CHAITANYA BHARATI INSTITUTE OF TECHNOLOGY

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING
Stake holder involvement in Curriculum Development
AY 2021-22

Action taken and implementation in Curriculum

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DEPARTMENT OF ECE
Chaitanya Bharathi Institute of Technolog
Hyderabad-500 075

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

Stakeholder involvement in Curriculum Development

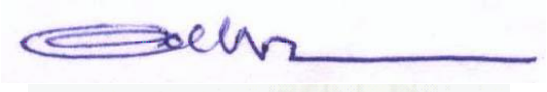
AY 2021-22

Action taken and implementation in Curriculum

1) Industry

S.no.	Suggestions & opinion	Actions Taken
1	The 5G Communication course includes 4G communications topics also. The speech Processing course includes Audio/Video Signal Processing. IoT and Its Applications course include Local Area Networking technologies such as Zigbee/BT/WLAN (IEEE802.11a/b/g/n/ac/ax and be, 802.11ah) and UWB. Include how the IoT devices are connected to the intelligent cloud. Green Communication course include Low Power communication techniques	All the topics are included
2	In the Speech processing I hope you are covering speech recognition using HMMs, RNNs, you can ask students to use Kaldi or HTK and build speech recognizers for Telugu, Hindi etc..	It is included in the syllabus.
3	Projects on Multi core programming of FPGA, Radar signal processing, working with Microwave circuits like circulator, direction coupler, antenna design, etc to be encouraged (areas required for industry)	It is included in the syllabus.
4	Navigation: VOR (VHF Omni Range), NDB, ILS (Instrument Landing system – (Localizer+Glide Path) and GNSS	These topics are included in the syllabus.

1) Industry (Proof)



20EC E26

5G COMMUNICATIONS

(Professional Elective-V)

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite: The student must prior knowledge in Communication systems, Mobile Cellular Communications

Course Objectives: This course aims to:

1. Understand the requirements & concepts of 4G/5G.
2. Expose the architecture and radio access technologies of 5G.
3. Learn Massive MIMO concepts.

Course Outcomes: Upon completion of this course, students will be able to:

1. Recall the requirements and key functionalities of 4G LTEA/5G NR technology.
2. Compare various channel access technologies, modulation techniques used in 5G wireless systems.
3. Illustrate the architecture of 5G and its NextGen core network.
4. Apply the 5G concepts to D2D communications.
5. Demonstrate the concept of massive MIMO.

Course Articulation Matrix

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

UNIT I

Overview of 4G/5G Wireless Communications: Evolution of mobile technologies (1G-5G), 3GPP Releases & its key aspects,4G overview, Overview of 5G, three high level 5G usage scenarios (eMBB, URLLC, mMTC), Key capabilities & requirements, performance & efficiency indicators, 5G vs. LTE-A Comparison, 5G frequency bands, 5G Use cases.

UNIT II

5G Channel Access Techniques: Basic requirements of transmission over 5G, Modulation Techniques- generalized frequency division multiplexing (GFDM), filter bank multi-carriers (FBMC) and universal filtered multi-carrier (UFMC), Multiple Accesses Techniques –non-orthogonal multiple accesses (NOMA), Sparse Code Multiple Access (SCMA) –Comparison of multiple access methods.

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CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

AICTE Model Curriculum with effect from AY 2023-24

B.E (Electronics and Communication Engineering)

SEMESTER – VII

List of Courses in Professional Elective-VI		List of Courses in Open Elective-II	
Course code	**Title of the Course**	**Course code**	**Title of the Course**
20ECE31	VLSI Technology	20CEO02	Disaster Risk Reduction and Management
20ECE32	Mobile Adhoc and Sensor Networks	20MEO04	Principles of Entrepreneurship
20ECE33	Speech Processing	20CSO01	Fundamentals of Virtual Reality
20ECE34	IoT and its Applications	20ADO01	Introduction to Python Programming
20ECE35	Remote Sensing	20EGO01	Technical Writing Skills
20ECE36	Network Security	20CSO02	Introduction to Web Technology

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20EC E17

Green Communication

(Professional Elective - III)

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite: The student must prior knowledge in Communication systems, Mobile Cellular Communications.

Course Objectives: This course aims to:

1. To learn the importance of energy conservation in green wireless communication system.
2. To compare the different types of energy reduction techniques for different traffic scenarios.
3. To inculcate the different green concepts for designing the energy efficient next generation wireless networks

Course Outcomes: Upon completion of this course, students will be able to:

1. Understand the challenges in energy efficiency and spectral efficiency for digital data transmission.
2. Conceptualize significant energy efficiency trade off in green wireless networks. Apply the basics of Python programming language, which is used in many IoT devices.
3. Apply the methods to manage the dynamic loads of mobile communications for energy saving.
4. Indicate the design practices for power minimization at cellular base station.
5. Implement cell deployment strategies for efficient network management.

Course Articulation Matrix

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

UNIT I

Introduction to Green Wireless Communications: Introduction, Effective Capacity and Energy Per Information Bit, Variable-Rate/Variable- Power and Variable-Rate/Fixed-Power Transmissions, Fixed-Rate/Fixed-Power Transmissions - Transmissions over Imperfectly-Known Wireless Channels, Energy Efficiency in the Low- Power Regime - Energy Efficiency in the Wideband Regime.

UNIT II

Energy Efficiency-Spectral Efficiency Trade-off: Spectral Efficiency, Energy Efficiency, Energy Efficiency-Spectral Efficiency Trade-Off, Idealistic vs. Realistic Power Consumption Model, MIMO vs. SISO: An Energy Efficiency Analysis, Power Model Implications.

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20EC E34

IOT AND ITS APPLICATIONS

(Professional Elective - VI)

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite: Knowledge of Programming and Problem Solving, Computer Organization, and Embedded systems.

Course Objectives: This course aims to:

1. Provide an insight into the required infrastructure for IoT technology.
2. Introduce Python Programming language and familiarize the IoT concepts, their origin, and methodology.
3. Develop Django Framework and domain-specific applications.

Course Outcomes: Upon completion of this course, students will be able to:

1. Understand the terminology, enabling technologies, and various protocols of IoT.
2. Illustrate the concepts of Machine to Machine, SDN, and NFV and build simple IoT systems using Raspberry Pi board, NodeMCU, and BeagleBone Black.
3. Apply the basics of Python programming language, which is used in many IoT devices.
4. Create the steps involved in IoT system design methodology.
5. Develop web applications using a python-based framework called Django and IoT technologies for domain-specific applications.

Course Articulation Matrix

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

UNIT-I

Introduction and Concepts: Introduction to Internet of Things, Definitions and Characteristics of IoT, Physical Design of IoT: Things in IoT, IoT Protocols, Concepts of zigbee, BT. Logical Design of IoT, IoT Functional Blocks, IoT Communication Models, IoT Communication APIs, IoT Enabling Technologies, Wireless Sensor Networks, Cloud Computing, Big Data, Communication Protocols, IoT Levels & Deployment Templates.

UNIT-II

MACHINE TO MACHINE and Networking: Introduction, MACHINE TO MACHINE, Differences between IoT and MACHINE TO MACHINE, Software Defined Networking, Network Function Virtualization.

IoT Physical Devices and End Points: Basic building blocks of an IoT device, Raspberry Pi- about the Raspberry Pi board, Raspberry Pi interfaces- Serial, SPI & I2C, Introduction to NodeMCU, Introduction to BeagleBone Black.

UNIT-III

Introduction to Python: Motivation for using Python for designing IoT systems, Language features of Python, Data types: Numbers, Strings, Lists, Tuples, Dictionaries, Type Conversions, Data Structures: Control of flow-if, for, while, range, break/continue, pass, functions, modules, packaging, Python packages of Interest for IoT: JSON, XML, HTTPLib, URLLib, SMTPLib.

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20EC E33

SPEECH PROCESSING
(Professional Elective-VI)

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite: Computer Architecture and Microprocessors

Course Objectives: This course aims to:

1. Provide students with the knowledge of basic characteristics of speech signal in relation to production and hearing of speech by humans.
2. Describe basic algorithms of speech analysis and pitch extraction.
3. Learn the various algorithms for speech recognition like HMM and Dynamic warping.

Course Outcomes: Upon completion of this course, students will be able to:

1. Understand the basic characteristics of speech signal in relation to production and hearing of speech by humans.
2. Analyze speech and extract features for speech applications.
3. Distinguish between different speech coding techniques.
4. Use dynamic warping and HMM for real time problems.
5. Design the various applications like recognition, synthesis, and coding of speech

Course Articulation Matrix

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

UNIT-I

Fundamentals of Speech:
Mechanism of speech production: Vocal track and physiology, LTI Model for Speech Production, Nature of Speech Signal, Phonetics, Types of Speech, Parameters of Speech: Pitch and Formants, Audio File Formats: Nature of WAV File.

UNIT-II

Time Domain Models of Speech processing:
Time dependent processing of speech, Short - time Energy and average magnitude , short time average Zero crossing rate, Speech versus Silence Discrimination using Energy and Zero crossing , Pitch period estimation, short time auto correlation estimation, Short time average magnitude difference function, median smoothing and speech processing.

UNIT-III

Digital representation of the speech waveform:
Waveform Speech Coding Techniques- Sampling speech signals, review of statistical model of speech signal, Instantaneous Quantization, Adaptive Quantization, Differential quantization. Qualitative treatment for Delta modulation and Differential PCM.Comparison of systems, LDM to PCM conversion and PCM to ADPCM conversion.

Parametric Speech Coding Techniques- Channel Vocoders, Transform domain coding of speech – Sub band coding.

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20EC E33

SPEECH PROCESSING
(Professional Elective-VI)

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite: Computer Architecture and Microprocessors

Course Objectives: This course aims to:

1. Provide students with the knowledge of basic characteristics of speech signal in relation to production and hearing of speech by humans.
2. Describe basic algorithms of speech analysis and pitch extraction.
3. Learn the various algorithms for speech recognition like HMM and Dynamic warping.

Course Outcomes: Upon completion of this course, students will be able to:

1. Understand the basic characteristics of speech signal in relation to production and hearing of speech by humans.
2. Analyze speech and extract features for speech applications.
3. Distinguish between different speech coding techniques.
4. Use dynamic warping and HMM for real time problems.
5. Design the various applications like recognition, synthesis, and coding of speech

Course Articulation Matrix

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

UNIT-I

Fundamentals of Speech:
Mechanism of speech production: Vocal track and physiology, LTI Model for Speech Production, Nature of Speech Signal, Phonetics, Types of Speech, Parameters of Speech: Pitch and Formants, Audio File Formats: Nature of WAV File.

UNIT-II

Time Domain Models of Speech processing:
Time dependent processing of speech, Short - time Energy and average magnitude , short time average Zero crossing rate, Speech versus Silence Discrimination using Energy and Zero crossing , Pitch period estimation, short time auto correlation estimation, Short time average magnitude difference function, median smoothing and speech processing.

UNIT-III

Digital representation of the speech waveform:
Waveform Speech Coding Techniques- Sampling speech signals, review of statistical model of speech signal, Instantaneous Quantization, Adaptive Quantization, Differential quantization, Qualitative treatment for Delta modulation and Differential PCM.Comparison of systems, LDM to PCM conversion and PCM to ADPCM conversion.

Parametric Speech Coding Techniques- Channel Vocoders, Transform domain coding of speech – Sub band coding.

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20EC C28

MICROWAVE AND RADAR ENGINEERING

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite: Knowledge of Electromagnetics and Antennas

Course Objectives: This course aims to:
1. To understand the importance of microwaves and their applications.
2. To understand the principle and operation of microwave sources.
3. To understand principle and operation of different radar systems.

Course Outcomes: Upon completion of this course, students will be able to:
1. Apply the wave equations and their solutions to analyze the waves in the waveguides.
2. Determine the scattering matrix for various microwave components.
3. Analyze the interaction of electron beam and RF field for various microwave sources.
4. Examine the principles of operation of pulse, CW and MTI radar system.
5. Compare different types of tracking radars.

Course Articulation Matrix

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

Unit-I

Introduction to Microwaves: Microwave frequency spectrum, Advantages and Applications of Microwaves.
Rectangular Waveguides: Rectangular waveguides, TM and TE waves, Impossibility of TEM wave in waveguides. Wave Impedance. Circular Wave guides Concepts.
Microwave Cavities: Rectangular and Circular Cavity Resonators, Quality factor and applications of cavity resonators.

Unit-II

Microwave Circuits and Components: Concept of microwave hybrid circuit, Introduction to scattering parameters. Properties and S-parameters of reciprocal components – E and H Plane Tees, Magic Tee, Directional Coupler.
Non Reciprocal Components: Ferrites – Composition and Faraday Rotation; Ferrite Components – Isolators, Gyrators and Circulators. S- Parameters of Isolator and Circulator.

Unit-III

Microwave Tubes: Limitations of Conventional Tubes at Microwave Frequencies. Principles of Gunn Diode.
O-type tubes: Two cavity klystron, velocity modulation process, bunching process. Output power and efficiency. Reflex Klystron-Velocity Modulation, Power out and efficiency, Electronic admittance.

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Helix TWT: Slow Wave Structures, Principles of Operation and Applications of TWT (qualitative treatment only). Concepts of Magnetron.

Unit- IV

Radar Systems: Introduction to radar, radar block diagram, and operation, radar frequencies, Applications of radar, Radar range Equation, Prediction of range performance, minimum detectable signal, receiver noise, probability density function, SNR, Integration of radar pulses, radar cross-section of targets, PRF and range ambiguities, transmitter power, system losses.

Unit-V

Radar Types: Doppler effect, CW radar, FM CW radar, multiple frequencies CW radar. MTI radar, delay line canceller, range-gated MTI radar, blind speeds, staggered PRF. Principles of Tracking radar. Concepts of SAR and its applications Fundamentals of EMI and EMC, Surveillance Radar, Applications and Advantages. Introduction to Electronic warfare: ECM and ECCM.

Text Book:

1. Samuel Y. Liao, "Microwave Devices and Circuits", 3/e, Pearson Education, 2003.
2. Merril. I. Skolnik, "Introduction to Radar Systems", 2/e, MGH, 2001.
3. V. Prasad Kodali, Engineering Electromagnetic Compatibility: Principles, Measurements, and Technologies, Wiley-IEEE Press, IEEE, 2001

Suggested Readings:

1. Rizzi P, "Microwave Devices and Circuits", 3/e, Pearson Education, 2003.

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20EC E29

PRINCIPLES OF GNSS

(Professional Elective-V)

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite: Fundamental concepts of communication are required.

Course Objectives: This course aims to:

1. Explain the basic principle of operation of GPS, GPS ephemerides and signal structure.
2. Make the students to understand various coordinate systems and highlight the effect of various errors affecting GPS signals.
3. Make the students to appreciate the significance of other GNSS systems, principle of DGPS and augmentation systems.

Course Outcomes: Upon completion of this course, students will be able to:

1. Demonstrate the fundamental concepts of communications in understanding of GPS architecture, operation and signal structure.
2. Apply the principles of orbital mechanics, time references, coordinate systems and range measurements in estimating user position.
3. Examine the effect of various error sources and satellite geometry on position estimates and analyze the suitability of a given data format.
4. Compare the architecture and working of other GNSS systems and make use of GNSS systems in a variety of civilian and defense applications.
5. Relate the knowledge of DGPS techniques in understanding augmentation systems.

Course Articulation Matrix

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

UNIT-I

GPS Fundamentals: Introduction to Radio Navigation system: VOR, ILS. GPS System Segments: space, control and user segments, Principle of operation, Current status of GPS satellite constellation. Orbital Mechanics: GPS ephemeris data, algorithm for computation of satellite's position from ephemeris data. Time References: solar and sidereal days, UTC time, GPS time.

UNIT-II

GPS Signals: Legacy GPS signals: Signal structure, Operating frequencies, C/A and P-Code, Navigation message, Modernized GPS signals: list of signals and their significance. Range measurements: code and carrier measurements, User position estimation with PRN codes.

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2) Alumni

S.no.	Suggestions & opinion	Action taken
1	Artificial Intelligence (AI)	Already the subject is included
2	Behavioral courses which helps in training or developing ethics, self-learning, increases responsibilities, pro-activeness	UHV: 2 Understanding Harmony subject is included.
3	From Sem 6: It would be nice to have Fundamentals of DBMS and Python programming in different electives	They are offered in different electives

2) Alumni (Proof)

20EC E06

PRINCIPLES AND APPLICATIONS OF AI

(Professional Elective-I)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite: Knowledge of probability, Linear Algebra, Data Structure and programming.

Course Objectives: This course aims to:

1. Exposure to the foundation of Artificial Intelligence.
2. Familiarize the applications of Artificial Intelligence in Industry
3. Inculcate the concepts of Neural Networks and Pattern Recognition

Course Outcomes: Upon completion of this course, students will be able to:

1. Understand the basics of AI and intelligent agents.
2. Apply Expert Systems to solve real time problems
3. Understand knowledge representation methods.
4. Build algorithms using neural network techniques for various applications
5. Solve the various classification problems like object recognition

Course Articulation Matrix

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

UNIT-I

Introduction to AI and Intelligent Agents: Concept of AI, current status of AI, Agents, Good Behavior: Environment, problem formulation. The structure of agents. Basic concepts of Search Algorithms: Uninformed depth first search, breadth first search, uniform cost search, depth limited search, iterative deepening search and informed search techniques like greedy best first search and A* algorithm, concepts of admissibility.

UNIT-II

Knowledge representation: Bayesian network representation, Construction and inference. Hidden Markov Model.Approaches to knowledge representation, knowledge representation using the semantic network, extended semantic networks for Knowledge representation, knowledge representation using frames.

UNIT-III

Expert system and applications: Introduction phases in building expert systems, expert system versus traditional systems, Rule-based expert systems, blackboard systems truth maintenance systems and application of expert systems.

UNIT-IV

Neural Networks: What is a neural network, the human brain, models of a neuron, neural networks as a directed graph, feedback and network architectures. Learning processes and learning tasks.

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AICTE Model Curriculum with effect from AY 2021-22

B.E (Electronics and Communication Engineering)

SEMESTER – IV

S. No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per week			Duration of SEE in Hours	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1	20ECC07	Analog Circuits	3	-	-	3	40	60	3
2	20ECC08	Analog Communication	3	-	-	3	40	60	3
3	20ECC09	Antennas and Wave Propagation	3	-	-	3	40	60	3
4	20ECC10	Control Systems	3	-	-	3	40	60	3
5	20ECC11	Digital Systems Design	3	-	-	3	40	60	3
6	20EGM03	Universal Human Values II: Understanding Harmony	2	1	-	3	50	50	3
7	20EGM01	Indian Constitution and Fundamental Principles	2	-	-	2	-	50	Non-Credit
8	20EGM02	Indian Traditional Knowledge	2	-	-	2	-	50	Non-Credit
PRACTICALS									
9	20ECC12	Analog Circuits Lab	-	-	2	3	50	50	1
10	20ECC13	Analog Communication Lab	-	-	2	3	50	50	1
11	20ECC14	Digital Systems Design Lab	-	-	2	3	50	50	1
Total			**21**	**1**	**06**	**31**	**400**	**600**	**21**
Clock Hours Per Week: 28									

L: Lecture **D: Drawing** **CIE: Continuous Internal Evaluation**

T: Tutorial **P: Practical/Project Seminar/Dissertation** **SEE: Semester End Examination**

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20EGM03

UNIVERSAL HUMAN VALUES II: UNDERSTANDING HARMONY

(Common for all Programs)

Instruction	2 L+1T Hours per Week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	3

Prerequisite: Knowledge of UNIVERSAL HUMAN VALUES I

Course Objectives:
This course aims to:

1. Development of a holistic perspective based on self-exploration about themselves (human being), family, society, and nature/existence.
2. Understanding (or developing clarity) of the harmony in human being, family, society, and nature/existence.
3. Strengthening of self-reflection.
4. Development of commitment and courage to act.

Course Outcomes:
Upon completion of this course, students will be able to:

1. Students are expected to become more aware of themselves, and their surroundings (family, society, nature)
2. They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
3. They would have better critical ability.
4. They would also become sensitive to their commitment towards what they have understood (human values, human relationship, and human society).
5. It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.

The course has 28 lectures and 14 practice sessions:

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

CO \ PO/PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	-	-	1	-	-	1	-	-	1	-	-	1	-	-	-
CO 2	-	-	1	-	-	1	1	-	1	-	1	1	-	-	-
CO 3	--	-	-	-	-	1	-	-	-	1	-	-	-	-	-
CO 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 5	-	-	-	1	-	-	-	-	1	1	1	1	-	-	-

UNIT-I
Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

- Purpose and motivation for the course, recapitulation from Universal Human Values-I
- Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation-as the process for self-exploration.
- Continuous Happiness and Prosperity- A look at basic Human Aspirations.

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20CS O09

FUNDAMENTALS OF DBMS

(Open Elective-I)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives: This course aims to:

1. To learn data models, conceptualize and depict a database system using E-R diagrams.
2. To understand the internal storage structures in a physical DB design.
3. To learn the fundamental concepts of transaction processing techniques.

Course Outcomes: Upon completion of this course, students will be able to:

1. Classify the difference between FMS and DBMS; describe the roles of different users and the structure of the DBMS. Design the database logically using ER modeling
2. Outline the schema of the relational database and key constraints. Develop queries using DDL, DML and DCL of SQL.
3. Identify the inference rules for functional dependencies and apply the principles of normal forms to decompose the relations in a database.
4. Summarize the concepts of dense, sparse, ISAM and B+ tree indexing and get familiar with states and properties of transactions.
5. Interpret the locking, time stamp, graph and validation-based protocols for concurrency control.
6. Summarize log-based recovery techniques to increase the robustness of the database, identify to resolve the deadlocks in the transactions.

Course Articulation Matrix

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

UNIT - I

Introduction: Database System Applications, Purpose of Database Systems, View of Data, Database Languages, Database Users and Administrators Database System Architecture, Application Architectures.
Database Design and E-R Model: Basic concepts, Constraints, E-R Diagrams, E-R Design Issues, Extended E-R Features, Specialization and Generalization.

UNIT - II

Relational Model: Structure of Relational Databases, Database Schema, Keys.
Structured Query Language: Overviews, SQL Data Types, SQL Queries, Data Manipulation Language Set Operations, Aggregate Functions, Data Definition Language, Integrity Constraints, Null Values, Views, Join Expression. Index Definition in SQL.

UNIT - III

Relational Database Design: Undesirable Properties in Relational Database Design, Functional Dependencies, Trivial and Nontrivial Dependencies, Closure of Set of Functional Dependencies, Closure of Set of Attributes, Irreducible Set of Functional Dependencies, Normalization – 1NF, 2NF, and 3NF, Dependency Preservation, BCNF, Comparison of BCNF and 3NF.

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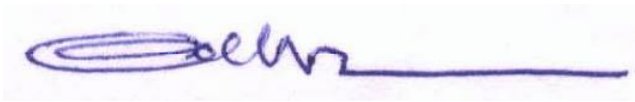

20AD O01

INTRODUCTION TO PYTHON PROGRAMMING

(Open Elective-II)

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite: Programming for problem solving.

Course Objectives: This course aims to:

1. To introduce the python programming environment.
2. To impart knowledge basics data types and operation.
3. To familiarize with function, tuple, dictionary to process the data.
4. To introduce various packages in python
5. To familiarize class, object, exception handling and working with files.

Course Outcomes: Upon completion of this course, students will be able to:

1. Explore data operations on list, tuple and dictionary in python.
2. Understand deployment of models on different datasets.
3. Apply supervised, unsupervised, ensembling and NLP models on different datasets.
4. Perform data analysis using python packages.
5. Build and evaluate the models using python programming.

Course Articulation Matrix

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

UNIT-I:

Introduction: Historical introduction to python, Installing Python, python interpreter and its environment: Argument passing and interactive mode, source encoding: Informal introduction to python: Python as calculator: Numbers, Strings, Lists, Programming steps.

UNIT - II

Control Statements and functions: control flow tools: if statement, for statements, range function, break and continue statements, else clauses on loops, pass and match statements; Defining function: default and keywords argument values, special parameters: positional-or-keywords arguments, positional parameters, keywords arguments, function examples, Arbitrary and Unpacking argument lists, lambda expression, documentation strings, function annotations, coding style, Input and output, reading and writing files.

UNIT - III

Data structures and Modules: More on lists: Lists as stack and queues, list comprehensions, nested list comprehensions, del statement, Tuples and sequences, sets and operations, Dictionaries, looping and conditional statements on dictionary; Modules: Executing modules as scripts, module search path, compiled python files, standards modules, dir() function, packages: Importing * from packages, intra packages references, packages in multiple directories, error and exception handling.

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4) Parent

S.no.	Suggestions &opinion	Action Taken
1	I understand that it might require a few administrative changes, but if it is feasible, it would prove to be a great opportunity for students to explore various verticals and find their niche.	It is done through OE and also through AME
2	Inclusion of topics like basics of biometric authentication and facial recognition in line with UIDAI and banking services	These topics are included in Image & Video processing and Pattern Recognition courses

4) Parent (Proof)

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

AICTE Model Curriculum with effect from AY 2023-24

B.E (Electronics and Communication Engineering)

SEMESTER – VII

List of Courses in Professional Elective-VI		List of Courses in Open Elective-II	
Course code	**Title of the Course**	**Course code**	**Title of the Course**
20ECE31	VLSI Technology	20CEO02	Disaster Risk Reduction and Management
20ECE32	Mobile Adhoc and Sensor Networks	20MEO04	Principles of Entrepreneurship
20ECE33	Speech Processing	20CSO01	Fundamentals of Virtual Reality
20ECE34	IoT and its Applications	20ADO01	Introduction to Python Programming
20ECE35	Remote Sensing	20EGO01	Technical Writing Skills
20ECE36	Network Security	20CSO02	Introduction to Web Technology

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20EC E21

IMAGE AND VIDEO PROCESSING

(Professional Elective-IV)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisites: A prior knowledge of Signal Processing is required

Course Objectives: This course aims to:

1. To introduce the basic concepts and methodologies involved in image and video processing.
2. To understand the fundamentals of image compression
3. To provide a conceptual foundation that can be used as a basis for further study and research in this field.

Course Outcomes: Upon completion of this course, the student will be able to

1. To Learn image representation.
2. Apply Image enhancement and segmentation techniques both in spatial and frequency domain.
3. To reduce the redundancy in both lossy and lossless compression models.
4. Apply 2D-Motion estimation algorithms and develop predictive coding.
5. Creatively apply contemporary theories, processes and tools in the development and evolution of solutions to problems related to image and video processing.

Course Articulation Matrix

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

UNIT I

Fundamentals of Image Processing:

Basic steps of Image Processing System, Sampling and Quantization of an image, Basic relationship between pixels.

UNIT II

Image Enhancement Spatial domain methods: Histogram processing, Fundamentals of Spatial filtering, Smoothing spatial filters, Sharpening spatial filters.

Frequency domain methods: Basics of filtering in frequency domain, image smoothing, image sharpening.

UNIT III

Image Compression: Image compression fundamentals - Coding Redundancy, Spatial and Temporal redundancy, Compression models: Lossy& Lossless, Arithmetic coding, Run length coding, Bit plane coding, Transform coding.

UNIT IV

Basic concepts of Video Processing

Analog Video, Digital Video. Time-Varying Image Formation models: Three-Dimensional Motion Models, Sampling of Video signals, Filtering operations.

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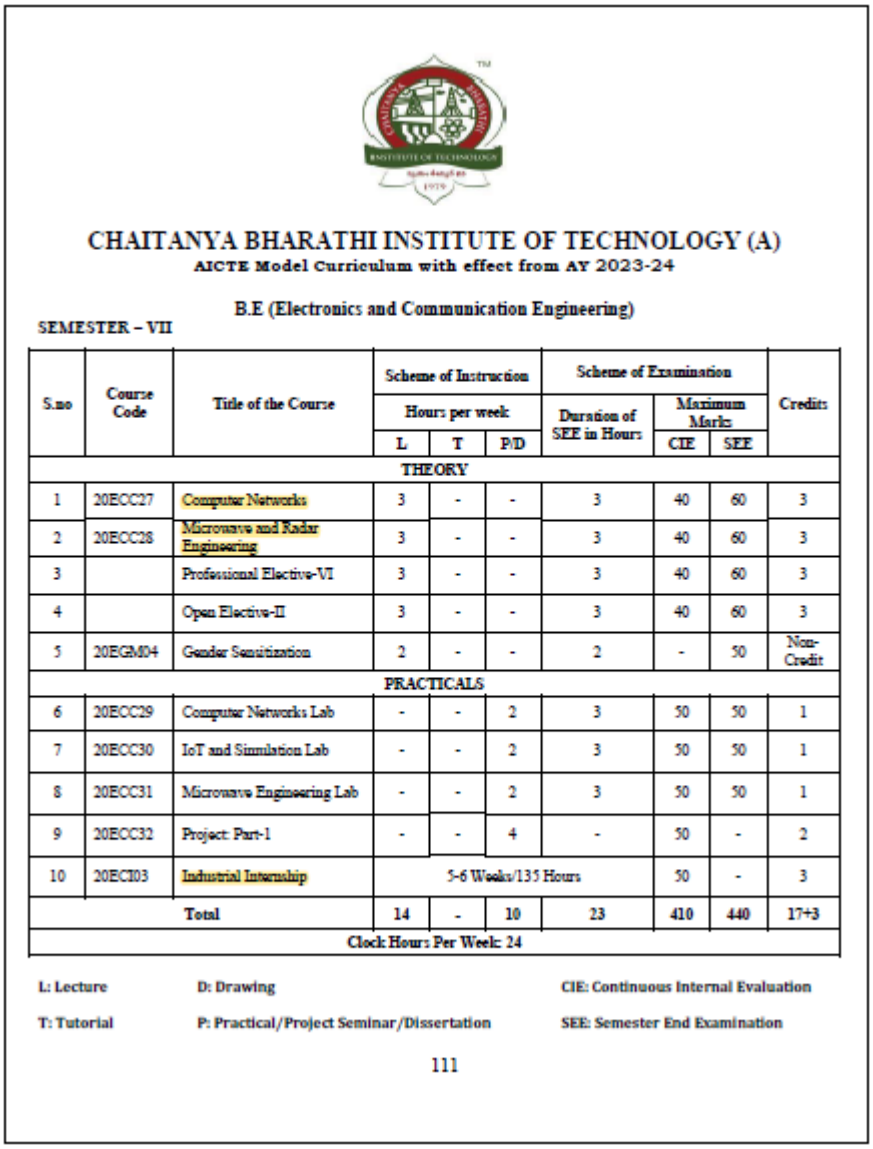
5) Professional Societies

S.no.	Suggestions & opinion	Action Taken
1	More Industry interaction subjects are required in the curriculum.	Internships are included
2	Project work should be done in industry minimum of 6 weeks remaining at college Internship outcome should be a product design	Internships are included

5) Professional Societies (Proof)



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AICTE Model Curriculum with effect from AY 2023-24

B.E (Electronics and Communication Engineering)

SEMESTER – VII

S.no	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per week			Duration of SEE in Hours	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1	20ECC27	Computer Networks	3	-	-	3	40	60	3
2	20ECC28	Microwave and Radar Engineering	3	-	-	3	40	60	3
3		Professional Elective-VI	3	-	-	3	40	60	3
4		Open Elective-II	3	-	-	3	40	60	3
5	20EGM04	Gender Sensitization	2	-	-	2	-	50	Non-Credit
PRACTICALS									
6	20ECC29	Computer Networks Lab	-	-	2	3	50	50	1
7	20ECC30	IoT and Simulation Lab	-	-	2	3	50	50	1
8	20ECC31	Microwave Engineering Lab	-	-	2	3	50	50	1
9	20ECC32	Project: Part-1	-	-	4	-	50	-	2
10	20EC103	Industrial Internship	5-6 Weeks/135 Hours				50	-	3
		Total	14	-	10	23	410	440	17+3
Clock Hours Per Week: 24									

L: Lecture D: Drawing CIE: Continuous Internal Evaluation

T: Tutorial P: Practical/Project Seminar/Dissertation SEE: Semester End Examination

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AICTE Model Curriculum with effect from AY 2022-23

B.E (Electronics and Communication Engineering)

SEMESTER – V

S.no	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per week			Duration of SEE in Hours	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1	20ECC15	Computer Architecture and Microprocessors	3	-	-	3	40	60	3
2	20ECC16	Digital Communication	3	-	-	3	40	60	3
3	20ECC17	Digital Signal Processing	3	-	-	3	40	60	3
4	20ECC18	Linear and Digital Integrated Circuits	3	-	-	3	40	60	3
5	20MBC01	Engineering Economics and Accountancy	3	-	-	3	40	60	3
6		Professional Elective-I	3	-	-	3	40	60	3
7		Professional Elective-II	2	-	-	3	40	60	2
PRACTICALS									
8	20ECC19	Digital Communication Lab	-	-	2	3	50	50	1
9	20ECC20	Digital Signal Processing Lab	-	-	2	3	50	50	1
10	20ECC21	Linear and Digital Integrated Circuits Lab	-	-	2	3	50	50	1
11	20ECI02	Industrial/Rural Internship	3-4 Weeks/90 Hours				50	-	2
Total			20	-	06	30	480	570	23+2
Clock Hours Per Week: 26									

L: Lecture **D: Drawing** **CIE: Continuous Internal Evaluation**

T: Tutorial **P: Practical/Project Seminar/Dissertation** **SEE: Semester End Examination**

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6) Faculty

S. no	Suggestions/Feedback	Action Plan
1	Add industry relevant topics in the V unit in whichever course it is possible	Included in possible courses

6) Faculty (Proof)

20EC E06

PRINCIPLES AND APPLICATIONS OF AI
(Professional Elective-I)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite: Knowledge of probability, Linear Algebra, Data Structure and programming.

Course Objectives: This course aims to:
1. Exposure to the foundation of Artificial Intelligence.
2. Familiarize the applications of Artificial Intelligence in Industry
3. Inculcate the concepts of Neural Networks and Pattern Recognition

Course Outcomes: Upon completion of this course, students will be able to:
1. Understand the basics of AI and intelligent agents.
2. Apply Expert Systems to solve real time problems
3. Understand knowledge representation methods.
4. Build algorithms using neural network techniques for various applications
5. Solve the various classification problems like object recognition

Course Articulation Matrix

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

UNIT-I
Introduction to AI and Intelligent Agents: Concept of AI, current status of AI, Agents, Good Behavior: Environment, problem formulation. The structure of agents. Basic concepts of Search Algorithms: Uninformed depth first search, breadth first search, uniform cost search, depth limited search, iterative deepening search and informed search techniques like greedy best first search and A* algorithm, concepts of admissibility.

UNIT-II
Knowledge representation: Bayesian network representation, Construction and inference. Hidden Markov Model Approaches to knowledge representation, knowledge representation using the semantic network, extended semantic networks for Knowledge representation, knowledge representation using frames.

UNIT-III
Expert system and applications: Introduction phases in building expert systems, expert system versus traditional systems, Rule-based expert systems, blackboard systems truth maintenance systems and application of expert systems.

UNIT-IV
Neural Networks: What is a neural network, the human brain, models of a neuron, neural networks as a directed graph, feedback and network architectures. Learning processes and learning tasks.

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