Batch 2018-22
Semester: VII

No	Code	Course	Category	L-T-P	Credits	Contact Hours	ISA	ESA	Total	Exam Duration
1	18EECC401	PC16: Wireless & Mobile Communication	PSC	3-0-0	3	3	50	50	100	3 hours
2	18EECE	PSE Elective 1	PSE	3-0-0	3	3	50	50	100	3 hours
3	18EECE	PSE Elective 2	PSE	3-0-0	3	3	50	50	100	3 hours
4	18EECE	PSE Elective 3	PSE	3-0-0	3	3	50	50	100	3 hours
6	18EECE	PSE Elective 4	PSE	3-0-0	3	3	50	50	100	3 hours
	20EECW401	P3: Senior Design Project	PW	0-0-6	6	12	50	50	100	3 hours
7	15EHSC402	CIPE	M	2-0-0		2	50	50	100	3 hours
TOTAL				**15-0-6**	**21**	**29**	**350**	**350**	**700**	

ISA: In Semester Assessment **ESA**: End Semester Assessment **L**: Lecture **T**: Tutorials **P**: Practical
HS (Humanities) = H; B(Basic Science) = B; ES(Engineering Science) = F; PC (Program Core) = C; EC(Any Elective) = E; PW(Project Work) = W; Research = R; Internship= I; Seminar = S; Colloquium = V; Self-study = Y; Special topic= T; Apprenticeship = A; Laboratory / Practical = P;Field Work = D; and Non-credit course = N.

Semester: VII (2018-22 Batch)

No	Code	**Course:** PSE: Elective	Category	L-T-P	Credits	Contact Hours	ESA	ISA	Total	Exam Duration
1.	19EECE416	Biosensor	PSE	0-0-3	3	3	-	100	100	3Hours
2.	18EECE418	Advanced Digital Logic Verification		0-0-3		6	-	100		
3.	18EECE410	Multimedia Communication		3-0-0		3	50	50		
4.	18EECE419	Physical Design-Analog		0-0-3		6	-	100		
5.	18EECE409	Design and Analysis of		0-0-		3	50	50		

		Algorithm		3						
6.	18EECE420	CMOS ASIC Design		0-0-3		6	-	100		
7.	18EECE405	Embedded Linux		0-0-3		3	50	50		
8.	18EECE411	Microwave & Antennas		3-0-0		3	50	50		
9.	20EECE406	AUTOSAR		3-0-0		3	50	50		
10.	18EECE415	Cryptography & Network Security		3-0-0		3	50	50		
11.	19EECE403	Testing & Characterization		0-0-3		3	-	100		
12.	21EECE421	RF VLSI (New)		3-0-0		3	50	50		
13.	21EECE422	Speech Processing(New)		3-0-0		3	50	50		
14.	21EECE423	CAD for VLSI(New)		3-0-0		3	50	50		
15.	21EECE424	System on Chip Design(New)		3-0-0		3	50	50		
16.	21EECE425	Computer Graphics		0-0-3		3	-	100		

Semester: VIII

No	Code	Course	Category	L-T-P	Intern-ship	Credits	Contact Hours	ISA	ESA	Total	Exam Duratio
1	18EECE	PSE Elective 5	PSE	3-0-0	6-0-0	3	3	50	50	100	3 hours
2	18EECE	Open Elective 1	OE	3-0-0		3	3	50	50	100	3 hours

3	20EECW402	Project Work	PRJ	0-0-11		11	22	50	50	100	3 hours
TOTAL				**6-0-11**		**17**	**28**	**150**	**150**	**300**	

Internship- Training: 18EECI493 – 0-0-6, ISA: 80 ESA: 20
Internship- Project: 20EECW494-- 0-0-11, ISA: 50 ESA: 50

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HS (Humanities) = H; B(Basic Science) = B; ES(Engineering Science) = F; PC (Program Core) = C; EC(Any Elective) = E; PW(Project Work) = W; Research = R; Internship= I; Seminar = S; Colloquium = V; Self-study = Y; Special topic= T; Apprenticeship = A; Laboratory / Practical = P;Field Work = D; and Non-credit course = N.

Course Code: 21EECE421	Course Title: RF VLSI	
L-T-P : 3-0-0	Credits: 3	Contact Hrs: 3 Hours
ISA Marks: 50	ESA Marks: 50	Total Marks: 100
Teaching Hrs: 40		Exam Duration: 3

Content	**Hrs**
Unit - 1	
Chapter No. 1: Basic concepts in RF Design Basic concepts in RF Design – harmonics, gain compression, desensitization, blocking, cross modulation, intermodulation, inter symbol interference, noise figure, Friis formula, sensitivity and dynamic range.	8 hrs
Chapter No. 2: Receiver architectures Receiver architectures – heterodyne receivers, homodyne receivers, image-reject receivers, digital-IF receivers and subsampling receivers.	7 hrs
Unit - 2	
Chapter No. 3: Transmitter architectures Transmitter architectures – direct-conversion transmitters, two-step transmitters; Low noise	10 hrs

amplifier (LNA) – general considerations, input matching, CMOS LNAs	
Chapter No. 4: Mixers Down conversion mixers – general considerations, spur-chart, CMOS mixers	5 hrs
Unit - 3	
Chapter 5: Oscillators Oscillators – Basic topologies, VCO, phase noise, CMOS LC oscillators; PLLs – Basic concepts, phase noise in PLLs, different architectures	10 hrs

Text Books:

Behzad Razavi, RF Microelectronics, Prentice Hall PTR, 1997
Thomas H. Lee, The design of CMOS radio-frequency integrated circuit, Cambridge University Press, 2006
Chris Bowick, RF Circuit Design, Newnes, 2007

Course Code: 21EECE423	Course Title: CAD for VLSI	
L-T-P : 3-0-0	Credits: 3	Contact Hrs: 3 Hours
ISA Marks: 50	ESA Marks: 50	Total Marks: 100
Teaching Hrs: 40		Exam Duration: 3

Content	Hrs
Unit - 1	
Chapter No. 1: Introduction Introduction to VLSI design methodologies and supporting CAD environment. Schematic editors: Parsing: Reading files, describing data formats, Graphics & Plotting Layout. Layout Editor: Turning plotter into an editor. Layout language: Parameterized cells, PLA generators.	8 hrs
Chapter No. 2: Silicon Compiler Introduction to Silicon compiler, Data path, Compiler, Placement & routing, Floor planning.	7 hrs
Unit - 2	
Chapter No. 3: Layout Analysis and Simulations Layout Analysis: Design rules, Object based DRC, Edge based layout operations. Module generators. Simulation: Types of simulation, Behavioral simulator, logic	10 hrs

simulator, functional simulator & Circuit simulator. Simulation Algorithms: Compiled code and Event-driven. Optimization Algorithms: Greedy methods, simulated annealing, genetic algorithm and neural models.	
Chapter No. 4: Testing ICs Testing ICs: Fault simulation, Aids for test generation and testing. Computational complexity issues: Big Oh and big omega terms.	5 hrs
Unit - 3	
Chapter 5: Recent Topics in CAD-VLSI Recent topics in CAD-VLSI: Array compilers, hardware software co-design, high-level synthesis tools and VHDL modeling.	10 hrs

Text Books:

1. Stephen Trimberger," Introduction to CAD for VLSI", Kluwer Academic publisher, 2002

2. Naveed Shervani, "Algorithms for VLSI physical design Automation", Kluwer Academic Publisher, Second edition.

Reference Books

1. Gaynor E. Taylor, G. Russell, "Algorithmic and Knowledge Based CAD for VLSI", Peter peregrinus ltd. London. 2. Gerez, "Algorithms VLSI Design Automation", John Wiley & Sons.

Commented [SBS1]:

Course Code: 21EECE424	Course Title: System on Chip Design	
L-T-P : 3-0-0	Credits: 3	Contact Hrs: 3 Hours
ISA Marks: 50	ESA Marks: 50	Total Marks: 100
Teaching Hrs: 40		Exam Duration: 3

Content	Hrs
Unit - 1	
Chapter No. 1: Introduction Introduction: Driving Forces for SoC - Components of SoC - Design flow of SoC Hardware/Software nature of SoC - Design Trade-offs - SoC Applications	5 hrs
Chapter No. 2: System Level Design System-level Design: Processor selection-Concepts in Processor Architecture: Instruction set architecture (ISA), elements in Instruction Handing-Robust processors: Vector processor, VLIW, Superscalar, CISC, RISC—Processor evolution: Soft and Firm processors, Custom Designed processors- on-chip memory.	10 hrs
Unit - 2	

Chapter No. 3: On-chip bus and IP based design Interconnection: On-chip Buses: basic architecture, topologies, arbitration and protocols, Bus standards: AMBA, Core Connect, Wishbone, Avalon - Network-on chip: Architecture topologies-switching strategies - routing algorithms flow control, Quality-of-Service- Reconfigurability in communication architectures. IP based system design: Introduction to IP Based design, Types of IP, IP across design hierarchy, IP life cycle, Creating and using IP - Technical concerns on IP reuse – IP integration - IP evaluation on FPGA prototypes.	10 hrs
Chapter No. 4: SoC Implementation SOC implementation: Study of processor IP, Memory IP, wrapper Design - Real-time operating system (RTOS), Peripheral interface and components, High-density FPGAs - EDA tools used for SOC design.	5 hrs
Unit - 3	
Chapter 5: SoC Testing SOC testing: Manufacturing test of SoC: Core layer, system layer, application layer-P1500 Wrapper Standardization-SoC Test Automation (STAT).	10 hrs

Text Books:

1. Michael J.Flynn, Wayne Luk, “Computer system Design: Systemon-Chip”, Wiley-India, 2012.
2. Sudeep Pasricha, Nikil Dutt, “On Chip Communication Architectures: System on Chip Interconnect”, Morgan Kaufmann Publishers, 2008.
3. W.H.Wolf, “Computers as Components: Principles of Embedded Computing System Design”, Elsevier, 2008.

Reference Books

1. Patrick Schaumont “A Practical Introduction to Hardware/Software Co-design”, 2nd Edition, Springer, 2012. 2. Lin, Y-L.S. (ed.), “Essential issues in SOC design: designing complex systems-on-chip. Springer, 2006.
3. Wayne Wolf, “Modern VLSI Design: IP Based Design”, Prentice-Hall India, Fourth edition, 2009.

Course Code: 21EECE422	Course Title: Speech Processing		
L-T-P : 3-0-0	Credits: 3	Contact Hrs: 3 Hours	
ISA Marks: 50	ESA Marks: 50	Total Marks: 100	
Teaching Hrs: 40		Exam Duration: 3	
Content			**Hrs**
Unit - 1			

Chapter No. 1: Introduction Basic Concepts: Speech Fundamentals: Articulatory Phonetics – Production and Classification of Speech Sounds; Acoustic Phonetics – acoustics of speech production; Review of Digital Signal Processing concepts; Short-Time Fourier Transform, Filter-Bank and LPC Methods.	5 hrs
Chapter No. 2: Speech Analysis Features, Feature Extraction and Pattern Comparison Techniques: Speech distortion measures – mathematical and perceptual – Log Spectral Distance, Cepstral Distances, Weighted Cepstral Distances and Filtering, Likelihood Distortions, Spectral Distortion using a Warped Frequency Scale, LPC, PLP and MFCC Coefficients, Time Alignment and Normalization – Dynamic Time Warping, Multiple Time – Alignment Paths.	10 hrs
Unit - 2	
Chapter No. 3: Speech Modeling Hidden Markov Models: Markov Processes, HMMs – Evaluation, Optimal State Sequence – Viterbi Search, Baum-Welch Parameter Re-estimation, Implementation issues	10 hrs
Chapter No. 4: Speech Recognition Large Vocabulary Continuous Speech Recognition: Architecture of a large vocabulary continuous speech recognition system – acoustics and language models – n-grams, context dependent sub-word units; Applications and present status.	5 hrs
Unit - 3	
Chapter 5: Speech Synthesis Text-to-Speech Synthesis: Concatenative and waveform synthesis methods, subword units for TTS, intelligibility and naturalness – role of prosody, Applications and present status.	10 hrs

Text Books:

1.Lawrence Rabinerand Biing-Hwang Juang, “Fundamentals of Speech Recognition”, Pearson Education, 2003. 2.Daniel Jurafsky and James H Martin, “Speech and Language Processing – An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition”, Pearson Education.

Reference Books

1.Steven W. Smith, “The Scientist and Engineer’s Guide to Digital Signal Processing”, California Technical Publishing.
2.Thomas F Quatieri, “Discrete-Time Speech Signal Processing – Principles and Practice”, Pearson Education. 3.Claudio Becchetti and Lucio Prina Ricotti, “Speech Recognition”, John Wiley and Sons, 1999.
4.Ben gold and Nelson Morgan, “Speech and audio signal processing”, processing and perception of speech and music, Wiley- India Edition, 2006 Edition.
5.Frederick Jelinek, “Statistical Methods of Speech Recognition”, MIT Press.

Course Code: 21EECE425	Course Title: Computer Graphics	
L-T-P : 0-0-3	Credits: 3	Contact Hrs: 3 Hours
ISA Marks: 100	ESA Marks: --	Total Marks: 100
Teaching Hrs: 40		Exam Duration: -

Topics	Hrs
Unit 1	
Chapter 1- Introduction: Applications of computer graphics; A graphics system; Images: Physical and synthetic; Imaging systems; The synthetic camera model; The programmer's interface; Graphics architectures; Programmable pipelines; Performance characteristics. Graphics Programming; Programming two dimensional applications.	5 hrs
Chapter 2- The OpenGL: The OpenGL API; Primitives and attributes; Color; Viewing; Control functions; Polygons and recursion; The three-dimensional; Plotting implicit functions.	5 hrs
Chapter 3- Input and Interaction: Interaction; Input devices; Clients and servers; Display lists; Display lists and modeling; Programming event-driven input; Menus; Picking; Building interactive models; Animating interactive programs; Design of interactive programs; Logic operations.	5 hrs
Unit 2	
Chapter 3: Geometric Objects and Transformations: Scalars, points, and vectors; Three-dimensional primitives; Coordinate systems and frames; Modeling a colored object; Affine transformations; Rotation, translation and scaling. Transformations in homogeneous coordinates; Concatenation of transformations; OpenGL transformation matrices; Interfaces to three-dimensional applications.	8 hrs
Chapter 4: Viewing and Lighting: Classical and computer viewing; Viewing with a computer; Positioning of the camera; Simple projections; Projections in OpenGL; Hidden surface removal; Parallel-projection matrices; Perspective-projection matrices; Lighting and Shading: Light and matter; Light sources; Illumination and Shading Models for Polygons, Reflectance properties of surfaces, Ambient, Specular and Diffuse reflections, The Phong lighting model; Light sources in OpenGL; Specification of materials in OpenGL.	7 hrs
Unit 3	
Chapter 5: Basic Raster Graphics Algorithms for drawing 2D primitives: Scan converting lines, circles, ellipses; Filling Rectangles, Polygons, Ellipse arcs; Pattern Filling; Thick Primitives; Clipping in a raster world; Clipping lines, ellipses, circles, polygons; Anti-aliasing.	6 hrs
Chapter 6: Plane Curves and Surfaces Curve Representation, Nonparametric Curves, Parametric Curves, Parametric Representation of a Circle, Parametric Representation of an Ellipse, Parametric Representation of a Parabola, Parametric Representation of a Hyperbola, A Procedure for using Conic Sections, The General Conic Equation; Representation of Space Curves, Cubic Splines, , Bezier Curves, B-spline Curves, B-spline Curve Fit, B-spline Curve Subdivision, Parametric Cubic Curves, Quadric Surfaces. Bezier Surfaces.	6 hrs

Text book:

1. Edward Angel- Interactive Computer Graphics A Top-Down Approach with OpenGL, 5th edition, Addison-Wesley, 2009

Reference Books:

1. Donald Hearn and Pauline Baker- Computer Graphics- OpenGL Version, 2nd edition, Pearson Education, 2004
2. James D Foley, Andries Van Dam, Steven K Feiner and John F Hughes, Computer Graphics - Principles and Practice, Second Edition in C, Pearson Education, 2003.
3. F. S. Hill Jr., Computer Graphics using OpenGL, Pearson Education, 2003.
4. D. F. Rogers and J. A. Adams, Mathematical Elements for Computer Graphics, 2nd Edition, McGraw-Hill International Edition, 1990.