CURRICULUM

for

Ph.D COURSE WORK

IN

ELECTRONICS & COMMUNICATION ENGINEERING

(Engineering&Technology)

[2021-22]

CHAITANYA (DEEMEED TO BE UNIVERSITY)
Kishanpura,Hanamkonda,

Warangal Urban,Telangana-506 001

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CHAITANYA (DEEMED TO BE UNIVERSITY)

Ph.D in Electronics & Communication Engineering

Faculty of Engineering

EFFECTIVE FROM ACADEMIC YEAR 2021–22 ADMITTED BATCH

Pre-Ph-D Course

i) The duration of the Pre-Ph.D. course will be of one semester.

ii) The Department concerned shall design the Pre-Ph.D. course as per latest guide lines of UGC which are: "The Pre-Ph.D. course must include a course on research methodology which may include quantitative methods and computer applications. It may also involve review of published research in relevant area".

iii) The scheme for Pre-Ph.D. course work is as under:

a) Common course: Research Methodology (Quantitative Techniques and Computer Applications in Research)

b) Departmental course: Departmental – Elective Course (in Relevant Research Area)

iv) The qualifying marks in each paper of the course work shall be 50%.

v) It is only on satisfactory completion of Pre-Ph.D Programme, which shall be an essential part and parcel of the Ph.D. programme that a candidate shall be eligible to apply for registration in Ph.D. Programme.

S.NO	Course Code	Course Title	Marks of Internal	Mraks of External	Total Marks	Duration of Exam
1	PhD-ECE-01	Research Methodology	20	80	100	3
2	PhD-ECE-02	Departmental – Elective Course (in Relevant Research Area)	20	80	100	3
Total			**40**	**160**	**200**	

* Marks of internal assessment of theory courses are based two assignments of 10 marks each.

SYLLABUS (Pre PhD ECE)

List of Electives:

S.NO	Course Code	Course Title
1	PhD-ECE-101	VLSI Design
2	PhD-ECE-102	Embedded System Design
3	PhD-ECE-103	Wireless and Mobile Communication
4	PhD-ECE-104	Advanced Image and Video Processing
5	PhD-ECE-105	Digital Signal Processing
6	PhD-ECE-106	RF & Microwave Engineering
7	PhD-ECE-107	Advanced Antenna Technology
8	PhD-ECE-108	Internet of Things
9	PhD-ECE-109	Artificial Intelligence & Machine Learning
10	PhD-ECE-110	Bio Medical Signal Processing
11	PhD-ECE-111	Nano Materials & Nanotechnology

Note: The departmental elective subjects will be offered as per availability of expertise and the required infrastructure in the department.

Ph.D-ECE-102: Embedded System Design

L	T	P/D	Marks of Internal: **20**
4	**-**	**-**	Examination: **80**
Duration of Exam: **3 Hrs**			Total Marks: **100**

UNIT-I: INTRODUCTION AND REVIEW OF EMBEDDED HARDWARE Terminology – Gates – Timing diagram – Memory – Microprocessor buses – Direct memory access – Interrupts – Built interrupts – Interrupts basis – Shared data problems – Interrupt latency - Embedded system evolution trends – Round-Robin – Round Robin with interrupt function – Rescheduling architecture – algorithm.

UNIT-II: REAL TIME OPERATING SYSTEM Task and Task states – Task and data – Semaphore and shared data operating system services – Message queues timing functions – Events – Memory management – Interrupt routines in an RTOS environment – Basic design using RTOS.

UNIT-III: EMBEDDED HARDWARE, SOFTWARE AND PERIPHERALS Custom single purpose processors: Hardware – Combination Sequence – Processor design – RT level design – optimizing software: Basic Architecture – Operation – Programmers view – Development Environment – ASIP – Processor Design –Peripherals – Timers, counters and watch dog timers – UART – Pulse width modulator – LCD controllers – Key pad controllers – Stepper motor controllers – A/D converters – Real time clock.

UNIT-IV: MEMORY AND INTERFACING Memory write ability and storage performance – Memory types – composing memory – Advance RAM interfacing communication basic – Microprocessor interfacing I/O addressing – Interrupts – Direct memory access – Arbitration multilevel bus architecture – Serial protocol – Parallel protocols – Wireless protocols – Digital camera example.

UNIT-V: PROCESS MODELS AND HARDWARE SOFTWARE CO-DESIGN Modes of operation – Finite state machine– HCFSL and state charts language – state machine models – Concurrent process model – Concurrent process – Communication among process –Synchronization among process – Implementation - Data Flow model - Design technology- Automation synthesis – Hardware & software co-simulation – IP cores – Design Process Model.

REFERENCE BOOKS

1. David. E.Simon, “An Embedded Software Primer”, Pearson Education, 2001.
2. Frank Vahid and Tony Gwargie, “Embedded System Design”, John Wiley & sons, 2002.
3. Steve Heath, “Embedded System Design”, Elsevier, Second Edition, 2004

Ph.D-ECE-103: Wireless and Mobile Communication

L	T	P/D	Marks of Internal: **20**
4	**-**	**-**	Examination: **80**
Duration of Exam: **3 Hrs**			Total Marks: **100**

UNIT 1: Cellular Communication Fundamentals: Cellular system design, Frequency reuse, cell splitting, handover concepts, Co channel and adjacent channel interference, interference reduction. techniques and methods to improve cell coverage, Frequency management and channel assignment. GSM architecture and interfaces, GSM architecture details, GSM subsystems, GSM Logical Channels, Data Encryption in GSM, Mobility Management, Call Flows in GSM.2.5 G Standards: High speed Circuit Switched Data (HSCSD), General Packet Radio Service (GPRS), 2.75 G Standards: EDGE,

UNIT 2: Spectral efficiency analysis based on calculations for Multiple access technologist, FDMA and CDMA, Comparison of these technologies based on their signal separation techniques, advantages, disadvantages and application areas. Wireless network planning (Link budget and power spectrum calculations)

UNIT 3: Mobile Radio Propagation: Large Scale Path Loss, Free Space Propagation Model, Reflection, Ground Reflection (Two-Ray) Model, Diffraction, Scattering, Practical Link Budget Design using Path Loss Models, Outdoor Propagation Models, Indoor Propagation Models, Signal Penetration into Buildings. Small Scale Fading and Multipath Propagation, Impulse Response Model, Multipath Measurements, Parameters of Multipath channels, Types of Small-Scale Fading: Time Delay Spread; Flat, Frequency selective, Doppler Spread; Fast and Slow fading.

UNIT 4: Equalization, Diversity: Equalizers in a communications receiver, Algorithms for adaptive equalization, diversity techniques, space, polarization, frequency diversity, Interleaving.

UNIT 5: Code Division Multiple Access: Introduction to CDMA technology, IS 95 system Architecture, Air Interface, Physical and logical channels of IS 95, Forward Link and Reverse link operation, Physical and Logical channels of IS 95 CDMA, IS 95 CDMA Call Processing, soft Handoff, Evolution of IS 95 (CDMA One) to CDMA 2000, CDMA 2000 layering structure and channels. Higher Generation Cellular Standards:3G Standards: evolved EDGE, enhancements in 4G standard, Architecture and representative protocols, call flow for LTE, VoLTE, UMTS, introduction to 5G.

Reference Books:

1. V.K.Garg, J.E.Wilkes, “Principle and Application of GSM”, Pearson Education, 5th edition, 2008.
2. V.K.Garg, “IS-95 CDMA & CDMA 2000”, Pearson Education, 4th edition, 2009.
T.S.Rappaport, “Wireless Communications Principles and Practice”, 2nd edition, PHI,2002.
3. William C.Y.Lee, “Mobile Cellular Telecommunications Analog and Digital Systems”, 2nd edition, TMH, 1995.
Asha Mehrotra, “A GSM system Engineering” Artech House Publishers Bosten, London,1997

Ph.D-ECE-104: Advanced Image and Video Processing

L	T	P/D	Marks of Internal: **20**
4	**-**	**-**	Examination: **80**
Duration of Exam: **3 Hrs**			Total Marks: **100**

UNIT 1: Image representation: Gray scale and colour Images, image sampling and quantization. Two dimensional orthogonal transforms: DFT, WHT, Haar transform, KLT, DCT. Image enhancement - filters in spatial and frequency domains, histogrambased processing, homomorphic filtering. Edge detection - non parametric and model based approaches, LOG filters, localization problem.

UNIT 2: Image Restoration: Degradation Models, PSF, circulant and block - circulantmatrices,deconvolution, restoration using inverse filtering, Wiener filtering and maximumentropy-based methods.

UNIT 3: Image Segmentation: Pixel classification, Bilevel thresholding, Multi-level thresholding, P-tile method, Adaptive thresholding, Spectral & spatial classification, Edge detection, Hough transform, Region growing.

UNIT 4: Fundamental concepts of image compression - Compression models - Information theoretic perspective - Fundamental coding theorem - Lossless Compression: Huffman Coding- Arithmetic coding - Bit plane coding - Run length coding – Lossy compression: Transform coding - Image compression standards.

UNIT 5: Object Recognition : Patterns and patterns classes, recognition based on decision–theoretic methods, matching, optimum statistical classifiers, neural networks, structural methods – matching shape numbers, string matching Video Processing: Representation of Digital Video, Spatio-temporal sampling; Motion Estimation; Video Filtering; Video Compression, Video coding standards.

Reference Books:

1. A. K. Jain, Fundamentals of digital image processing, Prentice Hall of India, 1989.
2. R. C. Gonzalez, R. E. Woods, Digital Image Processing, Pearson Education. II Ed.,2002
3. A. M. Tekalp, Digital Video Processing , Prentice-Hall, 1995
4. A. Bovik, Handbook of Image & Video Processing, Academic Press, 2000

Ph.D-ECE-108: Internet of Things

L	T	P/D	Marks of Internal: **20**
4	**-**	**-**	Examination: **80**
Duration of Exam: **3 Hrs**			Total Marks: **100**

UNIT 1: IoT& Web Technology The Internet of Things Today, Time for Convergence, Towards the IoT Universe, Internet of Things Vision, IoT Strategic Research and Innovation Directions, IoT Applications, Future Internet Technologies, Infrastructure, Networks and Communication, Processes, Data Management, Security, Privacy & Trust, Device Level Energy Issues, IoT Related Standardization, Recommendations on Research Topics.

UNIT 2: M2M to IoT – A Basic Perspective– Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies. M2M to IoT-An Architectural Overview– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations.

UNIT 3: IoT Architecture -State of the Art – Introduction, State of the art, Architecture Reference ModelIntroduction, Reference Model and architecture, IoT reference Model, IoT Reference ArchitectureIntroduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views

UNIT 4: IoT Applications for Value Creations Introduction, IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications, Four Aspects in your Business to Master IoT, Value Creation from Big Data and Serialization, IoT for Retailing Industry, IoT For Oil and Gas Industry, Opinions on IoT Application and Value for Industry, Home Management, eHealth.

UNIT 5: Internet of Things Privacy, Security and Governance Introduction, Overview of Governance, Privacy and Security Issues,

REFERENCES

1. Vijay Madisetti and Arshdeep Bahga, “Internet of Things (A Hands-on-Approach)”, 1st Edition, VPT, 2014.
2. Francis daCosta, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, 1st Edition, Apress Publications, 2013.
3. Cuno Pfister, “Getting Started with the Internet of Things”, O Reilly Media, 2011.

Ph.D-ECE-111: Nano Materials & Nanotechnology

L	T	P/D	Marks of Internal: **20**
4	**-**	**-**	Examination: **80**
Duration of Exam: **3 Hrs**			Total Marks: **100**

Unit 1: Background to Nanoscience: Defination of Nano, Scientific revolution-Atomic Structure and atomic size, emergence and challengs of nanoscience and nanotechnology, carbon age-new form of carbon (CNT to Graphene), influence of nano over micro/macro, size effects and crystals, large surface to volume ration, surface effects on the properties.

Unit 2: Types of nanostructure and properties of nanomaterials: One dimensional, Two dimensional and Three dimensional nanostructured materials, Quantum Dots shell structures, metal oxides, semiconductors, composites, mechanical-physical-chemical properties.

Unit 3: Application of Nanomaterial: Ferroelectric materials, coating, molecular electronics and nanoelectronics, biological and environmental, membrane based application, polymer based application. Nano structured Magnetism: Nanostructure magnetism, Effect Bulk nanostructuring of magnetic property, Giant and colossal magnetic resistance, Nanomagnetic materials, Paramagnetism in metallic nanoparticles, Semiconduction quantum dots.

Unit 4: Thermoelectric Materials: Concept of phonon, Thermal conductivity specific heat, exothermic and endothermic processes, Different types of thermoelectric materials, Bulk properties, One dimensional and composite thermoelectric materials, Applications.

Unit 5: Structure Properties of Polymeric Nanomaterials and Applications: Structure-property relationship, stress-strain behaviour, crystalline melting point, effect of chain flexibility and other steric factors, entropy and heat of fusion, glass transition temperature, relationship between Tm and Tg. Effect of molecular weight, property requirements and its utilization. Synthetic procedure commercial polymers, Fire retarding and biomedical polymers.

References:

1. Chemistry of nanomaterials: Synthesis, properties and applications by CNR Rao et.al.
2. Nanoparticles: From theory to applications – G. Schmidt, Wiley Weinheim 2004.
3. Instrument E L Principe, P Gnauck and P Hoffrogge,
4. Microscopy and Microanalysis (2005), 11: 830- 831, Cambridge University Press.
5. Processing & properties of structural naonmaterials - Leon L. Shaw,
6. Nanochemistry: A Chemical Approach to Nanomaterials, Royal Society of Chemistry, Cambridge UK 2005.