Punyashlok Ahilyadevi Holkar Solapur University, Solapur

NAAC Accredited-2015
'B' Grade (CGPA 2.62)

Name of the Faculty: Science & Technology

CHOICE BASED CREDIT SYSTEM (CBCS)

Syllabus: ELECTRONICS & TELECOMMUNICATION ENGINEERING

Name of the Course: M.Tech.- Semester I, II, III & IV

(Syllabus to be implemented w.e.f. 2023-24 & 2024-25)

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR
FACULTY OF SCIENCE & TECHNOLOGY
STRUCTURE OF M.Tech. (ELECTRONICS & TELECOMMUNICATION ENGINEERING)
Four Semester Course
Choice Based Credit System Syllabus w.e.f. 2023-24

Semester-I

Course Code	*Subject*	*Teaching Scheme*				*Credits*				*Evaluation Scheme*				
		L	***T***	***P***	***Total***	***Credits (L)***	***Credits (T)***	***Credits (P)***	***Total Credits***	***Scheme***	***Theory Marks***	***ICA- P Marks***	***ICA-T Marks***	***Total Marks***
EC 111	Research Methodology & IPR	3	1	-	4	3.0	1.0	-	4.0	ISE	30	--	25	125
										ESE	70	--	--	
EC 112	Antenna Theory & Techniques	3	-	2	5	3.0	-	1.0	4.0	ISE	30	25	--	125
										ESE	70	--	--	
EC 113	Advanced Embedded System	3	-	2	5	3.0	-	1.0	4.0	ISE	30	25	--	125
										ESE	70	--	--	
EC 114	Elective I	3	-	2	5	3.0	-	1.0	4.0	ISE	30	25	--	125
										ESE	70	--	--	
EC 115	Elective II	3	1	-	4	3.0	1.0	-	4.0	ISE	30	--	25	125
										ESE	70	--	--	
EC 116	Seminar- I	-	-	2	2	-	-	2.0	2.0	ISE	--	50	--	50
										ESE	--	--	--	
Total		**15**	**2**	**8**	**25**	**15.0**	**2.0**	**5.0**	**22.0**		**500**	**125**	**50**	**675**

***Note :** L- Lectures, P-Practical, T-Tutorial, ISE- In Semester Evaluation, ESE- End Semester Evaluation, ICA- Internal Continuous Assessment.*

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Semester-II

Course Code	*Subject*	*Teaching Scheme*				*Credits*				*Evaluation Scheme*				
		L	***T***	***P***	***Total***	***Credits (L)***	***Credits (T)***	***Credits (P)***	***Total Credits***	***Scheme***	***Theory Marks***	***ICA- P Marks***	***ICA-T Marks***	***Total Marks***
EC 121	Advanced Light Wave Communication	3	-	2	5	3.0	-	1.0	4.0	ISE	30	25	--	125
										ESE	70	--	--	
EC 122	RF & Microwave Engineering	3	-	2	5	3.0	-	1.0	4.0	ISE	30	25	--	125
										ESE	70	--	--	
EC 123	Advanced IoT	3	-	2	5	3.0	-	1.0	4.0	ISE	30	25	--	125
										ESE	70	--	--	
EC 124	Elective – I	3	1	-	4	3.0	1.0	-	4.0	ISE	30	--	25	125
										ESE	70	--	--	
EC 125	Elective – II	3	1	-	4	3.0	1.0	-	4.0	ISE	30	--	25	125
										ESE	70	--	--	
EC 126	Seminar- II	-	-	2	2	-	-	2.0	2.0	ISE	--	50	--	50
										ESE	--	--	--	
Total		**15**	**2**	**8**	**25**	**15.0**	**2.0**	**5.0**	**22.0**		**500**	**125**	**50**	**675**

***Note :** L- Lectures, P-Practical, T-Tutorial, ISE- In Semester Evaluation, ESE- End Semester Evaluation, ICA- Internal Continuous Assessment.*

- Seminar-I should be delivered on a topic related to student's broad area of interest for dissertation work selected in consultation with the advisor after compiling the information from the latest literature. Student should deliver seminar using modern presentation tools. A hard copy of the report (as per format specified by the department) should be submitted to the Department before delivering the seminar. A PDF copy of the report must be submitted to the advisor along with other details if any.

- Seminar II should be delivered on a topic related to student's particular area of interest for dissertation work selected in consultation with the advisor after compiling the information from the latest literature. Student should deliver seminar using modern presentation tools. A hard copy of the report (as per format specified by the department) should be submitted to the Department before delivering the seminar. A PDF copy of the report must be submitted to the advisor along with other details if any.

- **List of Elective Courses for semester I -**

Course Code	***Elective - I***	***Course Code***	***Elective – II***
EC 114.A	Biomedical Signal Processing	EC 115.A	Digital VLSI Design
EC 114.B	Soft Computing Methods	EC 115.B	Satellite Communication

- **List of Elective Courses for semester II -**

Course Code	***Elective - I***	***Course Code***	***Elective – II***
EC 124.A	Wireless Communication Systems	EC 125.A	Cryptography and Network Security
EC 124.B	Information and Coding Theory	EC 125.B	Automation and Industrial Robotics

***Note:** Courses may be added in the list of Elective I and II as and when required.*

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Four Semester Course

Choice Based Credit System Syllabus w.e.f. 2024-25

Semester-III

Course Code	*Subject*	*Teaching Scheme*		*Credits*			*Evaluation Scheme*			
		L	*P*	*Credits (L)*	*Credits (P)*	*Total Credits*	*Scheme*	*Theory Marks*	*ICA Marks*	*Total Marks*
SL001	Self-Learning Course	$	-	3.0	-	3.0	ISE	30	--	100
							ESE	70		
OE001	Open Elective Course#	3		3.0		3.0	ISE	30		100
							ESE	70		
EC 211	Dissertation Phase I : Synopsis Submission Seminar*		@4		3.0	3.0	ISE	--	100	100
							ESE	--	--	
EC 212	Dissertation Phase II : ICA*		-		3.0	3.0	ISE	--	100	100
							ESE	--	--	
EC 213	Dissertation Phase II Progress Seminar*		-		3.0	3.0	ISE	--		100
							ESE	--	100	
Total		**3**	**4**	**6.0**	**9.0**	**15.0**		**200**	**300**	**500**

***Note :** L- Lectures, P-Practical, T-Tutorial, ISE- In Semester Evaluation, ESE- End Semester Evaluation, ICA- Internal Continuous Assessment.*

Note -

- $- Being a Self-Learning Course, student shall prepare for examination as per specified syllabus.
- *- For all activities related to dissertation Phase I (synopsis submission seminar and progress seminar) student must interact regularly every week with the advisor.
- Synopsis submission seminar shall cover detailed synopsis of the proposed work. Student shall submit synopsis of the dissertation work only after delivering seminar.
- Progress seminar shall be delivered capturing details of the work done by student for dissertation.
- Student should deliver all seminars using modern presentation tools. A hard copy of the report shall be submitted to the department before delivering the seminar. A PDF copy of the report must be submitted to the advisor along with other details if any.
- @ Indicates contact hours of students for interaction with advisor.

List Self-Learning Courses -

Course Code	***Self-Learning Subject***
SL001.A	Design Thinking
SL001.B	Value Education & Professional Ethics
SL001.C	Cyber Security and Information Assurance

List of Open Elective Courses-

Course Code	**Open Elective Subject**
OE001.a	Business Analytics
OE001.b	Operation Research
OE001.c	Cost Management of Engineering Projects
OE001.d	Non Conventional Energy
OE001.e	Product Design & Development

***Note**: New Self Learning Courses and New Open Elective Courses may be added as and when required.*

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Four Semester Course

Choice Based Credit System Syllabus w.e.f. 2024-25

Semester-IV

Course Code	*Subject*	*Teaching Scheme*			*Credits*			*Evaluation Scheme*		
		L	*P*	*Total*	*Credits (L)*	*Credits (P)*	*Total Credits*	*Scheme*	*ICA Marks*	*Total Marks*
EC 221	Dissertation Phase III : Progress Seminar #	-	4@	4	-	3.0	3.0	ISE	100	100
EC 222	Dissertation Phase IV: #	-	2@	2	-	6.0	6.0	--	200	200
EC 223	Final Submission of the Dissertation and Viva –Voce	-	-	-	-	6.0	6.0	ESE	200	200
	Total	**-**	**-**	**6**	**--**	**15.0**	**15.0**	**-**	**500**	**500**

Note –

- #- For all activities related to dissertation Phase III & IV student must interact regularly every week with the advisor.
- Progress seminar should be delivered capturing details of the work done by student for dissertation.
- Student shall deliver all seminars using modern presentation tools. A hard copy of the report should be submitted to the Department before delivering the seminar. A PDF copy of the report must be submitted to the advisor along with other details if any.
- Student must submit a hard copy of Project Report to the department.
- @ indicates contact hours of the student for interaction with the advisor.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

M.Tech. (Electronics & Telecommunication Engg.) Semester-I

Choice Based Credit System (CBCS)

EC111 : RESEARCH METHODOLOGY and IPR

Teaching Scheme:
Lectures: 3 Hours/ week, 3 Credits
Tutorial: 1 Hour /week, 1 Credit

Examination Scheme:
ESE: 70 marks
ISE: 30 marks
ICA: 25 marks

Course content

Unit No.	Details	Teaching Hours
	Section-I	
1	**Introduction to Research:** Motivation and objectives, Research methods *vs.* Methodology, Types of research – Descriptive *vs.* Analytical, Applied *vs.* Fundamental, Quantitative *vs.* Qualitative, Conceptual *vs.* Empirical.	5
2	**Research Formulation:** Defining and formulating the research problem, Selecting the problem, Necessity of defining the problem, Importance of literature review in defining a problem, Literature review, Primary and secondary sources – reviews, treatise, monographs, patents, web as a source, searching the web, Critical literature review, Identifying gap areas from literature review, Development of working hypothesis.	8
3	**Research Design and Methods:** Research design – Basic Principles, Need of research design, Features of good design, Important concepts relating to research design, Observation and Facts, Laws and Theories, Prediction and explanation, Induction, Deduction, Development of Models, Developing a research plan, Exploration, Description, Diagnosis, and Experimentation, Determining experimental and sample designs.	8

Section-II		
4	**Data Collection and Analysis:** Execution of the research, Observation and Collection of data, Methods of data collection, Sampling Methods, Data Processing and Analysis strategies - Data Analysis with Statistical Packages, Hypothesis-testing, Generalization and Interpretation.	8
5	**Reporting and Thesis writing:** Structure and components of scientific reports, Types of report, Technical reports and thesis, Significance, Different steps in the preparation – Layout, structure and Language of typical reports/thesis, Illustrations and tables, Bibliography, referencing and footnotes, Plagiarism, Citation and acknowledgement, Reproducibility and accountability.	8
6	**Ethics and IPR:** Environmental impacts, Ethical issues, ethical committees, Commercialization, Copy right, royalty, Intellectual property rights and patent law, Trade Related aspects of Intellectual PropertyRights, Reproduction of published material.	5

Internal Continuous Assessment (ICA)

ICA shall be based upon minimum 6 tutorials based upon above curriculum.

References:-

1. Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K., 2002. An introduction to Research Methodology, RBSA Publishers.
2. Kothari, C.R., 1990. Research Methodology: Methods and Techniques. New Age International. 418p.
3. Sinha, S.C. and Dhiman, A.K., 2002. Research Methodology, EssEss Publications.2 volumes.
4. Trochim, W.M.K., 2005. Research Methods: the concise knowledge base, Atomic Dog Publishing. 270p.
5. Wadehra, B.L. 2000. Law relating to patents, trade marks, copyright designs and geographical indications,Universal Law Publishing.
6. Anthony, M., Graziano, A.M. and Raulin, M.L., 2009. Research Methods: A Process of Inquiry, Allyn and Bacon.
7. Carlos, C.M., 2000. Intellectual property rights, the WTO and developing countries:the TRIPS agreement and policy options, Zed Books, New York.
8. Coley, S.M. and Scheinberg, C. A., 1990, "Proposal Writing", Sage Publications.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

M.Tech. (Electronics & Telecommunication Engg.) Semester-I

Choice Based Credit System (CBCS)

EC112 : ANTENNA THEORY & TECHNIQUES

Teaching Scheme:

Lectures: 3 Hours /week, 3 Credits

Practical: 2 Hours / week, 1 Credit

Examination Scheme:

ESE: 70 marks

ISE: 30 marks

ICA: 25 marks

Course content

Unit No.	Details	Teaching Hours
	Section- I	
1	**Antenna Arrays**: Linear arrays, planner arrays and circular arrays. Array of two isotropic point sources, non isotropic Sources. Principle of pattern multiplication linear arrays of n elements, broadside, End-fire radiation pattern, directivity, Beam-width and null directions, array factor.	10
2	**Micro strip Radiators:** Introduction, Advantages and limitations of micro strip antenna, Radiation mechanism of Micro strip antenna, Various micro strip antenna configurations, feeding mechanisms, Transmission line model, cavity model and Design consideration of rectangular micro strip antenna.	11

Section- II		
3	**Broad banding of Micro strip Antenna:** Effect of substrate parameter on bandwidth, selection of shape of patch, selection of feeding technique: aperture coupled, transmission line model of aperture coupled antenna, broad banding using stacked elements, broad banding using coplanar parasitic elements and design examples.	8
4	**Design and Analysis of Micro strip Antenna Arrays:** Substrate characteristics for Microstrip Antenna Design, Ceramic Substrate, Semiconductor Substrate, Ferrimagnetic Substrate, Synthetic Substrate, Composite Material Substrate, Low-cost Low-loss Substrate and Desirable Substrate Characteristics for Antenna Fabrication, Parallel and series feed systems, Series feed of microstrip antenna, Mutual Coupling.	8
5	**Antennas for special applications:** Antennas design consideration for satellite communication, antenna for terrestrial mobile communication systems, Global Positioning System (GPS),WLAN (Wi-Fi),Bluetooth, Zigbee applications.	5

Internal Continuous Assessment (ICA)

ICA shall be based upon minimum 6 Laboratory Experiments based upon above curriculum using suitable **Modelling Softwar**e for these experiments.

References:-

1. Antenna Theory analysis and design- Costantine A. Balanis, John Wiley publication.
2. Antennas-John D. Kraus, Tata McGraw Hill publication.
3. Antenna and wave propagation, Harish A. R., Oxford University Press.
4. Micro-strip antenna design handbook by Ramesh Garg, Prakash, Bhartia, InderBahl and Apisak Ittipiboon, Artech House, Boston, London.
5. Antenna Theory- Analysis and Design, Balanis C, 3rd Wiley,3rd, 2005.
6. Antenna Theory & Design - W. L. Stutzman and G. A. Thiele, 2nd Edition, Wiley, 1998.

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M.Tech. (Electronics & Telecommunication Engg.) Semester-I

Choice Based Credit System (CBCS)

EC113 : ADVANCED EMBEDDED SYSTEM

Teaching Scheme:

Lectures: 3 Hours / week, 3 Credits

Practical: 2 Hours / week, 1 Credit

Examination Scheme:

ESE: 70 marks

ISE: 30 marks

ICA: 25 marks

Course content

Unit No.	Details	Teaching Hours
	Section-I	
1	**Embedded Architecture:** Embedded computers, characteristics of embedded computing applications, challenges in embedded computing system design, embedded memories, embedded system design process, designing hardware and software components.	4
2	**Embedded Processor:** ARM11, About the processor Extensions to ARMv6, MP11 CPU overview, Debug and programming support, Power, Configurable options, Pipeline stages, Typical pipeline operations ,MP Core architecture with Jazelle technology, Parity checking support, Product revisions.	6
3	**Programmers Model:** About the programmer's model, Processor operating states, Instruction length, Data types, Memory formats, Addresses in an MP Core system, Operating modes, Registers, The program status registers, Exceptions, Control Coprocessor CP15, CP15 registers arranged by function, Summary of control coprocessor CP15 registers and operations, register descriptions, Summary of CP15 instructions.	10

Section-II		
4	**Embedded system software:** Software architectures, software developments tools, programming concepts, embedded programming in C and C++, queues, stacks, optimization of memory needs, program modeling concepts, software development process life cycle and its model, software analysis, design and maintenance.	6
5	**Real time operating systems:** Real time operating systems (μC/OS)- real-time software concepts, kernel structure, task management, time management, inter task communication & synchronization, memory management, and porting μCos-II; Linux/RT Linux- features of Linux, Linux commands, file manipulations, directory, pipes and filters, file protections, shell programming, system programming, RT Linux modules, POSIX Threads, mutex management, semaphore management.	8
6	**Raspberry Pi:** Introduction to Raspberry Pi, ARM 11 Microcontroller Hardware Description & Interfacing Components, Hardware Interfacing of PI (HDMI Port, Keyboard mouse connection, 3.5mm audio jack, micro usb power cable) Programming the GPIO of Raspberry Pi, LCD interfacing.	6

Internal Continuous Assessment (ICA)

ICA shall be based upon minimum 6 practicals based on topics in the curriculum.

References:-

1. Embedded systems: a contemporary design tool, James K. Peckol- Wiley India.
2. Embedded Real Time Systems-Concepts, Design & Programming, Dr. K.V.K.K. Prasad, Dreamtech Publication.
3. ARM11 MPCore ™ Processor Revision: r2p0 , Technical Reference Manual.
4. Introduction to Embedded Systems, Jonathan W. Valvano , Cengage 2009.
5. Getting Started with Raspberry Pi By Matt Richardson, Shawn Wallace.
6. ARM System Developer's Guide, Sloss, Symes, Wright, Morgan, Kaufmann, 2004, 1st Edition.
7. ARM920T Technical Reference Manual (Rev 1) - ARM DDI 0151C, Data books of ARM7/ARM9 J., ARM Company Ltd.

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M.Tech. (Electronics & Telecommunication Engg.) Semester-I

Choice Based Credit System (CBCS)

ELECTIVE-I EC114. A : BIOMEDICAL SIGNAL PROCESSING

Teaching Scheme:

Lectures: 3 Hours / week, 3 Credits

Practical: 2 Hours / week, 1 Credit

Examination Scheme:

ESE: 70 marks

ISE: 30 marks

ICA: 25marks

Course content

Unit No.	Details	Teaching Hours
	Section-I	
1	**Biomedical signal origin and dynamics:** Action Potential and Its Generation, Origin and Waveform Characteristics of Basic Biomedical Signals Like: Electrocardiogram (ECG), Electroencephalogram (EEG), Electromyogram (EMG), Phonocardiogram (PCG), Electroneurogram (ENG), Event-Related Potentials (ERPS), Electrogastrogram (EGG), Objectives of Biomedical Signal Analysis, Difficulties in Biomedical Signal Analysis, Computer-Aided Diagnosis.	4
2	**Removal of Noise and Artifacts:** Statistical Preliminaries, Time domain filtering (Synchronized Averaging, Moving Average), Time domain filtering (Moving Average Filter to Integration, Derivative-based operator), Frequency Domain Filtering (Notch Filter), Optimal Filtering: The Weiner Filter.	9
3	**EEG Signal Processing and Event** : EEG Signal Processing and Event Detection in Biomedical Signals, EEG Signal and Its Characteristics, EEG Analysis, Autoregressive Method, Sleep EEG, Application of Adaptive Filter for Noise Cancellation in ECG and EEG Signals; Detection of P, Q, R, S and T Waves in ECG, EEG	8

	Rhythms, Waves and Transients, Detection of Waves and Transients, Correlation Analysis Ad Coherence Analysis of EEG Channels.	
	Section-II	
4	**Modeling of Biomedical systems:** Point processes- Parametric system modeling- All-pole, pole zero modeling, electromechanical models of signal generation. Analysis of non stationary signals: Characterization- Fixed segmentation- Short Time Fourier Transform-Adaptive segmentation Adaptive filters for segmentation- RLS and Lattice Filter.	9
5	**Introduction to medical image processing and visualization:** Human vision and perception,Two-dimensional Fourier transform, 2-D Convolution, 2-D filters, Image enhancement, Feature extraction, Edge detection.	5
6	**Advancement in Healthcare:** Introduction to CT, MRI, PET and SPECT, tumor types and their therapy, magnetic resonance imaging, Advancement in healthcare technologies. Case studies of biomedical signal and image processing.	7

Internal Continuous Assessment (ICA)

ICA shall be based upon minimum 6 Laboratory Experiments based upon above curriculum.

References:

1. D.C. Reddy, "Biomedical Signal Processing: Principles and techniques", Tata McGraw Hill, New Delhi, 2005.
2. Rangaraj M. Rangayyan, "Biomedical Signal Analysis: A case study Approach", Wiley Interscience 2002.
3. MetinAkay, "Biomedical Signal Processing", Academic press, Inc. California,1994.
4. Bruce, "Biomedical Signal Processing & Signal Modeling", Wiley, 2001.
5. Semmlow, Marcel Dekker "Biosignal and Biomedical Image Processing", 2004.
6. Enderle, "Introduction to Biomedical Engineering" , 2/e, Elsevier, 2005.
7. Tompkins W J "Biomedical Signal Processing", Prentice hall of India, New Delhi, 1999.
8. Bronzino J D "The Biomedical Engineering handbook", CRC and Free press, Florida, 1995.
9. Arnon Cohen "Biomedical Signal Processing", CrcPr I Llc; 2nd edition, May, 2002.

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M.Tech. (Electronics & Telecommunication Engg.) Semester-I

Choice Based Credit System (CBCS)

ELECTIVE-I EC114.B : SOFT COMPUTING METHODS

Teaching Scheme:

Lectures: 3 Hours / week, 3 Credits

Practical: 2 Hours / week, 1 Credit

Examination Scheme:

ESE: 70 marks

ISE: 30 marks

ICA: 25marks

Course content

Unit No.	Details	Teaching Hours
	Section-I	
1	**Introduction**: Introduction to Soft Computing, hard computing, Need for soft computing. Introduction to Fuzzy logic.	5
2	**Fuzzy Systems**: Fuzzy membership functions,Operations on Fuzzy sets, Fuzzy relations, Fuzzy propositions, Fuzzy implications, Fuzzy inferences, Defuzzification Techniques, Fuzzy logic controller.	8
3	**Genetic Algorithm:** Basic concepts, encoding, fitness function, reproduction, Differences of GA and traditional optimization methods.	8
	Section-II	
4	**Fundamentals of Neural Network:** Introduction, Model of Artificial Neuron, Architectures, Learning Methods, Taxonomy of NN Systems, McCulloch Pitts Neuron , Single-Layer NN System, Supervised Learning, Back-Propagation Learning, Back-Propagation Algorithm, Unsupervised Learning, Neural Networks, Competitive Learning Networks, Kohonen Self-Organizing Networks, Learning, Vector Quantization, Applications.	8
5	**Deep Learning-** History of Deep Learning, Deep Learning	7

	Success Stories, Introduction to Convolutional Neural Networks. Convolutional Neural Networks (CNN): convolution, filters, pooling, stride, drop out, layers, Recurrent Neural Networks (RNN), Variational Autoencoders, Generative Models, Applications.	
6	**Hybrid Systems:** Integration of Neural Networks, Fuzzy Logic and Genetic Algorithms, GA Based Back Propagation Networks.	6

Internal Continuous Assessment (ICA)

ICA shall be based upon minimum 6 Laboratory Experiments based upon above curriculum.

References:

1. Melanic Mitchell, " An Introduction to Genetic Algorithm" (MIT Press).
2. S.N. Sivanandam& S.N. Deepa, "Principles of Soft Computing", Wiley Publications, 3rd ed., 2018.
3. Collelo, Lament, Veldhnizer, " Evolutionary Algorithm for Solving Multi- objective, Optimization Problems", (2nd Edition), (Springer).
4. Timothy J. Ross, " Fuzzy Logic with Engineering Applications" (Wiley).
5. Davis E.Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley, N.Y., 1989.
6. Simon Haykin, " Neural Networks and Learning Machines" (PHI).
7. S. Rajasekaran & GA Vijayalakshmi Pai "Neural Networks, Fuzzy Logic, and Genetic Algorithms synthesis and application", PHI.
8. Ian Goodfellow and YoshuaBengio and Aaron Courville, " Deep Learning" An MIT Press book, http://www.deeplearningbook.org.

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M.Tech. (Electronics & Telecommunication Engg.) Semester-I

Choice Based Credit System (CBCS)

ELECTIVE-II EC115.A : Digital VLSI Design

Teaching Scheme:

Lectures: 3 Hours / week, 3 Credits

Tutorial: 1 Hour / week, 1 Credit

Examination Scheme:

ESE: 70 marks

ISE: 30 marks

ICA: 25 marks

Course content

Unit No.	Details	Teaching Hours
	Section-I	
1	**The CMOS Invertor:** Introduction, The static CMOS invertor, The Dynamic Behavior of CMOS invertor, Power and Energy Delay.	5
2	**Designing Combinational Logic in CMOS:** Introduction, Static CMOS design- Complementary Logic, Ratioed Logic, Pass Transistor Logic. Dynamic CMOS Design- Pre-charge & evaluation, Speed and Power Dissipation, Cascading Dynamic Gates, Designing Logic for Reduced Supply Voltages.	8
3	**Designing Sequential Logic Circuits:** Basic concepts, Bi-stability principle, Static & dynamic latches and registers, Non-Bistable Sequential circuits - The Schmitt Trigger, Monostable Sequential Circuits, A-stable Circuits.	8
	Section-II	

4	**Implementation Strategies for Digital ICs:** Introduction, Cell-Based Design Methodology-Standard Cell, Compiled Cells, Macrocells, Megacells and Intellectual Property, Semi-Custom Design Flow, Array-Based Implementation Approaches-Pre-diffused (or Mask-Programmable) Arrays, Pre-wired Arrays.	8
5	**Designing Arithmetic Building Blocks:** The Adder, The Multiplier, The Shifter, Other Arithmetic Operators, Power and Speed Trade-off's in Datapath Structures.	7
6	**Designing Memory and Array Structures:** Classification of semiconductor memories, Memory Peripheral Circuitry-The Address Decoders, Sense Amplifiers, Voltage References, Drivers/Buffers, Timing and Control. Case Studies in Memory Design-The Programmable Logic Array (PLA), A 4 Mbit SRAM, A 1 Gbit NAND Flash Memory	6

Internal Continuous Assessment (ICA)

ICA shall be based upon minimum 6 tutorials based on topics in the curriculum.

References:-

1. Rabey, Chandrakasan, Nikolic ,"Digital Integrated Circuits", Pearson Education.
2. Neil H. E. Weste, David Harris, Ayan Banerjee," CMOS VLSI design" Pearson Education.
3. Wayne Wolf, " Modern VLSI Design".
4. Timothy J. Ross, " Fuzzy Logic with Engineering Applications" (Wiley).
5. Kamran Ehraghian, Dauglas A. Pucknell and Sholeh Eshraghiam "Essentials of VLSI Circuits and Systems" – PHI, EEE, 2005 Edition.

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M.Tech. (Electronics & Telecommunication Engg.) Semester-I

Choice Based Credit System (CBCS)

ELECTIVE-II EC115.B : Satellite Communication

Teaching Scheme:

Lectures: 3 Hours / week, 3 Credits

Tutorial: 1 Hour / week, 1 Credit

Examination Scheme:

ESE: 70 marks

ISE: 30 marks

ICA: 25 marks

Course content

Unit No.	Details	Teaching Hours
	Section-I	
1	**Introduction to Satellite Communication, Orbit Mechanism and Launchers:** *Introduction* – Introduction to satellite communication, frequency allocation. *Orbital Mechanism*- Introduction, basic principle, Kepler's laws, Orbiting parameters-apogee, perigee, orbital time, velocity, sub-satellite point, types of satellite orbit (LEO, MEO, GEO), orbital perturbations, numerical on orbital parameters. *Launchers*- Launch vehicle introduction, Satellite launch vehicle (SLV), Polar Satellite launch vehicle (PSLV), Geo-Satellite launch vehicle (GSLV).	8
2	**Satellite subsystems:** Satellite subsystems, attitude and orbit control system (AOCS), Telemetry, Tracking command and monitoring, power system, communication subsystem, antenna subsystem, equipment reliability and space qualification.	6

3	**Satellite Link Design:** Introduction, basic transmission theory, system noise temperature and G/T Ratio, design of downlinks, uplink design, design of specified C/N-Combining C/N and C/I values in satellite links, system design examples.	7
	Section-II	
4	**Earth station:** Introduction, Types of earth stations- FSS, BSS, MSS, single frequency station, Gateway station, earth station architecture, earth station design consideration, performance parameters, optimization, earth station testing, R.F. equipment for earth station.	6
5	**Propagation effects:** Introduction, atmospheric absorption, cloud attenuation, tropospheric & ionospheric Scintillations &low angle fading, rain induced attenuation.	8
6	**Satellite Navigation and Global Positioning system (GPS):** Introduction, radio and satellite navigation, GPS position location principles, GPS receivers and codes, satellite signal acquisition, VSAT. Home satellite TV, Digital DBS TV, satellite radio broadcasting.	7

Internal Continuous Assessment (ICA)

ICA shall be based upon minimum 6 tutorials based on topics in the curriculum.

References:

1. Satellite communication-Timothy Pratt, Charles Bostian, Jeremy Allnutt- John Wiley & Sons (2nd Edition).
2. Satellite Communication-Anil K. Maini, Varsha Agrawal- Wiley India PVT Ltd.
3. Satellite Communication- Dennis Roody- McGraw Hill.
4. Satellite communication- Manjit Mitra- PHI Learning PVT Ltd.
5. Satellite communication- systems- Gerard Maral, Michel Bousquet - John Wiley & Sons.
6. Satellite Communication- K.N. Raja Rao- Prentice Hall of india.