॥ सा विद्या या विमुक्तये ॥

स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

'ज्ञानतीर्थ', विष्णुपुरी, नांदेड – ४३१ ६०६ (महाराष्ट्र राज्य) भारत

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

'Dnyanteerth', Vishnupuri, Nanded - 431 606 (Maharashtra State) INDIA

Established on 17th September, 1994, Recognized By the UGC U/s 2(f) and 12(B), NAAC Re-accredited with'B++' grade

स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

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प्रस्तुत विद्यापीठाच्या सलग्निंत महाविद्यालयातील विज्ञान व तंत्रज्ञान विद्याशाखेतील B. E. Electronics & Telecommunication Engineering पदवी स्तरावरील CGPA Revised Pattern नुसारचा अभ्यासक्रम शैक्षणिक वर्ष २०२१–२२ पासून लागू करण्याबाबत.

प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, प्रस्तुत विद्यापीठाच्या सलग्निंत अभियांत्रीकी महाविद्यालयातील **विज्ञान व तंत्रज्ञान विद्याशाखेतील B. E. Electronics & Telecommunication Engineering या पदवी स्तरावरील C.G.P.A. Revised Pattern** नुसारचा अभ्यासक्रम शैक्षणिक वर्ष २०२१–२२ पासून लागू करण्याच्या दृष्टीन मा. कुलगुरू महोदयांनी मा. विद्यापरिषदेच्या मान्यतेच्या अधीन राहून अभ्यासक्रमास मान्यता दिलेली आहे.

सदरील परिपत्रक व अभ्यासक्रम प्रस्तुत विद्यापीठाच्या **www.srtmun.ac.in** या संकेतस्थळावर उपलब्ध आहेत. तरी सदरील बाब ही सर्व संबंधितांच्या निदर्शनास आणून द्यावी, ही विनंती.

'ज्ञानतीर्थ' परिसर,
विष्णुपुरी, नांदेड – ४३१ ६०६.
जा.क्र.:शैक्षणिक–१/परिपत्रक/पदवी–अभियांत्रीकी अभ्यासक्रम/
न्यू मॉडल डिग्री कालेज/ २०२१–२२/**१७६**

स्वाक्षरित
सहा.कुलसचिव
शैक्षणिक (१–अभ्यासमंडळ) विभाग

दिनांक : २३.१०.२०२१.

प्रत माहिती व पुढील कार्यवाहीस्तव :

१) मा. अधिष्ठाता, विज्ञान व तंत्रज्ञान विद्याशाखा, प्रस्तुत विद्यापीठ.
२) मा. संचालक, परीक्षा व मूल्यमापन मंडळ यांचे कार्यालय, प्रस्तुत विद्यापीठ.
३) मा. प्राचार्य, संबधित सलग्निंत महाविद्यालये, प्रस्तुत विद्यापीठ.
४) उपकुलसचिव, पात्रता विभाग, प्रस्तुत विद्यापीठ.
५) अधीक्षक, परिक्षा विभाग व्यवसाईक अभ्यासक्रम विद्याशाखा प्रस्तुत विद्यापीठ.
६) सिस्टम एक्सपर्ट, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ. यांना देवून कळविण्यात येते की, सदरील परिपत्रक व अभ्यासक्रम विद्यापीठ संकेतस्थळावर प्रसिध्द करण्यात यावे.

Swami Ramanand Thirth Marathwada University Nanded

CURRICULUM For

(Engineering & Technology)

UNDERGRADUATE DEGREE COURSES IN

ELECTRONICS & TELECOMMUNICATION ENGINEERING

FINAL YEAR CGPA REVISED

[Proposed from 2021-22]

Teaching Scheme – Fourth Year Electronics & Telecommunication Engineering
SEMESTER – VII

Sr.NO	Category	Code	Course Title	Teaching Scheme				Examination Scheme					Grand Total
				L	T	P	CR	PR	OR	TW	MSE	ESE	
1	Professional Elective courses	PEC-ECEL701-A	Microwave Theory and Techniques	3	0	0	3	0	0	0	30	70	100
		PEC-ECEL701-B	Mixed Signal Design										
		PEC-ECEL701-C	Adaptive Signal Processing										
2	Professional Elective courses	PEC-ECEL702-A	Mobile Communication and Networks	3	1	2	4	0	0	25	30	70	125
		PEC-ECEL702-B	Digital Image & Video Processing										
3	Professional Elective courses	PEC-ECEL703-A	Fiber Optic Communications	3	0	0	3	0	0	0	30	70	100
		PEC-ECEL703-B	High Speed Electronics										
4	Open Elective Course	OEC 704-A	Cyber Law & Ethics	3	1	2	3	0	0	25	15	35	75
		OEC 704-B	Computer Networks										
5	Project	ECP-I705	Project Stage-I	0	0	10	5	0	150@	50	0	0	200
6	Mandatory Courses (non-credit)	MC 706	Industrial Internship	0	0	0	0	0	25#	25	0	0	50
7	Humanities and Social Sciences including Management courses	HSMC 707	Interview Techniques and Mock Exercise	0	0	2	1	0	25@	25	0	0	50
Total				**11**	**0**	**16**	**19**	0	200	150	105	245	**700**

Symbols to remember: - @ - Internal Assessment, # - External Assessment

T – Theory , P– Practical, T – Tutorial , CR – Credit , OR – Oral , TW – Term work, MSE –Minor Semester Examination, ESE – End Semester Examination. ***(Note:-Internship after 6th semester examination for 6 weeks.)***

Teaching Scheme – Fourth Year Electronics & Telecommunication Engineering
SEMESTER – VIII

Sr. NO	Category	Code	Course Title	Teaching Scheme				Examination Scheme					Grand Total
				L	T	P	CR	PR	OR	TW	MSE	ESE	
1	Professional Elective courses	PEC-ECEL801-A	Satellite Communication	3	0	0	3	0	0	25	30	70	125
		PEC-ECEL801-B	Consumer Electronics										
2	Professional Elective courses	PEC-ECEL802-A	Mechatronics	3	0	0	3	0	0	25	30	70	125
		PEC-ECEL802-B	Mobile Cmputing										
3	Open Elective Course	OEC 803-A	Artificial Intelligence Deep Learning	3	0	0	3	0	0	25	15	35	75
		OEC 803-B	Internet of Things (IOT)										
4	Open Elective Course	OEC 804-A	Digital VLSI Design	3	0	0	3	0	0	25	15	35	75
		OEC 804-B	Mobile App Development										
5	Humanities and Social Sciences including Management courses	HSMC 805	Entrepreneurship Development	0	0	2	1	0	25@	25	0	0	50
6	Project	ECP-II 806	Project Stage-II	0	0	18	9	0	200#	50	0	0	250
Total				**12**	**0**	**20**	**22**	0	225	175	90	210	**700**

Symbols to remember: - @ - Internal Assessment, # - External Assessment
T – Theory , P– Practical, T – Tutorial , CR – Credit , OR – Oral , TW – Term work, MSE –Minor Semester Examination, ESE – End Semester Examination.

Curriculum for
Undergraduate Degree Courses in Engineering & Technology

ELECTRONICS & TELECOMMUNICATION ENGINEERING

Chapter -1
General, Course structure & Theme
&
Semester-wise credit distribution

A. Definition of Credit:

1 Hr. Lecture (L) per week	1 credit
1/2 Hr. Tutorial (T) per week	1 credit
1 Hr. Practical (P) per week	0.5credits
2 Hours Practical (Lab) per week	1 credit
4 Hours Practical (Lab) per week	2 credits

B. Credits required– Total 160 credits are required for a student to be eligible to get Under Graduate degree in Engineering.

C. Structure of Undergraduate Engineering program:

S. No.	Category	Breakup of Credits (Total 160)
1	Humanities and Social Sciences including Management courses	13
2	Basic Science Courses	23
3	Engineering Science courses including workshop, drawing, basics of electrical/mechanical/computer etc.	14
4	Professional core courses, project &entrepreneurship in industry	71
5	Professional Elective courses relevant to chosen specialization/branch	24
6	Open subjects – Electives from other technical and /or emerging subjects	15
7	Mandatory Courses [Environmental Sciences, Induction program, Indian Constitution, Essence of Indian Traditional Knowledge]	(non-credit)
	Total	160

D. Credit distribution in the First year of Undergraduate Engineering program :

Subject	Lecture (L)	Tutorial (T)	Laboratory/ Practical (P)	Total Credits (C)
Chemistry	3	0	2	4
Physics	3	0	2	4
Mathematics-I	3	1	0	4
Mathematics-II	3	1	0	4
Programming for Problem Solving	2	0	4	4
English	2	1	0	3
Engineering Graphics & Design	1	0	4	3
Basic Electrical Engineering	3	0	2	4
Workshop/Practices	1	0	4	3

E. Course Code and Definition:

Course code	Definitions
BSC	Basic Science Courses
ESC	Engineering Science Courses
HSMC	Humanities and Social Sciences including Management courses
PCC-EC	Professional core courses
PEC-ECEL	Professional Elective courses
OEC	Open Elective courses
ECP	Project
MC	Mandatory courses

HUMANITIES & SOCIAL SCIENCES INCLUDING MANAGEMENT

Sl. No	Code No.	Subject	Semester	Credits
1	HSMC205	English	II	3
2	HSMC306	Humanities-I (Effective Technical Communication)	III	2
3	HSMC307	Seminar I	III	2
4	HSMC407	Interpersonal Skills and Personality development	IV	1
5	HSMC507	Seminar II	V	1
6	HSMC607	Seminar III	VI	1
7	HSMC608	Competitive and Technical exams	VI	1
8	HSMC707	Interview Techniques and Mock Exercise	VII	1
9	HSMC805	Entrepreneurship Development	VIII	1
			Total Credits:	**13**

BASIC SCIENCE COURSES

Sl. No	Code No.	Subject	Semester	Credits
1.	BSC101	Chemistry-I	I	4
2.	BSC102	Mathematics –I (Calculus, Multivariable Calculus and Linear Algebra)	I	4
3.	BSC201	Physics	II	4
4.	BSC202	Mathematics –II (Differential Equations)	II	4
5.	BSC305	Mathematics-III	III	4
6.	BSC404	Biology for Engineers	IV	3
			Total Credits:	**23**

ENGINEERING SCIENCE COURSES

Sl. No	Code No.	Subject	Semester	Credits
1.	ESC103	Basic Electrical Engineering	I	4
2.	ESC104	Engineering Graphics & Design	I	3
3.	ESC203	Programming for Problem Solving	II	4
4.	ESC204	Workshop/Practices	II	3
			Total Credits:	**14**

		Designing B. Mobile App Development		
			Total Credits:	**15**

MANDETORY NON CREDITS COURSES

Sr. No.	Code No.	Subject	Semester
1	HSMC001	Induction Programme -2 weeks	At Start of Ist semester
2	HSMC105	Development of Life skill	I
3	HSMC206	Behavioural Science	II
4	MC308	Constitution of India/Essences of Indian Traditional Knowledge	III
5	HSMC405	Management –I (Organization Behaviour Finance & Accounting)	IV
6	MC406	Environmental Science	IV
7	MC706	Industrial Training	VII

PEC-ECEL701-A	Microwave Theory and Techniques	3L:0T:0P	3 credits

Introduction to Microwaves-History of Microwaves, Microwave Frequency bands; Applications of Microwaves: Civil and Military, Medical, EMI/ EMC.

Mathematical Model of Microwave Transmission-Concept of Mode, Features of TEM, TE and TM Modes, Losses associated with microwave transmission, Concept of Impedance in Microwave transmission.

Analysis of RF and Microwave Transmission Lines- Coaxial line, Rectangular waveguide, Circular waveguide, Strip line, Micro strip line.

Microwave Tubes

Introduction, microwave tubes, principle of operation and velocity modulation of two cavity klystron, multi cavity klystron, reflex klystron, TWT, Cylindrical Magnetron.

Passive and Active Microwave Devices- Microwave passive components: Directional Coupler, Power Divider, Magic Tee, Attenuator, Resonator.

Microwave Semiconductor Devices- Gunn Diodes, IMPATT diodes, TRAPATT diodes, PIN diodes. Principle of Operation and application of tunnel diode, Principle of operation of Gunn diode, application of Gunn diode, advantages of Gunn diode,

Microwave Systems- Radar, Terrestrial and Satellite Communication, Radio Aids to Navigation, RFID, GPS. Modern Trends in Microwaves Engineering- Effect of Microwaves on human body, Medical and Civil applications of microwaves, Electromagnetic interference and Electromagnetic Compatibility (EMI & EMC), Monolithic Microwave ICs, RFMEMS for microwave components, Microwave Imaging.

Text/Reference Books:

1. R.E. Collins, Microwave Circuits, McGraw Hill
2. Liao S. Y., *'"Microwave devices and Circuits"*, Prentice Hall of India
3. K.C. Gupta and I.J. Bahl, Microwave Circuits, Artech house
4. Das, Annapurna &Sisir K. Das, Microwave Engineering, Tata McGraw-Hili.
5. POZAR DM, Microwave Engg, John Wiley & Sons Inc.
6. Samuel Y. Liao, Microwave Devices and Circuits, Prentice-Hall of India.

Course Outcomes:

At the end of the course, students will demonstrate the ability to:

1. Understand various microwave system components their properties.
2. Appreciate that during analysis/ synthesis of microwave systems, the different mathematical treatment is required compared to general circuit analysis.
3. Understand microwave systems for different practical application.

PEC-ECEL701-B	Mixed Signal Design	3L:0T:0P	3 Credits

Signal Processing- Analog and discrete-time signal processing, introduction to sampling theory; Analog continuous time filters: passive and active filters; Basics of analog discrete-time filters and Z-transform.

Switched-capacitor filters- Non idealities in switched-capacitor filters; Switched-capacitor filter architectures; Switched-capacitor filter applications.

Basics of data converters- Successive approximation ADCs, Dual slope ADCs, Flash ADCs, Pipeline ADCs, Hybrid ADC structures, High-resolution ADCs, DACs.

data transmission- Mixed-signal layout, Interconnects and data transmission; Voltage-mode signaling and data transmission; Current-mode signaling and data transmission.

Introduction to frequency synthesizers and synchronization; Basics of PLL, Analog PLLs; Digital PLLs; DLLs.

Text/Reference Books:

1. R. Jacob Baker, CMOS mixed-signal circuit design, Wiley India, IEEE press, reprint 2008.

2. Behzad Razavi , Design of analog CMOS integrated circuits, McGraw-Hill, 2003.

3. R. Jacob Baker, CMOS circuit design, layout and simulation, Revised second edition, IEEE press, 2008.

4. Rudy V. dePlassche, CMOS Integrated ADCs and DACs, Springer, Indian edition,2005.

5. Arthur B. Williams, Electronic Filter Design Handbook, McGraw-Hill, 1981.

6. R. Schauman, Design of analog filters by, Prentice-Hall 1990 (or newer additions).

7. M. Burns et al., An introduction to mixed-signal IC test and measurement by, Oxford university press, first Indian edition, 2008.

Course Outcomes:

At the end of the course, students will demonstrate the ability to:

1. Understand the practical situations where mixed signal analysis is required.

2. Analyze and handle the inter-conversions between signals.

3. Design systems involving mixed signals

PEC-ECEL701-C	Adaptive Signal Processing	3L:0T:0P	3 credits

Introduction to adaptive Signal processing- General concept of adaptive filtering and estimation, applications and motivation, Review of probability, random variables and stationary random processes, Correlation structures, properties of correlation matrices.

Filter and Algorithm- Optimal FIR (Wiener) filter, Method of steepest descent, extension to complex valued The LMS algorithm (real, complex), convergence analysis, weight error correlation matrix, excess mean square error and miss-adjustment Variants of the LMS algorithm: the sign LMS family, normalized LMS algorithm, block LMS and FFT based realization, frequency domain adaptive filters, Sub-band adaptive filtering.

Signal space concepts- introduction to finite dimensional vector space theory, subspace, basis, dimension, linear operators, rank and nullity, inner product space, orthogonality, Gram Schmidt orthogonalization, concepts of orthogonal projection, orthogonal decomposition of vector spaces. Vector space of random variables, correlation as inner product, forward and backward projections, Stochastic lattice filters, recursive updating of forward and backward prediction errors, relationship with AR modeling, joint process estimator, gradient adaptive lattice.

RLS transversal adaptive filters- Introduction to recursive least squares (RLS), vector space formulation of RL Sestimation, pseudo-inverse of a matrix, time updating of inner products, development of RLS lattice filters, RLS transversal adaptive filters.

Advanced topics: affine projection and subspace based adaptive filters, partial update algorithms, QR decomposition and systolic array.

Text/Reference Books:

1. S. Haykin, Adaptive filter theory, Prentice Hall, 1986.
2. C.Widrow and S.D. Stearns, Adaptive signal processing, Prentice Hall, 1984.

Course Outcomes:

At the end of the course, students will demonstrate the ability to:

1. Understand the non-linear control and the need and significance of changing the control parameters w.r.t. real-time situation.
2. Mathematically represent the 'adaptability requirement'.
3. Understand the mathematical treatment for the modeling and design of the signal processing systems.

PEC-ECEL702-A	Mobile Communication and Networks	3L:0T:2P	4 credits

Cellular concepts- Cell structure, frequency reuse, cell splitting, channel assignment, handoff, interference, capacity, power control; Wireless Standards: Overview of 2G and 3G cellular standards.

Signal propagation- Propagation mechanism- reflection, refraction, diffraction and scattering, large scale signal propagation and lognormal shadowing. Fading channels- Multipath and small

scale fading- Doppler shift, statistical multipath channel models, narrowband and wideband fading models, power delay profile, average and rms delay spread, coherence bandwidth and coherence time, flat and frequency selective fading, slow and fast fading, average fade duration and level crossing rate.Capacity of flat and frequency selective channels.

Antennas- Antennas for mobile terminal- monopole antennas, PIFA, base station antennas and arrays.

Multiple access schemes-FDMA, TDMA, CDMA and SDMA. Modulation schemes- BPSK, QPSK and variants, QAM, MSK and GMSK, multicarrier modulation, OFDM.

Receiver structure- Diversity receivers- selection and MRC receivers, RAKE receiver, equalization: linear-ZFE and adaptive, DFE.

Transmit diversity- Altamonte scheme. MIMO and space time signal processing, spatial multiplexing, diversity/multiplexing tradeoff. Performance measures- Outage, average snr, average symbol/bit error rate. System examples- GSM, EDGE, GPRS, IS-95, CDMA 2000 and WCDMA.

Text/Reference Books:

1. WCY Lee, Mobile Cellular Telecommunications Systems, McGraw Hill, 1990.
2. WCY Lee, Mobile Communications Design Fundamentals, Prentice Hall, 1993.
3. Raymond Steele, Mobile Radio Communications, IEEE Press, New York, 1992.
4. AJ Viterbi, CDMA: Principles of Spread Spectrum Communications, Addison Wesley, 1995.
5. VK Garg &JE Wilkes, Wireless & Personal Communication Systems, Prentice Hall, 1996.

Course outcome-

At the end of the course, students will demonstrate the ability to:

1. Understand the working principles of the mobile communication systems.

2. Understand the relation between the user features and underlying technology.

3. Analyze mobile communication systems for improved performance

List of Practicals:

1. To study and analyze the behavior of the CDMA Trainer kit designed to provide experimental knowledge of CDMA Direct Sequence Spread Spectrum Modulation / Demodulation technique.
2. Study of the Tx IQ/Rx IQ signals.
3. To study and analyze the behavior of the PSTN TST switch on Trainer kit.
4. To study and analyze the Mobile phone on it's trainer kit.
5. Observe signal constellation of GMSK signal.
6. Study the working of Audio IC and observe Audio Signal.
7. To study and verify the performance of SIM Detection.
8. To study and analyze the behavior of 3G network using cellular phone on the 3G mobile trainer kit
9. To study and use the AT commands using GSM trainer kit.
10. To study the VoIP implementation on VOIP Trainer kit.
11. Study of voice call using AT command.
12. Sending message using AT command.
13. Measurement of test point voltages of mobile.

14. Study and Analyze the Buzzer in a GSM Handset and measure the PWM signal of the Buzzer.

15. Observe waveforms at different test points of mobile.

16. To study amplitude modulation in MATLAB.

PEC-ECEL702-B	Digital Image & Video Processing	3L:0T:2P	4 credits

Digital Image Fundamentals-Elements of visual perception, image sensing and acquisition, image sampling and quantization, basic relationships between pixels – neighborhood, adjacency, connectivity, distance measures.

Image Enhancements and Filtering-Gray level transformations, histogram equalization and specifications, pixel-domain smoothing filters – linear and order-statistics, pixel-domain sharpening filters – first and second derivative, two-dimensional DFT and its inverse, frequency domain filters – low-pass and high-pass.

Color Image Processing-Color models–RGB, YUV, HSI; Color transformations–formulation, color complements, color slicing, tone and color corrections; Color image smoothing and sharpening; Color Segmentation.

Image Segmentation- Detection of discontinuities, edge linking and boundary detection, thresholding – global and adaptive, region-based segmentation.

Wavelets and Multi-resolution image processing- Uncertainty principles of Fourier Transform, Time-frequency localization, continuous wavelet transforms, wavelet bases and multi-resolution analysis, wavelets and Subband filter banks, wavelet packets.

Image Compression-Redundancy–inter-pixel and psycho-visual; Lossless compression – predictive, entropy; Lossy compression- predictive and transform coding; Discrete Cosine Transform; Still image compression standards – JPEG and JPEG-2000.

Fundamentals of Video Coding- Inter-frame redundancy, motion estimation techniques – full search, fast search strategies, forward and backward motion prediction, frame classification – I, P and B; Video sequence hierarchy – Group of pictures, frames, slices, macro-blocks and blocks; Elements of a video encoder and decoder; Video coding standards – MPEG and H.26X.

Video Segmentation- Temporal segmentation–shot boundary detection, hard-cutsand soft-cuts; spatial segmentation – motion-based; Video object detection and tracking.

Text/Reference Books:

1. R.C. Gonzalez and R.E. Woods, Digital Image Processing, Second Edition, Pearson Education 3rd edition 2008.

2. Anil Kumar Jain, Fundamentals of Digital Image Processing, Prentice Hall of India.2nd edition 2004.

3. Murat Tekalp , Digital Video Processing" Prentice Hall, 2nd edition 2015.

Course Outcomes:

At the end of the course, students will demonstrate the ability to:

1. Mathematically represent the various types of images and analyze them.

2. Process these images for the enhancement of certain properties or for optimized use of the resources.

3. Develop algorithms for image compression and coding

List of Practicals:

1. Write a MATLAB program for reading an image to MATLAB, display pixel operations, Flipping & Cropping.

2. Write a MATLAB program for Image Enhancement.

3. Write a MATLAB program for Image Compression.

4. Write a MATLAB program for Image Segmentation.

5. Write a MATLAB program for Image Morphology.

6. Write a MATLAB program for Image Restoration.

7. Write a MATLAB program for Edge Detection.

8. Write a MATLAB program for Blurring 8 bit color versus monochrome.

9. Write a MATLAB program for Object Recognition like Circles & Triangles.

10. Write a MATLAB program to perform Histogram Equalization operation on a given

11. Write a MATLAB program to perform Image Complement operation on a given Image.

12. Write a MATLAB program to perform Gamma correction operation on a given Image.

PEC-ECEL703-A	**Fibre Optic Communication**	**3L:0T:0P**	**3 credits**

Introduction-, Introduction, block diagram of optical fiber communication, advantages, disadvantages, and applications of optical fiber communication, Introduction to vector

nature of light, propagation of light in a cylindrical dielectric rod, Ray theory, optical fiber waveguides. Ray theory, propagation of light through optical fiber, Numerical aperture,

Basic Of Optical Fiber Communication- Fiber Materials, Different types of optical fibers, Modal analysis of a step index fiber, Signal degradation in optical fiber due to dispersion and attenuation, Absorption, scattering losses, Fabrication of fibers and measurement techniques like OTDR.

Optical Sources & Detector- LEDs and Lasers, Types of LED & Laser , Characteristics of Optical sources, Limitations, photo-detectors, Physical Principles of Photodiodes, Photo detector noise, Detector Response Time, Comparisons of Photo detectors. pin-diodes, APDs, detector responsivity, noise, optical receivers. Optical link design-BER calculation, quantum limit,

Optical Components- Introduction, fiber alignment and joint loss, single mode fiber joints, fiber splices, fiber connectors and fiber couplers.

Optical Amplifiers- Basic Applications and Types of Optical Amplifiers, Semiconductor Optical Amplifiers, Amplifier Noise, Optical SNR, System Applications, Wideband Optical Amplifiers, EDFA, Raman amplifier.

Wdm Concepts And Components

Operational Principles of WDM, Passive components: 2x2 Fiber Coupler, the 2x2 Waveguide

Coupler, star couplers, Mach-Zehnder interferometer multiplexers, tunable sources, tunable filters.

Text/Reference Books

1. J.Keiser, Fibre Optic communication, McGraw-Hill, 5 th Ed.2013 (Indian Edition).
2. T.Tamir, Integrated Optics, (Topics in Applied Physics Vol.7.), Springer-Verlag,1975.
3. J.Gowar, Optical communication systems, Prentice Hall India,1987.
4. S.E.Miller and A.G.Chynoweth, eds., Optical fibers telecommunications, Academic Press,1979.
5. G. Agarwal, Nonlinear fibre optics, Academic Press, 2 nd Ed.1994.
6. G. Agarwal, Fiber Optic Communication Systems, John Wiley and sons, New York, 1997.
7. F.C. Allard, Fiber Optics Handbook for engineers and scientists, McGraw Hill, New York

(1990).

Course Objectives:-

1] To understand basic elements of optical fiber communication link,

2] To know different kind of losses in optical fiber,

3] To design a fiber optic communication link and carry out power budget analysis

Course Outcomes:-

At the end of the course, the students will be able to

1] Estimate various losses in optical fiber,

2] Design fiber optic communication link,

3] Find out the necessity of optical amplifier.

PEC-ECEL703-B	**High Speed Electronics**	**3L:0T:0P**	**3 credits**

Introduction to High speed Electronics- Transmission line theory (basics) crosstalk and nonideal effects; signal integrity: impact of packages, vias, traces, connectors; non-ideal return current paths, high frequency power delivery, methodologies for design of high speed buses; radiated emissions and minimizing system noise; Noise Analysis: Sources, Noise Figure, Gain compression, Harmonic distortion, Intermodulation, Cross-modulation,

Dynamic range Devices: Passive and active, Lumped passive devices (models), Active (models, low vs high frequency)

RF Amplifier Design- RF Amplifier Design, Stability, Low Noise Amplifiers, Broadband Amplifiers (and Distributed) Power Amplifiers, Class A, B, AB and C, D E Integrated circuit realizations, Cross-over distortion Efficiency RF power output stages

Mixers –Up conversion Down conversion, Conversion gain and spurious response. Oscillators

Principles.PLL Transceiver architectures

Printed Circuit Board Anatomy- CAD tools for PCB design, Standard fabrication, Microvia Boards. Board Assembly: Surface Mount Technology, Through Hole Technology, Process Control and Design challenges.

Text/Reference Books:

1. Stephen H. Hall, Garrett W. Hall, James A. McCall "High-Speed Digital System Design: A Handbook of Interconnect Theory and Design Practices", August 2000, Wiley-IEEE Press

2. Thomas H. Lee, "The Design of CMOS Radio-Frequency Integrated Circuits", Cambridge University Press, 2004, ISBN 0521835399.

3. Behzad Razavi, "RF Microelectronics", Prentice-Hall 1998, ISBN 0-13 887571-5.

4. Guillermo Gonzalez, "Microwave Transistor Amplifiers", 2nd Edition, Prentice Hall.

5. Kai Chang, "RF and Microwave Wireless systems", Wiley.

6. R.G. Kaduskar and V.B.Baru, Electronic Product design, Wiley India, 2011

Course Outcomes:

At the end of the course, students will demonstrate the ability to:

1. Understand significance and the areas of application of high-speed electronics circuits.

2. Understand the properties of various components used in high speed electronics

3. Design High-speed electronic system using appropriate components.

OEC 704-A	Cyber Law and Ethics	2L:0T:2P	3 credits

Module 1-The Business Aspects of Penetration Testing, The Technical Foundations of Hacking, Foot printing and scanning Enumeration and Step - by-Step System Hacking, The Business Aspects of Penetration Testing, Automated Security Assessment Tools, Trojans and Backdoors, Sniffers Session Hijacking and Denial of Service Web Server Hacking Web application Vulnerabilities and Database Attacks

Module 2-Wireless Technologies, Security and Attacks IDS Honeypots and Firewalls Buffer

Overflow Cryptographic Attacks and Defenses Social Engineering and Physical Security

Module 3-Understanding Copy Right in Information Technology, Understanding the technology of Software, software copyright vs Patent debate, Authorship Assignment issues, Commissioned work, Work for hire Idea/Expression dichotomy, Copy right in internet, Legal Issues in internet and Software Copyright Jurisdiction Issues, Copyright Infringe Remedies of Infringement Multimedia, Copyright issues, Software Piracy, Patents understanding.

Module 4:-Cyber Crimes, Understanding Cyber Crimes in context of Internet, Indian Penal Law

& Cyber Crimes Fraud Hacking Mischief, International law, Obscenity and Pornography Internet, Potential of Obscenity Indian Law On Obscenity & Pornography Technical, Legal solutions International efforts Changes in Indian Laws, Ecommerce & Taxation, UNCITRAL model law of E,-Commerce, Indian Legal Position on E-Commerce IT Act 2000/Indian Evidence, Act/Draft law on E-Commerce.

Reference Books

1. Gray Hat Hacking: The Ethical Hackers Handbook by Allen Harper, Shon Harris,Cyber Laws by C.K punia, Sumit Enterprises

2. Cyber Crime and Law Enforcementt by V. D. Dudeja, Commonwealth Publishers

Objectives-

After learning the course the students should be able to:

1. Understand the core concepts of Defensive and Offensive Security.
2. Understanding of breaching the networks domains and systems.
3. Understanding the ethics of Hacking.
4. Limitations of Penetration Testing.
5. Cyber Crime Cases and IT act India and amendments.

List of Practicals-

1. Download the tool samspade and carry out a who is on any of the domains.

2. Using google hacks /dorks carry out any three information gathering exercises.

3. Using bing,find the shared hosting details for a domain.

4. Using net craft, identify the webserver / server associated with a domain of your choice.

5. Carry out an email header analysis on an email received (preferably from a non-Gmail email

D) and document the identified information.

6. Carry out information gathering using FOCA.

7. Using Wireshark, create a Filter to capture only FTP traffic

8. Using wireshark, identify the version of SSL protocol used (SSLv1, SSLv2, SSLv3, TLSv1, TLSv2, etc) in any HTTPS web portal of your choice. You may need to login to get this information.

9. Carry out a port scanning on an internal lab machine using nmap.

10. Carry out a Vulnerability Scanning using Nessus and assess the report.

OEC 704-B credits	**Computer Networks**	**2L:0T:2P**	**3**

Introduction And Physical Layer :
Uses of computer networks, Network Hardware, Network software, Reference Models, Example Networks. Theoretical basis for data communication, Guided Transmission media, Wireless Transmission, Communication Satellites, Public Switched telephone Networks, Mobile telephone system

Data Link Layer And Medium Access Control Sub Layer:
Data link layer design issues, Error detection and correction, Elementary data link protocols, Sliding Window protocols. The Channel Allocation problem, multiple access protocols, Ethernet, Wireless LANs, Broadband wireless, Bluetooth, Data link layer switching.

Network Layer And Transport Layer:
Network layer design issues, Routing algorithms, Quality of service, Inter-net working, Network layer in Inter-net. Transport service, Elements of transport protocols, simple transport protocol, and Inter-net transport protocols: UDP and TCP, Performance issues

Application Layer:
Domain name system (DNS), Electronic mail, multipurpose mail extensions (MIME), HTTP. SMTP (Simple mail transfer protocols).FTP. World-wide web (WWW), Multimedia.

Network Security:

Cryptography, Symmetric-key algorithms, Public key algorithms, Digital signatures, management of public keys, Communication security, Authentication protocols, E-mail security, Web security.

Mobile Ad-Hoc Network And Wierless Sensar Network:
Overview of wireless ad-hoc networks, routing in ad-hoc networks outing protocols of ad-hoc networks.Senser networks .unic constraints and challenges advantages.Senser network applications.

Text Book:
1. Andrew S. Tanenbaum, Computer Networks Prentice-Hall India.

Reference Books:
1] Willian Stalling, Data and Computer Communication, Prentice. Hall India.
2] Uyless Black, Computer Network, Prentice. Hall India.
3] V. Ahuja, Design and analysis of Computer Network, MGH.
4] Computer and communication networks by Nadir F.Mir by pearson education india
5] Ad-hoc mobile wireless network protocalls and system by C.K.TOH by persons
6] Wierless sensor networks by Feng ZHAO Leonidas GUIBAS by MORGAN KAOFMANN.

OBJECTIVES:
The student should be made to:
1] Understand the division of network functionalities into layers.
2] Be familiar with the components required to build different of network
3] Be exposed to the required function at each layer
4] Learn the flow control and congestion control algorithms

OUTCOMES:
At the end of the course, the students should be able to :
1] **I**dentify the components required to build different types of network
2] Choose the required functionality at each layer for given application identify solution for each
Function at each layer
3] Trace the fiow of information from one to another node in the network

List Of Practicals:

Computer Network Lab

1] Write C program to find shortest path between two or more nodes.

2] Write a program to determine shortest path using flyod‟s algorithm.

3] Using generator polynomial obtains CRC Code & hence calculates checksum for the code.

4] Write a C program to find the minimum spanning tree of a subset.

5] Write an program for the encryption and decryption of given data.

6] Write a program to simulate character stuffing and stuffing.

7] Write a program to simulate bit stuffing and stuffing.

ECP-I 705	**Project Work –I**	**0L:0T:10P**	**5 credits**

The object of Project Work I is to enable the student to take up investigative study in the broad field of Electronics & Communication Engineering, either fully theoretical/practical or involving both theoretical and practical work to be assigned by the Department on an individual basis or two/three students in a group, under the guidance of a Supervisor. This is expected to provide a good initiation for the student(s) in R&D work. The assignment to normally include:

1. Survey and study of published literature on the assigned topic;

2. Working out a preliminary Approach to the Problem relating to the assigned topic;

3. Conducting preliminary Analysis/Modeling/Simulation/ Experiment / Design / Feasibility;

4. Preparing a Written Report on the Study conducted for presentation to the Department; Final Seminar, as oral Presentation before a departmental committee.

Survey for Project Selection	5
Selection of Problem/ Project	5
Presentation for selection of project	5
Weekly Report for continued assessment 1	5
2	5
3	5
4	5
5	5
Final Presentation for Project 6	5
	30 HOD
	30 Guide
Weightage	**Oral 100 Marks by HOD/Professor of institute**
	TW of 50 Marks by Internal Guide

MC706	**Industrial Internship (At start of sementer VII)**	**0L:0T:0P**	**0 credits**

Every Student has to undergo 4 weeks industrial training after completion of Sixth Semester Examination, Performance of training will be assessed in the 7 th semester. He has to submit continuous assessment and report of training to the Department and work should be represented in presentation before the Head of Department and faculties and students.

HSMC-707	**Interview Techniques and Mock Exercises**	**0L:0T:2P**	**1 credits**

Pre interview preparation: Know yourself Interview as selection process Types of interview Competency based interview technique

Interview Process: Interview Process Candidate philosophy, reason for selecting and rejecting candidate, most common Mistakes during interview, Questions not to be asked in interview, Dress code for interview, Preparing FAQ s in the interview Aptitude Test Psychometric Test

Group Discussion: Meaning of GD - Why group discussion? - Characters tested in a GD- Tips on GD - Types of GD - Skills required in a GD - Consequences of GD - Behaviour in a GD - Essential elements of GD - Different characters in GD - Traits tested in a GD - GD etiquette - Areas to be concentrated while preparing for a GD - Initiating a GD - Techniques to initiate a GD - Non-verbal communication in GD - Movement and gestures to be avoided in a GD - Topics for GD.

Etiquettes and Manners: Etiquette Introduction - Modern etiquette - Benefits of etiquette - Classification of etiquette - Accompanying women - Taboo topics - Proposing the toast. Manners Introduction - Poor manners noticed in youth - Why should you practice good manners? - Practicing good manners - Manners at the wheel: Driving - Manners in the flight - Respecting the sacred : Visiting holy places - Dealing with the challenged - Attending funeral - Professional manners - Social skills (manners) - Getting along with people - Manners to get respect from others ,

Corporate grooming tips - Mind your mobile manners - Annoying office habits. Exercise 1 : Test your etiquette Exercise 2 : Test your manners

Preparing Resume: Difference among Bio-data, CV and Resume - The terms - The purpose of CV writing - Types of resumes - Interesting facts about resume, CV / Resume Perpetration tips, Entry level Resume,

Exercise: Finding Pattern of aptitude test of different MNC's and Preparation of the same**.**3 Question papers solving each on aptitude and Technical Competency**,** Video shooting of Mock interview of individual student and identification of common mistakes committed by him.

Reference:

1. How to Win interview – Tushar Kokane – Educreation Publications New Delhi
2. Soft Skills – Know yourself and Know your world by Dr.K.Alex – S.Chand and Publications, New Delhi

PEC-ECEL801-A	Satellite Communication	3L:0T:0P	3 credits

Introduction to Satellite Communication: Principles and architecture of satellite Communication, Brief history of Satellite systems, advantages, disadvantages, applications and frequency bands used for satellite communication.

Orbital Mechanics: Orbital equations, Kepler's laws, Apogee and Perigee for an elliptical orbit, evaluation of velocity, orbital period, angular velocity etc. of a satellite, concepts of Solar day and Sidereal day.

Satellite sub-systems: Study of Architecture and Roles of various sub-systems of a satellite system such as Telemetry, tracking, command and monitoring (TTC & M), Attitude and orbit control system (AOCS), Communication sub-system, power sub-systems etc.

Phenomena in Satellite Communication: Solar Eclipse on satellite, its effects, remedies for Eclipse, Sun Transit Outage phenomena, its effects and remedies, Doppler frequency shift phenomena and expression for Doppler shift.

Propagation Impairments And Space Link:

Introduction, atmospheric loss, ionospheric effects, rain attenuation, other impairments.

SPACE LINK: Introduction, EIRP, transmission losses, link power budget, system noise, CNR, uplink, down link, effects of rain, combined CNR

Modulation and Multiple Access Schemes: Various modulation schemes used in satellite communication, Meaning of Multiple Access, Multiple access schemes based on time, frequency, and code sharing namely TDMA, FDMA and CDMA.

Text /Reference Books:

1. Timothy Pratt Charles W. Bostian, Jeremy E. Allnutt: Satellite Communications: Wiley India. 2nd edition 2002

2. Tri T. Ha: Digital Satellite Communications: Tata McGraw Hill, 2009

3. Dennis Roddy: Satellite Communication: 4th Edition, McGraw Hill,2009

Course outcomes-

At the end of this course students will demonstrate the ability to

1. Visualize the architecture of satellite systems as a means of high speed, high range communication system.
2. State various aspects related to satellite systems such as orbital equations, sub-systems in a satellite, link budget, modulation and multiple access schemes.
3. Solve numerical problems related to orbital motion and design of link budget for the given parameters and conditions.

PEC-ECEL801-B	**Consumer Electronics**	**3L:0T:0P**	**3 credits**

Communication devices- Mobile handsets, Android technology, 2G, 3G Mobiles, i-phone, EPABX

Mass Communication devices-Color Television, Antenna, HDTV, LCD TV,LED TV, 3D Technology In TV, Interactive TV, DTHTV, Plasma TV, Video Conferencing, FAX Machine, PA System, Dolby Digital Systems, Gesture Technology In TV.

Household e1cctronics devices- Washing Machine, Microwave Oven, Types Applications, Electronics Weighing Balance, Air Conditioner, Vacuum Cleaner.

Printing and recording devices- LASER printer, Inkjet Printers, Photocopiers, Scanner, DVD/CD Player, Blue ray DVD Player.

Special purpose machines- Electronic Voting Machine, CFL, LED Lamps, Application and Advantages. Solar lamp, Water Purifier, Electronic Calculator, DVD Player, ATM Security devices Biometric attendance Monitoring System, Working, Biometric Sensors, Home Automation System.

Compliance- Product safety and liability issues, standards related to electrical safety and standards related to fire hazards, e.g., UL and VDE. EM1/EMC requirements and design techniques for

compliance, e.g. ESD, RF interference and immunity, line current harmonics and mains voltage surge.

Text/Reference Books-

1. Television &Video Engineering-A. M. Dhake, TMH Publication.

2. Monochrome and Color TV - R. R. Gulati, Wiley Eastern publication.

3. Video demystified -Keith Jack, PI publication

4. Audio &Video Systems-R.G.Gupta

5. Audio and Video system - Principles, maintenance and Troubleshooting by R. Gupta

6. Arora C. P., "Refrigeration and Air conditioning", Tata McGraw-Hill, New Delhi, 1994

7. Color TV Theory &Practice -S. P. Bali. TMG Hill Publication.

8. Basic TV &Video Systems-Bernard Grobb.

9. Electronic Communication Systems, Kennedy, TMH.

10. Principles of Communication Engineering- Anokh Singh-TMH.

11. C. M. Wintzer, International Commercial EMC Standards, Interference Control Techno1ologies 1988

Course Objectives:

To acquaint students with the practical knowledge of designing and developing consumer electronic systems and products and introduce the latest trends and technologies.

Course Outcomes:

Students will be able to:

1. List technical specification of electronics Audio system (microphone and speaker)
2. Trouble shoots consumer electronics products like TV, washing machine and AC.
3. Identify and explain working of various color TV transmission blocks.
4. Adjust various controls of color TV receiver and troubleshoot it.
5. Use various functions of Cam coder and shoot a video and take snapshots and save them

in appropriate format.

PEC-ECEL802-A	Mechatronics	3L:0T:0P	3 credits

Introduction to Sensors & Actuators

Introduction to Mechatronics, Measurement characteristics: -Static and Dynamic Sensors: Position Sensors: -Potentiometer, LVDT, Encoders; Proximity sensors:-Optical, Inductive,

Capacitive; Motion Sensors:-Variable Reluctance; Temperature Sensor: RTD, Thermocouples; Force / Pressure Sensors:-Strain gauges; Flow sensors: -Electromagnetic Actuators: Stepper motor, Servo motor, Solenoids**.**

Block Diagram Representation

Open and Closed loop control system, identification of key elements of mechatronics systems and represent into block diagram (Electro-Mechanical Systems), Concept of transfer function, Block diagram reduction principles, Applications of mechatronics systems:-Household, Automotive, Shop floor (industrial).

Data Acquisition & Microcontroller System

Interfacing of Sensors / Actuators to DAQ system, Bit width, Sampling theorem, Aliasing, Sample and hold circuit, Sampling frequency, ADC (Successive Approximation), DAC (R-2R), Current and Voltage Amplifier.

PLC

Programming Introduction, Architecture, Ladder Logic programming for different types of logic gates, Latching, Timers, Counter, Practical Examples of Ladder Programming, and Introduction to SCADA system.

Modelling and Analysis of Mechatronics System

System modelling (Mechanical, Thermal and Fluid), Stability Analysis via identification of poles and zeros, Time Domain Analysis of System and estimation of Transient characteristics: % Overshoot, damping factor, damping frequency, Rise time, Frequency Domain Analysis of System and Estimation of frequency domain parameters such as Natural Frequency, Damping Frequency and Damping Factor.

Control System

P, I and D control actions, P, PI, PD and PID control systems, Transient response:- Percentage overshoot, Rise time, Delay time, Steady state error, PID tuning (manual).

Text /Reference Books:

1. K.P. Ramchandran, G.K. Vijyaraghavan, M.S. Balasundaram, Mechatronics: Integrated Mechanical Electronic Systems, Willey Publication, 2008

2. Bolton, Mechatronics -A Multidisciplinary approach, 4th Edition, Prentice Hall, 2009.

3. Alciatore & Histand, Introduction to Mechatronics and Measurement system, 4thEdition,

McGraw Hill publication, 2011.

4. Bishop (Editor), Mechatronics –An Introduction, CRC Press, 2006.

5. Mahalik, Mechatronics –Principles, concepts and applications, Tata Mc - Graw Hill publication, New Delhi.

Course Objectives:

1. Understand key elements of Mechatronics system, representation into block diagram.
2. Understand concept of transfer function, reduction and analysis.
3. Understand principles of sensors, its characteristics, interfacing with DAQ
4. Microcontroller
5. Understand the concept of PLC system and its ladder programming, and significance of
6. PLC systems in industrial application.
7. Understand the system modelling and analysis in time domain and frequency domain.
8. Understand control actions such as Proportional, derivative and integral and study its
9. significance in industrial applications.

Course Outcomes:

1. Identification of key elements of mechatronics system and its representation in terms of block diagram.

2. Understanding the concept of signal processing and use of interfacing systems such as ADC, DAC, digital I/O.

3. Interfacing of Sensors, Actuators using appropriate DAQ micro-controller.

4. Time and Frequency domain analysis of system model (for control application).

5. PID control implementation on real time systems.

6. Development of PLC ladder programming and implementation of real life system.

PEC-ECEL802-B	Mobile Computing	3L:0T:0P	3 credits

Mobile Computing- Mobile Computing vs. wireless Networking, Mobile Computing Applications, Characteristics of Mobile computing, Structure of Mobile Computing Application.

MAC Protocols- MAC Protocols, Wireless MAC Issues, Fixed Assignment Schemes, Random Assignment Schemes, Reservation Based Schemes.

Mobile IP- Overview of Mobile IP, Features of Mobile IP, Key Mechanism in Mobile IP, route
Optimization. Overview of TCP/IP, Architecture of TCP/IP- Adaptation of TCP Window, Improvement in TCP Performance.

Communication- Global System for Mobile Communication (GSM), General Packet Radio Service (GPRS), Universal Mobile Telecommunication System (UMTS).

Ad-Hoc Basic Concepts- Characteristics , Applications , Design Issues , Routing , Essential
of Traditional Routing Protocols ,Popular Routing Protocols , Vehicular Ad Hoc networks (VANET) , MANET vs. VANET , Security.

Text /Reference Books:

1. Principles of Mobile Computing, 2nd Edition, Uwe Hansmann, Lothar Merk, Martin Nicklous, Thomas Stober, Springer
2. Mobile Computing, Tomasz Imielinski, Springer.

Course Objectives:

1. To provide guidelines, design principles and experience in developing applications for
2. small, mobile devices, including an appreciation of context and location aware services.
3. To introduce wireless communication and networking principles, that support

4. connectivity to cellular networks, wireless internet and sensor devices.
5. To appreciate the social and ethical issues of mobile computing, including privacy.

Course Outcomes:

1. At the end of the course, the student will be able to demonstrate:

2. A working understanding of the characteristics and limitations of mobile hardware devices including their user-interface modalities

3. The ability to develop applications that are mobile-device specific and demonstrate current practice in mobile computing contexts

4. A comprehension and appreciation of the design and development of context-aware solutions for mobile devices.

5. An awareness of professional and ethical issues, in particular those relating to security and privacy of user data and user behavior.

OEC 803-A	**Artificial Intelligence Deep Learning**	**3L:0T:0P**	**3 credits**

Introduction:

What Is AI? Thinking humanly: The cognitive modeling approach. Thinking rationally: The "laws of thought" approach, Acting rationally: The rational agent approach. The Foundations of Artificial Intelligence, Mathematics, Economics, Neuroscience, Computer engineering, The History of Artificial Intelligence. AI becomes an industry (1980--present). Agents and Environments, Good Behaviour: The Concept of Rationality. The Nature of Environments. The Structure of Agents.

Search Techniques:

Problem-Solving Agents, Well-defined problems and solutions, Formulating problems, Realworld problems. Uninformed Search Strategies, Breadth-first search, Uniform-cost search, Depth-first search, Depth-limited search, Iterative deepening depth-first search, Bidirectional search, Informed (Heuristic) Search Strategies, Greedy best-first search, A* search: Minimizing the total estimated solution cost, Heuristic Functions. The effect of heuristic accuracy on performance. Beyon Classical Search, Local Search Algorithms and Optimization Problems, Local Search in Continuous Spaces

Game Playing:

Games, Optimal Decisions in Games, The minimax algorithm, Optimal decisions in multiplayer games, Alpha Beta Pruning, Move ordering, Imperfect Real-Time Decisions, Cutting off search, Forward pruning, Stochastic Games, Evaluation functions for games of chance, Partially Observable Games, Krieg spiel: Partially observable chess, Card games, State-of-the-Art Game Programs, Alternative Approaches

Logic and inference:

Defining Constraint Satisfaction Problems, Constraint Propagation: Inference in CSPs, Backtracking Search for CSPs, Local Search for CSPs, The Structure of Problems, Knowledge-Based Agents, The Wumpus World, Logic , Propositional Logic: A Very Simple Logic, Propositional Theorem Proving, Effective Propositional Model Checking, Agents Based on Propositional Logic. Forward Chaining, Backward Chaining, Definition of Classical Planning. Algorithms for Planning as State-Space Search, Planning Graphs.

Learning:

Forms of Learning, Supervised Learning, Learning Decision Trees, Evaluating and Choosing the Best Hypothesis, Model selection: Complexity versus goodness of fit, From error rates to loss, Regularization, The Theory of Learning, Regression and Classification with Linear Models, Artificial Neural Networks, Nonparametric Models, Ensemble Learning, Online Learning, Practical Machine Learning, A Logical Formulation of Learning. Knowledge in Learning. Explanation-Based Learning, Learning Using Relevance Information. Inductive Logic Programming. Statistical Learning. Learning with Complete Data. Learning with Hidden Variables: The EM Algorithm.

Text /Reference Books:

1. Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach. III Edition

2. E. Rich, K. Knight & S. B. Nair - Artificial Intelligence, 3/e, McGraw Hill.

3. Dan W. Patterson, Introduction to Artificial Intelligence and Expert Systems, Prentice Hal of India.

4. G. Luger, “Artificial Intelligence: Structures and Strategies for complex problem

Solving", Fourth Edition, Pearson Education, 2002.

5. N.P. Padhy "Artificial Intelligence and Intelligent Systems" , Oxford UniversityPress2015.

Course Objectives:

1. Apply AI techniques to solve the given problems.
2. Implement trivial AI techniques on relatively large system
3. Explain uncertainty and Problem solving techniques.
4. Compare various learning techniques.

Course Outcomes:

This course will enable students to

1. Identify the AI based problems.
2. Apply techniques to solve the AI problems.
3. Define learning and explain various logic inferences.
4. Discuss different learning techniques.

OEC 803-B	**Internet of Things**	**3L:0T:0P**	**3 credits**

Internet in general and Internet of Things:

Layers, protocols, packets, services, performance parameters of a packet network as well as Applications such as web, Peer-to-peer, sensor networks, and multimedia.

IoT System:

IoT definitions, Overview, applications, potential & challenges, and architecture. Logical design using python: Introduction, installing python, data types & data structure, numbers, strings, list, tuples, dictionaries, type conversions.

Conditional statements & loops in Python:

Understanding conditional statements, Break statements & continue, pass statements using indentations for defining IF & else block, , while, for loops in python, function, arguments, file handling, date/time operations, classes.

Graphical User Interface in python: -

GUI Basics, Tkinter widgets Button, Check button frame, label, label frame, Radio button, scrollbar, Progress bar,Python packages of internet for IoT

IOT Physical devices:

What is an IOT device building blocks of an IOT device, Raspberry Pi as exemplary device about the board, Raspberry Pi interface serial, SPI, I2C Other IOT device, PC Duino, Beaglebone, black Cubiboard ,Programming Raspberry Pi with Python.

IoT examples:

Case studies, e.g. sensor body-area-network and control of a smart home, smart cities, Agriculture.

Text/Reference Books

1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos,

David Boyle, “From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence”, 1st Edition, Academic Press, 2014.

2. Vijay Madisetti and Arshdeep Bahga, “Internet of Things (A Hands-on-Approach)”, 1st Edition, VPT, 2014.

3. Francis daCosta, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, 1st Edition, Apress Publications, 2013.

4. Mark Lutz,”Learning Python”Fifth edition,SPD,April 2016

Course Objectives:

1] Vision and Introduction to IoT.

2] Understand IoT Market perspective.

3] Data and Knowledge Management and use of Devices in IoT Technology.

4] Understand State of the Art – IoT Architecture.

5] Real World IoT Design Constraints, Industrial Automation and Commercial Building Automation in IoT.

Course Outcomes:

After successfully completing the course students will be able to

1] Explain in a concise manner how the general Internet as well as Internet of Things work.

2] Understand programming using python and raspberry PI .

3] Use basic measurement tools to determine the real-time performance of packet based Networks.

4] Analyze trade-offs in interconnected wireless embedded sensor networks.

5] Application of IoT in Industrial and Commercial Building Automation and Real World Design

Constraints.

6] To study different hardware physical devices like Beagle bone, Black cubiboard.

OEC 804-A	**Digital VLSI Design**	**3L:0T:0P**	**3credits**

Introduction

Historical perspective, issues in digital design, trends in design. Devices:MOS transistor, static behavior,dynamic behavior, secondary effects, CMOS technology, attributes, layouts, design rules, MOS as a switch, transmission gate.

Inverter Analysis

Definition and properties, area and complexity, functionality– static behavior, performance – dynamic behavior, power, static CMOS inverter analysis, regions of operation, noise margin, bipolar /ECL inverter.

Static Cmos Design

CMOS Logic, ratioed logic, Pseudo NMOS, depletion load CMOS circuit design, pass transistor logic, transmission gate logic, transistor sizing, low power CMOS design, switching activity in a logic gate, glithing, short circuit currents, analyzing power consumption.

Dynamic Cmos Design

Dynamic CMOS Design: Dynamic logic – basic principles, domino logic, NP-CMOS logic, DCVSLLogic

Cmos Sequential Cir Cuit Design

Bistability, flip-flop classification, CMOS static flip-flops, master- slave and edge triggered flip-flops,dynamic sequential circuits – pseudostatic latch, dynamic two phase flip-flop, C2MOS latch, NORA CMOS, Schmitt trigger.

Datapath Design

The Adder – CMOS implementations of ripple carry adder, mirror adder, carry save adder, carry look ahead adder, tradeoffs, multiplier array, Booths, Wallace tree multiplier design, shifters – barrel Shifter, logarithmic shifters. Memory Design Classification, trends, RAM design – static RAM design, dynamic RAM (DRAM), ROM design – Nand-based, Nor-based ROM, programmable logic Array

Text Book:

1. Jan Rabey, Digital IC Design, Prentice Hall, ISBN 0-13-178609-1.

2. Weste–Eshragian, Principles of CMOS VLSI design, Addison-Wesley

Reference Books:

1. Hodges and Jackson, Analysis and design of Digital Ics, Mc-Graw Hill International edition, 1996.

2. Morris Mano, Computer architecture.

3. Wayne Wolf, Modern VLSI design.

Course Objectives:-

1] To understand fundamental steps in digital VLSI design.
2] To learn various techniques of CMOS design.
3] To study the data path design.

Course Outcomes:

1]Model digital circuit with, simulate, synthesis in Microwind.
2] Understand chip level issues and need of testability.
3]Design digital CMOS circuits for specified applications.

OEC 804-B	**Mobile App Development**	**3L:0T:0P**	**credits 3**

Module 1:- Introduction-About Android, Smartphones future, preparing the Environment, Installing the SDK, Creating Android Emulator, Installing Eclipse,

Installing Android Development Tools, Choosing which Android version to use. Hello Sheep- Creating a project, working with the AndroidManifest.xml, Using the log system, Activities

Module 2:- UI Architecture-Application context, Intents, Activity life cycle, Supporting multiple screen sizes, User Interface Widgets- Text controls, Button controls, Toggle buttons, Images Notification and Toast- Parameters on Intents, Pending intents, Status bar notifications, Toast notifications.

Module 3:- Menus-Localization, Options menu, Context menu, Dialogs- Alert dialog, Custom dialog, Dialog as Activity, Lists-Using string arrays , Creating lists, Custom lists, Location and Maps-Google maps, Using GPS to find current location.

Module 4:-Working with data Storage-Shared preferences, Preferences activity, Files access, SQLite database, Animation-View animation, Draw able animation, Content Providers- Content provider introduction, Query providers, Network Communication-Web Services, HTTP Client, XML and JSON, Services-Service lifecycle, Foreground service, Publishing Your App- Preparing for publishing, Signing and preparing the graphics, Publishing to the Android Market.

References-

1. Bill Phillips, Chris Stewart, Brian Hardy, and Kristin Marsicano.
2. Android Programming: The Big Nerd Ranch Guide, Big Nerd Ranch LLC, 2nd edition, 2015.
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4. Valentino Lee, Heather Schneider, and Robbie Schell, Mobile Applications: Architecture, Design and Development, Prentice Hall, 2004.
5. Tomasz Nurkiewicz and Ben Christensen, Reactive Programming with xJava, O'Reilly Media,2016.
6. Raoul-Gabriel Urma, Mario Fusco, and Alan Mycroft, Java8inAction:Lambdas,Streams, and Functional-Style Programming, Manning Publications, 2015.
7. Benjamin J. Evans and Martijn Verburg, the Well-Grounded Java Developer: Vital Techniques of Java 7 and Polyglot Programming, Manning Publications, 2013.
8. Brian Fling, Mobile Design and Development, O'Reilly Media, Inc., 2009.

9. Maximiliano Firtman, Programming the Mobile Web, O'Reilly Media, Inc., 2nd ed., 2013.

10. Cristian Crumlish and Erin Malone, Designing Social Interfaces, 2nd ed., O'Reilly Media, Inc.,2014.

11. Suzanne Ginsburg, Designing the iPhone User Experience: A User-Centered Approach to Sketching and Prototyping iPhone Apps, Addison-Wesley Professional, 2010.

12. Benjamin Muschko, Gradle in Action, Manning Publications, 2014.

13. Craig Larman, Applying UML and Patterns: A Guide to Object- Oriented Analysis and Design and Iterative Development, 3rd ed., Prentice Hall, 2004.

Objectives-

1. Be exposed to technology and business trends impacting mobile applications
2. Be competent with the characterization and architecture of mobile applications.
3. Be competent with understanding enterprise scale requirements of mobile applications.
4. Be competent with designing and developing mobile applications using one application development framework.

HSMC805	**Entrepreneurship Development**	**0L:0T:2P**	**1 Credits**

Unit 1 Entrepreneurship, Creativity & Opportunities

Concept, Classification & Characteristics and qualities of Entrepreneur

Creativity and Risk taking.

Concept of Creativity & Qualities of Creative person.

Risk Situation, Types of risk & risk takers.

Business Reforms.

Process of Liberalization.

Reform Policies.

Impact of Liberalization.

Emerging high growth areas.

Business Idea Methods and techniques to generate business idea.

Transforming Ideas in to opportunities transformation involves Assessmentof idea &Feasibility of opportunity

SWOT Analysis

Unit 2 Information and Support Systems

Information Needed and Their Sources.

Information related to project, Information related to support system, Information related to procedures and formalities

Support Systems

1) Small Scale Business Planning, Requirements.
2) Govt. & Institutional Agencies, Formalities
3) Statutory Requirements and Agencies.

Unit 3 Market Assessment

Marketing -Concept and Importance

Market Identification, Survey Key components

Market Assessment

Unit 4 Business Finance & Accounts

Business Finance

Cost of Project

1) Sources of Finance
2) Assessment of working capital
3) Product costing
4) Profitability
5) Break Even Analysis
6) Financial Ratios and Significance

Business Account

Accounting Principles, Methodology

1) Book Keeping
2) Financial Statements
3) Concept of Audit,

Unit 5 : Business Plan & Project Report

Business plan steps involved from concept to commissioning Activity Recourses,Time,Cost

Project Report

1) Meaning and Importance
2) Components of project report/profile **(Give list)**

Project Appraisal

1) Meaning and definition
2) Technical, Economic feasibility

3) Cost benefit Analysis

3) Cost benefit Analysis

Unit 6 Enterprise Management and Modern Trends

Enterprise Management: -

1) Essential roles of Entrepreneur in managing enterprise
2) Product Cycle: Concept and Importance
3) Probable Causes of Sickness
4) Quality Assurance Importance of Quality, Importance of testing

E-CommerceConcept and process

Global Entrepreneur

ECP-II 806	Project Work II & Dissertation	0L:0T:18P	9 Credits

The object of Project Work II & Dissertation is to enable the student to extend further the investigative study taken up under EC P1, either fully theoretical/practical or involving both theoretical and practical work, under the guidance of a Supervisor from the Department alone or jointly with a Supervisor drawn from R & D laboratory/Industry. This is expected to provide a good training for the student(s) in R & D work and technical leadership. The assignment to normally include:

1. In depth study of the topic assigned in the light of the Report prepared under EC P1;
2. Review and finalization of the Approach to the Problem relating to the assigned topic;
3. Preparing an Action Plan for conducting the investigation, including team work;
4. Detailed Analysis/Modeling/Simulation/Design/Problem Solving/Experiment as needed;
5. Final development of product/process, testing, results, conclusions and future directions;
6. Preparing a paper for Conference presentation/Publication in Journals, if possible;
7. Preparing a Dissertation in the standard format for being evaluated by the Department.
8. Final Seminar Presentation before a Departmental Committee

Survey for Project Selection		5
Selection of Problem/ Project		5
Presentation for selection of project		5
Weekly Report for continued assessment	**1**	5
	2	5
	3	5
	4	5
	5	5
Final Presentation for Project	**6**	5
		30 HOD
		30 Guide
Weightage		**Oral 100 Marks by HOD/Professor of institute**
		TW of 50 Marks by Internal Guide