Recognition", M. K. Pakhira , PHI
3	"Digital Image Processing and Computer vision", Milan Sonk, Cengage learning
4	" Computer Vision: Algorithms and Applications", Richard Szeliski Springer-Verlag LondonLimited 2011

Reference Books:	
1	"Digital Image Processing", S. Sridhar , Oxford
2	" Multiple View Geometry in Computer Vision", Richard Hartley and Andrew Zisserman, Second Edition, Cambridge University Press, March 2004.

ETC801P- WIRELESS COMMUNICATION LAB

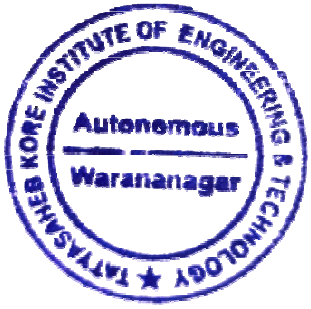
Practical : 2 Hrs/Week
Credit : 1

Evaluation Scheme
ISA : 25 Marks
POE : 50 Marks

Course Objectives: The course aims to make the student understand :	
1	Focus on basic fundamentals of wireless communication.
2	Explain radio wave propagation models.
3	Understand basic wireless technology.
4	Understand various wireless protocols .

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	List basic fundamentals of wireless communication	Understand
CO2	Analyze large & small scale radio wave propagation	Analyze
CO3	Able to understand basic wireless technologies	Understand
CO4	Able to understand and analyze wireless concepts	Understand ,Analyze

Description:		
This course discusses the wireless communication systems , design considerations, applications and protocols used in mobile communications. Students will have basic understanding of mobile technology, evolutions and various services provided by wireless communication systems.		
Prerequisites:	1	Communication Systems, Electromagnetic Engineering, Computer Networks



List of Experiments			
Minimum 08 experiments:			
Sr. No.	**Name of the experiment**	**Hrs.**	**Cognitive levels of attainment as per Bloom's**
1	Study of ISDN Trainer kit Hardware & Software Setup.	2	Understand
2	Study of Architecture of ISDN kit.	2	Understand
3	Study of Analog & Digital Subscriber Link establishment using ISDN trainer kit.	2	Analyze
4	Study of numbering plans in ISDN trainer kit.	2	Understand
5	Study of Establishment point to point & Multi-draft Links using ISDN.	2	Understand
6	Study of Protocol Analysis (based on any protocol).	2	Analyze
7	Study of Mobile Communication Set up (Study of Link Mobile Trainer Kit , Handset).	2	Understand
8	Study of Multiple Access Techniques (Any one).	2	Understand
9	Industrial Visit to Mobile Company Like BSNL , AIRTEL , Idea.	2	Study
10	Implementation of outdoor propagation Model (Any one) using Matlab.	2	Analyze
11	Implementation of Free Space propagation model using Matlab	2	Analyze

Mapping of POs & COs:

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

ETC802P- AUDIO VIDEO ENGINEERING 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	Provide basics information of TV system . Know color TV transmission and reception
2	Understand basic concept of digital TV system
3	Understand high definition TV
4	Know advanced TV systems like LCD, plasma, LED, CCTV

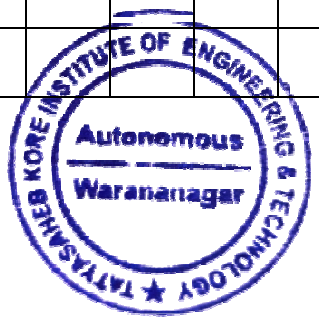
Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Describe picture and sound transmission and reception. Explain color composite video signal	Understand
CO2	Describe principle of digital TV system . Explain high definition television system	Analyze
CO3	Elaborate concept of video conferencing and videophone	Understand
CO4	Describe advanced TV system like LCD, plasma, LED, CCTV, etc..	Understand

Description:		
Introduce basic concepts of TV systems ,Describe picture and sound transmission. study composite video signal, To study digital TV and High Defination TV,to study all types of Picture tubes, to know about advanced TV systems like LCD, LED ,Plasma TV, CCTV.		
Prerequisites:	1	Analog Communication Systems, Digital Communication, Electronics all basic circuits.

List of Experiments			
Minimum 08 experiments:			
Sr. No.	**Name of the experiment**	**Hrs.**	**Cognitive levels of attainment as per Bloom's**
1	Study of S.M.P.S. from ET&T Colour T.V.	2	Study
2	Study of C.V.S. for different Video patterns using Pattern Generator	2	Study, Knowledge
3	Study of Horizontal details using Pattern Generator	2	Knowledge
4	Study of Vertical details using Pattern Generator	2	Knowledge
5	Build & test of Sync. Separator using Transistors	2	Study, Evaluation
6	Study of Horizontal Section of T.V.	2	Study
7	Study of Vertical Section of T.V.	2	Study
8	Study of Magnetic effect on T.V. Screen	2	Study, Knowledge
9	Fault finding & Trouble Shouting from 14'' B/W T.V.	2	Study, Knowledge
10	Fault finding & Trouble Shouting from Colour T.V.	2	Study, Knowledge

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



ETC805P- PROJECT WORK

			Evaluation Scheme
Practical	**:**	8 Hrs/Week	**ISA :100 Marks**
Credit	**:**	4	**POE :150 Marks**

Course Objectives:
The objective of the course is :
To understand the basic concepts & broad principles of projects.
To understand the value of achieving perfection in project implementation & completion.
To apply the theoretical concepts to solve real life problems with teamwork and Multidisciplinary approach.
To demonstrate professionalism with ethics; present effective communication skills and relate engineering issues to broader societal context. Course

Course Outcomes:

COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Demonstrate a sound technical knowledge in field of E&TC in the form of project.	Understand
CO2	Undertake real life problem identification, formulation and solution	Analyze
CO3	Design engineering solutions to complex problems utilizing a systematic approach.	Apply
CO4	Demonstrate the knowledge, effective communication skills and attitudes as professional engineer.	Understand

Description:

Guidelines:

1. The project TW/OR assessment shall be based on Live Project Demonstration and presentation by the students. The assessment parameters shall be Innovative Idea of selected project, literature survey, Depth of understanding, Applications, Individual contributions, presentations, project report, timely completion of work (Project review presentations), participation in project competition, publication of research work in journal/conference, publication in the form of patent and copyright etc. The college can prepare the rubrics based on these parameters
2. Certified hard bound project report to be submitted by the students in prescribed format.
3. Students must preferably publish at least one technical paper on project work in the conference or peer reviewed Journals or publish patent or copyright or should participate into one of the project competition at university/State/National/International level.
4. A log book of work carried out during the semester should be maintained with weekly review remarks by the guide and committee.
5. A certified copy of report preferably using LATEX is required to be presented to external examiner at the time of Fourth examination.
6. The project report must undergo by plagiarism check and the similarity index must be less than 10%. The plagiarism report should be included in the project report.

Member Secretary
Board of Studies

Chairman
Board of Studies

Chairman
Board of Studies
E & TC DEPT.
Tatyasaheb Kore Institute of Engg.
& Technology (Autonomous)
Warananagar, Dist. Kolhapur

Dean Academic
T.K.I.E.T, Warananagar

Dean Academic
Tatyasaheb Kore Institute of Engg.
& Technology (Autonomous)
Warananagar, Dist. Kolhapur

Principal
T.K.I.E.T, Warananagar

PRINCIPAL
Tatyasaheb Kore Institute of Engg.
& Technology (Autonomous)
Warananagar, Dist. Kolhapur

TATYASAHEB KORE INSTITUTE ENGINEERING & TECHNOLOGY
Autonomous
Warananagar

87

Honor Degree Course in Cyber Security

(Electronics & Telecommunication Engineering)

Structure and Evaluation Scheme

(To be implemented from 2022 - 23)

Credit scheme

Course Code	Course Title	Semester	Category	Teaching and Credit Scheme					Examination & Evaluation Scheme			
				L	P	T	CH	C	Components	Marks	Min for Passing	
ETC-H-501	Introduction to Cyber Security	V	ESC	4			4	4	ESE	60	24	40
									ISE	40	16	
ETC - H-601	Cyber Security & Law	VI	ESC	4			4	4	ESE	60	24	40
									ISE	40	16	
ETC-H-701	Network Security	VII	ESC	4			4	4	ESE	60	24	40
									ISE	40	16	
ETC - H-801	Applied Cryptography	VIII	ESC	4			4	4	ESE	60	24	40
									ISE	40	16	
ETC-P-801	Seminar	VIII	ESC	--	4	--	4	2	ISA	100	40	
				16	**4**		**20**	**18**	**--**	**500**	--	

Evaluation

For each course 100 marks evaluation. (60 marks End Semester Examination and 40 marks In Semester Examination which will consist of test, assignment, and presentations by students.)

Guidelines For Honors Degree

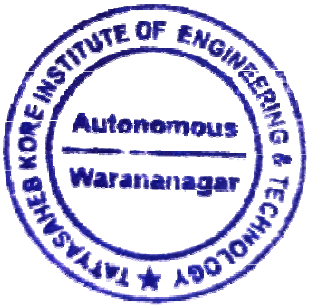
As per the guidelines provided by AICTE APH 20-21 Chapter 7 Section 7.3.2, institute has made the provision to opt for Honors for its students to achieve specialization in the area of his / her interest.

Approval Process Handbook_2021-22.pdf - AICTEhttps://www.aicte-india.org › sites › default › filesPDF 30-Apr-2021 — Courses as per Chapter VII of the Approval Process Handbook. 38 —Level‖ means Diploma, Post Diploma Certificate, Under Graduate Degree, ...309 pages

Honors Degree:

Under Graduate Degree Courses in EMERGING AREAS shall be allowed as specialization from the same Department or compatible Dept. as specialization in that particular area.

1. Students from same department are eligible for Honor degree.
2. Students can select advanced courses from their respective specialization in which they areperusing the degree.
3. Student can select one subject per semester from the list of Honor courses of a branch inwhich they are perusing the degree.
4. Online courses as per the AICTE APH are from platforms from nationally/Internationally recognized institutes, Universities, Companies /platforms approved by concern BoS.



ETC-501H- INTRODUCTION TO CYBER SECURITY

Lectures : 4 Hrs/Week
Credit : 4

Evaluation Scheme
ISE : 40 Marks
ESE : 60 Marks

Course Objectives: The course aims to make the student understand :	
1	To study information security, Computer ethics and security policies.
2	Choosing the best browser and understand different security.
3	To study Smartphone security.
4	To understand online banking, Credit card and UPI security.

Course Outcomes:

COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Understand information security, Computer ethics and security policies.	Understand
CO2	Choose best browser according to the requirement and email security and understand how to secure password and wi-fi security, social media,basic windows security.	Understand
CO3	Understand Smartphone security.	Understand
CO4	Understand online banking, Credit card and UPI security.	Understand

Description:

This course is geared towards generating and enhancing awareness about cyber security challenges and theconcepts of cyber security and cyber ethics among the stake holders to help them become responsible cyber citizens and participate safely and securely in the rapidly evolving information-age society.

Prerequisites:	1	Fundamental knowledge in Computers.

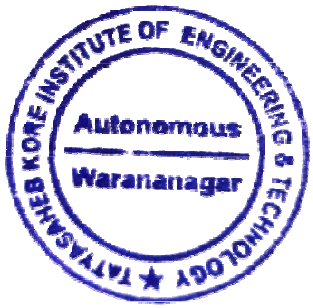
Course Contents		
Unit No:1	**INTRODUCTION TO CYBER SPACE:** History of Internet, Addressing Scheme in the Internet, Domain Name System(DNS), Cyber Crime, Malware and its type, Kinds of Cyber Crime,Information Security, Cyber Security Models, Threats, Vulnerabilities and Risks,Computer Ethics and SecurityPolicies, Tactics to Ensure Computer Security and Maintain Privacy.	**4 Hrs.**
Unit No:2	**WEB BROWSER AND EMAIL SECURITY:** Guidelines to choose web browsers, Securing web browser, Antivirus, Securing computer using antivirus, Email security.	**3 Hrs.**
Unit No:3	**PASSWORD AND WI-FI SECURITY:** Guidelines for setting up a Secure password, Two steps authentication, How to Set up 2 Step Verification in Gmail, Password Manager, Wi-Fi Security, Types of Attacks on Wireless Environment.	**4 Hrs.**
Unit No:4	**SOCIAL MEDIA AND BASIC WINDOWS SECURITY:** Guidelines for social media security, social networking platforms, Tips and best practices for safer Social Networking, Basic Security for Windows, User Account Password, Windows firewall, bloatware, Avoiding malware on windows, windows defender.	**4 Hrs.**
Unit No:5	**SMARTPHONE SECURITY:** Introduction to mobile phones, Smartphone Security, Mobility and The Vulnerability of information, Mobile Infrastructure, Tracking, surveillance and eavesdropping, Android Security, recommended android apps, IOS Security.	**4 Hrs.**
Unit No:6	**ONLINE BANKING AND UPI SECURITY:** Online Banking Security, Threats to Online Banking, Mobile Banking Security, Threats to Mobile Banking, Security of Debit and Credit Card, Security Threats, UPI Security.	**4 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		1		2			2	1	1	2	1	
CO2	3	2	3		2		1			1	2	1	1	2	
CO3	3	2	1			1	1			1		1		1	1
CO4	2	1	2		1	1	1			1	2		2	1	

Text Books:	
1	Introduction to Cyber Security http://uou.ac.in/foundation-course

Reference Books:	
1	“Computer Security : Principles and Practices”, William Stallings, Pearson 6th Ed.
2	“Cyber Security- Understanding Cyber Crimes, Computer Forensics and Legal Perspectives”,



ETC-601H- CYBER SECURITY AND LAW

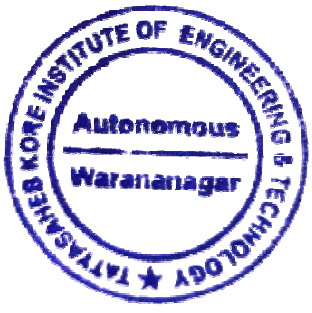
Lectures : 4 Hrs/Week
Credit : 4

Evaluation Scheme
ISE : 40 Marks
ESE : 60 Marks

Course Objectives: The course aims to make the student understand :	
1	To gain knowledge about securing both clean and corrupted systems, protect personal data, and securecomputer network.
2	To understand cyber physical security and forensics.
3	To understand key terms and concepts in Information Technology Act.
4	To understand cyber security laws.

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Explain the cyber security concepts.	Understand
CO2	Describe the cyber security vulnerabilities and prevention techniques and understand cyber physical security, forensics.	Understand
CO3	Understand the different rules and regulations under I.T. ACT.	Understand
CO4	Understand cyber security laws.	Understand

Description:		
The course on Cyber Security is very important in this digital era due to dependency on online operations, social media practices, upcoming technologies like IoT, IIoT, IoE, digitization and pervasive nature of mobile devices.		
Prerequisites:	1	Fundamental knowledge of Cyber Security.



Course Contents		
Unit No:1	**Introduction to Cyber Crime:** Cyber stalking, protecting yourself against Cyber Crime, Detecting and EliminatingViruses and Spyware.	**3 Hrs.**
Unit No:2	**Techniques Used by Hackers:** Introduction, Basic Terminology, The Reconnaissance Phase, Actual Attacks, MalwareCreation, Penetration Testing.	**5 Hrs.**
Unit No:3	**Cyber Physical Security:** Cyber Physical System Security, Virtual Currency, Block Chain Technology, SecurityAuditing.	**4 Hrs.**
Unit No:4	**Introduction to Forensics:** Introduction, General Guidelines, Finding Evidence on the PC, Finding Evidence inSystem Logs, Getting Back Deleted Files, Operating System Utilities, Mobile Forensics: Cell Phone Concepts.	**6 Hrs.**
Unit No:5	**The Legal Perspectives of Cyber Crimes:** Why Do We Need Cyber laws: The Indian Context, The Indian IT Act, Challenges toIndian Law and Cybercrime Scenario in India.	**5 Hrs.**
Unit No:6	**Cyber Law:** Evidentiary value of Email/SMS, Cybercrimes and offences dealt with IPC, RBI Actand IPR Act in India, Jurisdiction of Cyber Crime, Cyber Security Awareness Tips.	**5 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		1		2			2	1	1	2	1	
CO2	3	2	3		2		1			1	2	1	1	2	
CO3	3	2	1			1	1			1		1		1	1
CO4	2	1	2		1	1	1			1	2		2	1	

Text Books:	
1	"Computer Security Fundamentals", Chuck Easttom, Pearson, Third edition.
2	"Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Nina Godbole and Sunil Belapure, Wiley INDIA.

Reference Books:	
1	"Incident Response & Computer Forensics". Jason Luttgens, Matthew Pepe, Kevin Mandia, , McGraw-Hill Osborne Media, 3rd edition , 2014.
2	"Real Digital Forensics: Computer Security and Incident Response",'Keith J. Jones, Richard Bejtlich, Curtis W. Rose, Paperback – Import, 005.
SWAYAM Courses:	
1	Cyber Security: https://onlinecourses.swayam2.ac.in/cec23_cs03/course

ETC-701H- NETWORK SECURITY

Lectures : 4 Hrs/Week
Credit : 4

Evaluation Scheme
ISE : 40 Marks
ESE : 60 Marks

Course Objectives: The course aims to make the student understand :	
1	To introduce various network models, security threats and attacks and fundamentals of network security.
2	To imbibe good foundation of network security in students for implementation of new network security algorithms.
3	To understand different network models and the protocols used in each layer.
4	To acquire detailed approach of encryption decryption for the data to transmit

Course Outcomes:

COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Analyze attacks on computers and computer security.	Analyze
CO2	Demonstrate knowledge of cryptography techniques.	Understand
CO3	Illustrate various Symmetric and Asymmetric keys for Ciphers	Understand
CO4	Evaluate different Message Authentication Algorithms and Hash Functions and get acquainted with various aspects of E-Mail Security	Understand

Description:

This course is aimed to analyze attacks on computers and related security. It also enables to know different cryptography techniques, algorithms and security issues.

Prerequisites:	1	Fundamentals of Cyber Security

Course Contents		
Unit No:1	**Attacks on Computers and Computer Security** Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for NetworkSecurity.	**6 Hrs.**
Unit No:2	**Cryptography-Concepts and Techniques** Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, stenography, key range and key size, possible types of attacks.	**6 Hrs.**
Unit No:3	**Symmetric and Asymmetric key for Ciphers** Block Cipher principles & Algorithms (DES, AES, Blowfish), Differential and Linear Crypt analysis, Block cipher modes of operation, Stream ciphers, RC4, Location and placement of encryption function, Key distribution, Asymmetric	**6 Hrs.**
Unit No:4	**Message Authentication Algorithms and Hash Functions** Authentication requirements, Functions, Message authentication codes, Hash Functions, Secure hash algorithm, HMAC, CMAC, Digital signatures, knapsack algorithm, Authentication Applications such as Kerberos, X.509 Authentication Service, Public – Key Infrastructure, Biometric Authentication.	**6 Hrs.**
Unit No:5	**E-Mail Security** Pretty Good Privacy, S/MIME, IP security overview, IP Security architecture, Authentication Header, Encapsulating , Security payload, Combining security associations, Key management.	**6 Hrs.**
Unit No:6	**Web Security** Web security considerations, Secure Socket Layer and Transport Layer Security, Secure electronic transaction, Intruders, Intrusion detection, password management, virus and related threats, Countermeasures, Firewall design	**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		1		1		2			2	1	1	2	1	
CO2	3	2	3		2		1			1	2	1	1	2	
CO3	3	2	1			1	1			1		1		1	1
CO4	2	1	2		1	1	1			1	2		2	1	

Text Books:	
1	"Cryptography and Network Security", William Stallings , Pearson Education, 4th Edition
2	"Cryptography and Network Security", Atul Kahate, McGraw Hill, 3rd Edition.
3	"Cryptography and Network Security", C K Shymala, N Harini, Dr. T R Padmanabhan Wiley India,1st Edition.

Reference Books:	
1	"Cryptography and Network Security", Forouzan Mukhopadhyay, Mc Graw Hill, 2 nd Edition.
2	"Information Security, Principles and Practice", Mark Stamp, Wiley India, 2nd Edition.
3	"Principles of Computer Security", W.M. Arthur Conklin, Greg White, TMH, 4th Edition.
4	"Introduction to Network Security", Neal Krawetz, CENGAGE Learning Distributor, 1st Edition.
5	"Network Security and Cryptography", Bernard Menezes, CENGAGE Learning Distributor, 1st Edition

Member Secretary
Board of Studies

Chairman
Board of Studies
Chairman
Board of Studies
E & TC DEPT.
Tatyasaheb Kore Institute of Engg.
& Technology (Autonomous)
Warananagar, Dist. Kolhapur

Dean Academic
T.K.I.E.T.,Warananagar
Dean, Academic
Tatyasaheb Kore Institute of Engg.
& Technology (Autonomous)
Warananagar, Dist. Kolhapur

TATYASAHEB KORE INSTITUTE OF ENGINEERING & TECHNOLOGY
Autonomous
Warananagar

Principal
T.K.I.E.T.,Warananagar
PRINCIPAL
Tatyasaheb Kore Institute of Engg.
& Technology (Autonomous)
Warananagar, Dist. Kolhapur

98