Integral University, Lucknow

Effective from Session:							
Course Code	**EC601**	**Title of the Course**	**RF Circuit Design & Technology**	**L**	**T**	**P**	**C**
Year	**2**	**Semester**	3	3	1	0	4
Pre-Requisite	Integrated Circuit	**Co-requisite**	NA				
Course Objectives	• To understand the RF and wireless technology, spectrum allocation, can identify issues in the design of RF circuits, can apply Maximum RF power transfer theorem. • To learn the basic building blocks in RF systems-RF transmitters and receivers. Can understand the basic low noise amplifier design and the oscillator, mixer design and input & output characteristics of RF amplifier. • To learn the analysis of the transistor equivalent circuit-Y parameters, S parameters, the MOS transistor biasing-design using Y parameters, MOS transistor biasing-design using S parameters and power amplifier design. • To understand the concept and design of sheet resistance, skin effect, parasitic capacitance, parasitic inductance and diffusion resistors. • To understand the concepts of inductors and transformers.						

Course Outcomes	
CO1	Students shall be able to understand RF and wireless technology, spectrum allocation, identify issues in the design of RF circuits, apply maximum RF power transfer theorem.
CO2	For a given RF system, student shall be able to analyze basic building blocks in RF systems-RF transmitters and receivers and evaluate the low noise amplifier design and predict the oscillator, mixer design and input & output characteristics of RF amplifier.
CO3	For a given RF system, student shall be able to analyze the transistor equivalent circuit-Y parameters, S parameters. Examine and analyze the MOS transistor biasing-design using Y parameters, MOS transistor biasing-design using S parameters and power amplifier design.
CO4	Students shall be able to identify the technology back end and metallization in IC technologies and will be able to understand sheet resistance, skin effect, parasitic capacitance, parasitic inductance and diffusion resistors.
CO5	For a given a RF system, student shall be able to design the inductors and transformers and will be able to understand the self-resonance of inductors, the quality factor of an inductor, characterization of an inductor, layout of spiral inductors, isolating the Inductor, the use of slotted ground shields. Analyze the basic transformer layouts in IC technologies and radio architectures of GSM, CDMA and UMTS.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Introduction	Introduction to RF and wireless technology, spectrum allocation, issues in the design of RF circuits, PCB, Electronic chips, Transmission media and reflections, Maximum RF power transfer, Applications of RF.	8	1
2	RF circuit design	Basic building blocks in RF systems – RF Transmitters and receivers, Antenna, impedance matching, Noise, Low noise amplifier design and Linearity, Oscillator, Mixer design, Filter design, Input & output characteristics of RF Amplifier, Nonlinearity and time variance, Inter-symbol interference, Random process and noise, Sensitivity and dynamic range, Passive impedance transformation; Issues in RFIC Design.	8	2
3	The Transistor Equivalent Circuit	Y Parameters, S Parameters, Understanding RF transistor data sheets, MOS Transistor Biasing - Design Using Y Parameters, MOS Transistor Biasing - Design Using S Parameters, RF Power Transistor Characteristics - Transistor Biasing, Power Amplifier Design - Matching to Coaxial Feed lines, Automatic Shutdown Circuitry, Broadband Transformers	8	3
4		The Technology Back End and Metallization in IC Technologies, Sheet Resistance and the Skin Effect, Parasitic Capacitance, Parasitic Inductance, Current Handling in Metal Lines, Poly Resistors and Diffusion Resistors, Metal-Insulator-Metal Capacitors, Poly Capacitors.	8	4
5		Applications of On-Chip Spiral Inductors and Transformers, Design of Inductors and Transformers, Some Basic Lumped Models for Inductors, Calculating the Inductance of Spirals, Self-Resonance of Inductors, The Quality Factor of an Inductor, Characterization of an Inductor, Layout of Spiral Inductors, Isolating the Inductor, The Use of Slotted Ground Shields and Inductors, Basic Transformer Layouts in IC Technologies, Multilevel Inductors, Characterizing Transformers for Use in ICs, On-Chip Transmission Lines, Effect of Transmission Line, Transmission, High High-Frequency Measurement of On-Chip, Passives, Some Common De-Embedding Techniques, radio architectures of GSM, CDMA and UMTS.	8	5

Reference Books:

1. RF circuit design by Chris Bowick , Elsevier's Science & Technology Rights Department in Oxford, UK.
2. " RF Microelectronics by Behzard Razavi, Prentice Hall Ptr.
3. Radio Frequency Integrated Circuit Design, John Rogers, Calvin Plett, Artech House.

e-Learning Source:

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)																	
PO-PSO / **CO**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO5	PSO6	PSO7
CO 1	**3**	**2**						**1**				**1**	**3**	**3**	**2**			
CO 2	**3**	**2**										**1**	**2**	**3**	**2**			
CO 3	**3**	**3**	**3**	**2**	**1**							**1**	**3**	**3**	**2**			
CO 4	**3**	**2**	**1**	**2**								**1**	**3**	**3**	**2**			
CO 5	**3**	**2**	**1**	**1**	**1**				**1**			**1**	**3**	**3**	**2**			

1- **Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation**

Name & Sign of Program Coordinator	**Sign & Seal of HoD**

Integral University, Lucknow

Effective from Session: 2016-17							
Course Code	EC602	**Title of the Course**	Advanced DSP	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	III	**3**	**1**	**0**	**4**
Pre-Requisite	Signals and systems, DSP and its applications	**Co-requisite**					
Course Objectives	• To learn the concept of discrete time signals & systems. • To understand the basic idea of classifications of a signal and to define the LTI discrete time systems. • To learn, how to design IIR filter and to know the concept of matched Z- Transform. • To understand the designing of FIR filter. • To understand significance of multi-rate signal processing, down sampling and up sampling. • To know the elementary knowledge regarding signals and systems in order tackle different interconnections in time and frequency domain						

Course Outcomes	
CO1	For a particular system, student should be able to deal with Discrete time signals and systems, Characterization & Classification of signals, Time domain characterization of LTI Discrete – Time systems, Discrete –Time Fourier Transform, Discrete Fourier Transform, Fast Fourier Transform, Z-Transform
CO2	For designing IIR filter, a student should overcome the working and realization of Aapproximation of derivatives, Design of IIR filter using impulse invariance Technique, Design of IIR filter using bilinear transformation, matched z-transform. Realization of Digital Filters: Direct form I and II realization, signal flow graph, Cascade form and Parallel form Structure.
CO3	For a particular window function, student should be having a clear idea of solving Rectangular window, Triangular window, Hanning window, Hamming window, Blackman window and Kaiser window. Realization of FIR Filters: Transversal structure, Linear phase realization and Polyphase realization of FIR filter
CO4	He/she should be able to know the concept of Decimation and Interpolation and to know the multistage implementation of sampling rate conversion
CO5	For good signal and systems, a student should know the statistical characteristics of a Random Signal, Cross-correlation of random processes and Cross-covariance of random processes and the Power Density Spectrum.

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	**Review of Signals and systems.**	Discrete time signals and systems, Characterization & Classification of signals, Time domain characterization of LTI Discrete – Time systems, Discrete –Time Fourier Transform, Discrete Fourier Transform, Fast Fourier Transform, Z-Transform	8	CO1
2	**IIR and FIR Filter**	Approximation of derivatives, Design of IIR filter using impulse invariance Technique, Design of IIR filter using bilinear transformation, matched z-transform. Realization of Digital Filters: Direct form I and II realization, signal flow graph, Cascade form and Parallel form Structure.	8	CO2
3	**Types of windows and realization of FIR filter.**	Rectangular window, Triangular window, Hanning window, Hamming window, Blackman window and Kaiser window. Realization of FIR Filters: Transversal structure, Linear phase realization and Polyphase realization of FIR filter.	8	CO3
4	**Sampling and its application**	Decimation and Interpolation, sampling theorem and its application in signal processing	8	CO4
5	**Random Signals and their parameters**	Statistical characteristics of a Random Signal, Cross-correlation of random processes and Cross-covariance of random processes and the Power Density Spectrum.	8	CO4

Reference Books:

- Digital Signal Processing, Principles, Algorithms, and Applications: John G. Proakis, Dimitris G. Manolakis, Pearson Education / PHI, 2007.
- Discrete Time Signal Processing – A. V. Oppenheim and R.W. Schaffer, PHI, 2009.
- Fundamentals of Digital Signal Processing – Loney Ludeman, John Wiley, 2009

- Digital Signal Processing – Fundamentals and Applications – Li Tan, Elsevier, 2008.

e-Learning Source:

Lectures from You tube and presentations from various repositories like slide share etc.

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)																	
PO-PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO4	PSO5	PSO6	PSO7
CO1	3	2	3	1	1	1	2	3	2	3								
CO2	2	2	3	3	2	3	1	1	1	1								
CO3	2	3	3	2	3	3	2	1	1	2								
CO4	2	3	3	2	3	3	2	1	1	2								
CO5	3	3	3	2	1	2	3	3	1	2								

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	**Sign & Seal of HoD**

Integral University, Lucknow

Effective from Session:							
Course Code	EC603	**Title of the Course**	Advanced Digital Image Processing	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	III	**3**	**1**	**0**	**4**
Pre-Requisite	Digital Image Processing	**Co-requisite**	Data Signal Processing				
Course Objectives	1. To understand the need of processing in digital image. To learn 2D convolution in an image. To understand and apply edge detection technique on an image. To understand about image enhancement, restoration and segmentation. 2. To understand about the need of compression. What are techniques and how can it be applied on image. 3. To understand the feature extraction its representation and to learn the concept of topological, geometric attributes. **4.** To understand the applications of image processing techniques medical imaging, biometrics, watermarking, barcodes and image forensics.						

Course Outcomes	
CO1	Students shall be able to understand the digital modulation techniques and represent it into mathematical form.
CO2	For the error control in digital communication network, student shall be able to analyze the error in the network and applying the predefined coding method for the detection and correction of error in the network.
CO3	Student shall be able to understand the basics of data communication in the network. To achieve it, they will understand and Examine the OSI and TCP/IP Model and analyze the services provided to data link layer.
CO4	Students shall be able to understand and analysis of various protocols as well as fast Ethernet and internetworking devices.
CO5	Student shall be able understand the function of network layer, transport layer and learn how to apply it by using Dijkstra Algorithm. They will have the knowledge on network security.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Fundamentals of Digital Image Processing	Elements of visual perception, brightness, contrast, hue, saturation, mach band effect, 2D image transforms-DFT, DCT, KLT, and SVD. Image enhancement in spatial and frequency domain, Review of morphological image processing	8	CO-1
2	Segmentation	Edge detection, Thresholding, Region growing, Fuzzy clustering, Watershed algorithm, Active contour methods, Texture feature based segmentation, Model based segmentation, Atlas based segmentation, Wavelet based Segmentation methods	8	CO-2
3	Feature Extraction	First and second order edge detection operators, Phase congruency, Localized feature extraction detecting image curvature, shape features Hough transform, shape skeletonization, Boundary descriptors, Moments, Texture descriptors- Autocorrelation, Co-occurrence features, Runlength features, Fractal model based features, Gabor filter, wavelet features	8	CO-3
4	Registration and Image Fusion	Registration- Preprocessing, Feature selection-points, lines, regions and templates Feature correspondence-Point pattern matching, Line matching, region matching Template matching. Transformation functions- Similarity transformation and Affine Transformation. Resampling- Nearest Neighbour and Cubic Splines Image Fusion-Overview of image fusion, pixel fusion, Multi-resolution based fusion discrete wavelet transform, Curvelet transform. Region based fusion.	8	CO-4
5	3D Image Visualization	Sources of 3D Data sets, Slicing the Data set, Arbitrary section planes, The use of color, Volumetric display, Stereo Viewing, Ray tracing, Reflection, Surfaces, Multiply connected surfaces, Image processing in 3D, Measurements on 3D images	8	CO-5

Reference Books:

1. Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing', Pearson, Education
2. Anil K. Jain, , Fundamentals of Digital Image Processing', Pearson Education, Inc., 2002
3. Rick S. Blum, Zheng Liu, Multisensor image fusion and its Applications, Taylor & Francis, 2006

4. John C.Russ, The Image Processing Handbook, CRC Press
e-Learning Source:
Digital Image Processing - Course (nptel.ac.in)
Image Signal Processing - Course (nptel.ac.in)

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)																	
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO4	PSO5	PSO6	PSO7
CO1	3	2		1								2	2			1		
CO2	3	2		3		1							2		2			
CO3	2	2	3				1						2	3		2		
CO4	2	3	2	3										1	3	3		
CO5	3	2				3		1				2	3	2	1			

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	**Sign & Seal of HoD**

Integral University, Lucknow

Effective from Session: 2016-17							
Course Code	EC604	**Title of the Course**	Advanced Nanoelectronics	**L**	**T**	**P**	**C**
Year	III	**Semester**	V	3	1	0	4
Pre-Requisite	Nano Electronics	**Co-requisite**					
Course Objectives	**1.** Developed understanding of fundamental ideas of Nanotechnology **2.** Understand various synthesis techniques of nanomaterials. **3.** To Develop various classification of nanomaterials and its properties. **4.** Develop various applications of nanomaterial with focus on medical aspect also. **5.** Apply various characterization techniques on different materials.						

Course Outcomes	
CO1	1. Understanding of usage of Fundamental issue of nanotechnology. 2. To know the various Limitations and downsides of nanotechnology. 3. Evaluate nanotechnology application for its optimum performance.
CO2	1. Understand nanostructure science and technology. 2. Understand various synthesis techniques of nanoparticles. 3. Understand function of nanostructure material.
CO3	1. Understand various types of nanomaterials 2. Develop knowledge about nanocomposites materials 3. Understand the various applications of nanocomposites materials.
CO4	1. Develop knowledge about nanomedicines. 2. Understand different types of nanomedicines 3. Develop knowledge about nano sensor and scanning techniques.
CO5	1. Understanding of nanorobotics. 2. Design nanorobotics and its controlling system. 3. Develop knowledge of Nature's Nanorobotics devices 4. Develop knowledge about various applications of nanorobotics in medicines.

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	NANOTECHNOLOGY AND REVOLUTION	Fundamental issues of Nanotechnology, Nanotechnology: fulfilling the basics, nanotechnology: aiding the Environment. Limits and Downsides, NASA applications, Nanotubes.	8	**CO1**
2	NANOSTRUCTURE MATERIALS	Nanostructure science and Technology, Nanoparticle synthesis strategies, Functional nanoscale devices.	8	**CO2**
3	NANOCOMPOSITES	Nanocomposites, Nanomaterial Additives, Nanocomposite classification system, Nanocomposites- Applications, Nanoclusters.	8	**CO3**
4	NANOMEDICINES	Prospect of Nanomedicine, Nanomedicine Taxonomy, nanomedicine, Nano sensors and Nanoscale scanning.	8	**CO4**
5	NANOROBOTICS	Introduction to Nanorobotics, Nature's Nanorobotics devices, Nanorobotics Design and control. Applications: SPM and Nanomanipulation, Robot in surgery, Nanotribology.	8	**CO5**

Reference Books:

1)"Nanotechnology: A Gentle Introduction to the Next Big Idea", M. Ratner and D. Ratner, Pearson Education.

2)"Nanotechnology – Science, Innovation, and Opportunity", L. E. Foster, Pearson Education.

3)"Nanotechnology – the fun and easy way to explore the science of mater's smallest particles", Richard Booker and Earl Boysen, Wiley

e-Learning Source:

https://nptel.ac.in

www.youtube.com

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)																	
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO4	PSO5	PSO6	PSO7
CO1	**3**	**3**	**3**	**2**	**2**	**2**	**2**	**1**					**3**	**3**				
CO2	**3**	**3**	**2**	**2**	**2**	**2**	**2**	**2**					**2**	**3**				
CO3	**3**	**3**	**3**	**2**	**2**	**3**	**3**	**3**					**3**	**3**				

CO4	**3**	**3**	**3**	**2**	**2**	**3**	**3**	**3**					**3**	**3**				
CO5	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**3**					**3**	**3**				

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	**Sign & Seal of HoD**

Integral University, Lucknow

Effective from Session:							
Course Code	EC605	**Title of the Course**	Current model VLSI Circuits and Applications	**L**	**T**	**P**	**C**
Year	**2nd**	**Semester**	III	**3**	**1**		**4**
Pre-Requisite	Integrated Circuits	**Co-requisite**	VLSI Design				
Course Objectives							

Course Outcomes	
CO1	To learn the importance of analog signal processing and analog VLSI, and the advantage analog system of processing enjoys over the digital counterpart.
CO2	To learn the simple CM devices and their applications in systems as building blocks.
CO3	To learn the variety of CMOS amplifiers like gm based and other OTAs,
CO4	To learn the advanced analog techniques like translunearity in analog VLSI Design and current conveying devices, their generations, types and applications.
CO5	To learn the switched current (SI) techniques in analog/mixed signal design.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**Currentmode**	Overview of the digital systems,merits and demerits, considerations of speed, advantages of analog systems,CM/VM systems, Working of BJT and MOSFET, Subthreshold operation of the MOSFET, Bandwidth, power and f_T considerations, Source coupled circuits-characteristics and logic functions.	8	CO1
2	**CM Devices**	Introduction to current mirrors, circuit applications, cascade, high swing, regulated current mirrors, and performance, Principle of translinearity, devices, structures, analysis and circuit applications, Differential pair amplifier, characteristics, Applications.	8	CO2
3	**Transcoductance amifiers**	Introduction to Differential pair amplifier conductance, g_m cells and their characteristics, OTA, model characteristics, important features, Simple CMOS OTA circuits and their analysis, OTA signal processing applications	8	CO3
4	**Advanced CM Devices**	Introduction to current conveyors, CC nomenclature, generations, Circuit structures, CMOS ckts, chaaracteristics. Translinear circuits, class AB operation and circuits, CCI, CCII, CCIII and signal processing applications CCCII conveyors and applications, Multi-input/output conveyors.	8	CO4
5	**Switched Techniques**	Introduction to switched techniques, Switched capacitor circuit applications, advantages, Principle of switching current, Comparison of SC and SI techniques, SI applications, SI integrators- I/II order integrators, bilinear integrators.	8	CO5

Reference Books:

1. Liu, Kramer, et.all., Analog VLSI : Circuits and Principles, Pearson Ed.
2. Ananda Mohan, Current Mode VLSI Analog Filters, Springer, India
3. Giuseppe Ferri, LV LP CMOS Current Conveyors, Springer.
4. M Ismail and Terri Fiez, Analog VLSI: Signal and Information Processing, McGrawwhill.
5. R J Baker et. all., CMOS: Circuit Design, Layout and Simulation, J Wiley, India
6. C Toumazou et. all., Analog IC Design: the Current Mode Approach, IEE Circuits and Systems series 2.
7. Edgar Sanchez Sinencio, LV LP IC Circuits and Systems: Low Voltage mixed Signal Circuits, IEEE Solid-State Circuits and Society

e-Learning Source:

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)																	
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO6	PSO7
CO1	3	3	3	3									3	1	1			
CO2	3	3	2	1	1								3	2	1			

CO3	3	3	2	1	1							1	3	2	3	1		
CO4	3	3	3	1	2							1	3	3	3	1		
CO5	3	3	3	1	2							1	3	3	3	1		

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	**Sign & Seal of HoD**

Integral University, Lucknow

Effective from Session:							
Course Code	EC 606	**Title of the Course**	DSP Structures for VLSI	**L**	**T**	**P**	**C**
Year	**2nd**	**Semester**	4th	**3**	**1**		**4**
Pre-Requisite		**Co-requisite**	VLSI Design				
Course Objectives	**Adv. DSP.**						

Course Outcomes	
CO1	To learn DSP Principles, Fourier analysis of signals and systems.
CO2	To learn H/W transformation techniques for efficient design and physical realizations.
CO3	To learn the fast processing algorithms, parallel processing and pipelining techniques for low power FIR filter designs.
CO4	To learn the Low power design of IIR Filters involving the techniques like pipelining and parallel processing.
CO5	To learn the manipulation of system in rounding of the filter coefficients to make them suitable for physical realization.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**Discrete Linear Systems**	An overview of DSP concepts-Linear system theory, DFT, FFT, realization of digital filters. Typical DSP algorithms, DSP applications. Data flow graph representation of DSP algorithms.	8	CO1
2	**Retiming texhniques**	Loop bound and iteration bound Retiming and its applications.	8	CO2
3	**LP FIR Design**	Algorithms for fast convolution. Algorithmic strength reduction in filters and transforms. DCT and inverse DCT. Parallel FIR filters. Pipelining of FIR filters. Parallel processing. Pipelining and parallel processing for low power.	8	CO3
4	**LP IIR Design**	Pipeline interleaving in digital filters. Pipelining and parallel processing for IIR filters. Low power IIR filter design using pipelining and parallel processing, Pipelined adaptive digital filters.	8	CO4
5	**Rounding and noise**	Round off noise and its computation. State variable description of digital filters, Round off noise computation using state variable description. Scaling using slow-down, retiming and pipelining.	8	CO5

Reference Books:

1. Keshab K Parthi, VLSI Digital Signal Processing Systems, John-Wiley India.
2. U. Meyer Baese , Digital Signal Processing with FPGAs, Springer
3. Digital Signal Processing Structures for VLSI (Very Large Scale Integration) Defense Technical Information Center.

e-Learning Source:

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)																	
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO6	PSO7
CO1	3	2	1	1									3	3	1			
CO2	3	2	2	1									3	3	1			
CO3	3	2	3	2		1							3	3	2	1		
CO4	2	3	3	2		1							3	3	2	1		
CO5	2	3	3	2		1							3	3	3	1		

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	**Sign & Seal of HoD**

Integral University, Lucknow

Effective from Session:							
Course Code	EC607	**Title of the Course**	Advanced Computer Architecture	**L**	**T**	**P**	**C**
Year	II	**Semester**	III	3	1	0	4
Pre-Requisite	Computer Organization& Architecture	**Co-requisite**					
Course Objectives	• To make students know about the Parallelism concepts in Programming . • To give the students an elaborate idea about the different memory systems and buses. • To introduce the advanced processor architectures to the students. • To make the students know about the importance of multiprocessor and multicomputers. • To study about data flow computer architectures.						

Course Outcomes	
CO1	Demonstrate concepts of parallelism in hardware/software.
CO2	Describe architectural features of advanced processors.
CO3	Interpret performance of different pipelined processors.
CO4	Explain data flow and hybrid in arithmetic algorithms
CO5	Ilustrate parallel programming concepts.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1		Multiprocessors and multi-computers. Multi-vector and SIMD computers. PRAM and VLSI Models. Conditions of parallelism. Program partitioning and scheduling. Program flow mechanisms. Parallel processing applications. Speed up performance law.	8	CO.1
2		Advanced processor technology. Superscalar and vector processors. Memory hierarchy technology. Virtual memory technology. Cache memory organization. Shared memory organization	8	CO.2
3		Linear pipeline processors. Non linear pipeline processors. Instruction pipeline design. Arithmetic design. Superscalar and super pipeline design. Multiprocessor system interconnects. Message passing mechanisms.	8	CO.3
4		Vector Processing principle. Multivector multiprocessors. .Compound Vector processing.Principles of multithreading. Fine grain multicomputers. Scalable and multithread architectures.Dataflow and hybrid architectures.	8	CO.4
5		Multiprocessors and multi-computers. Multi-vector and SIMD computers. PRAM and VLSI Models. Conditions of parallelism. Program partitioning and scheduling. Program flow mechanisms. Parallel processing applications. Speed up performance law.	8	CO.5

Reference Books:

1. M.J. Quinn, “Designing Efficient Algorithms for Parallel Computer”, McGraw Hill

e-Learning Source:

1. **https://nptel.ac.in**
2. **www.youtube.com**

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)																	
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	2	2	2	2		-	-	-	-	3	3	-	-	3	3
CO2	3	3	2	2	2	2	2		-	-	-	-	2	3	-	-	3	3
CO3	3	3	3	2	2		3		-	-	-	-	3	3	-	-	3	3
CO4	3	3	3	2	2		3		-	-	-	-	3	3	-	-	3	3
CO5	3	3	3	3	2	2			-	-	-	-	3	3	-	-	3	3

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	**Sign & Seal of HoD**