WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR
(AN AUTONOMOUS INSTITUTE)

Affiliated to
Punyashlok Ahilyadevi Holkar Solapur University,
Solapur

CHOICE BASED CREDIT SYSTEM (CBCS)

Structure and Syllabus
for
T. Y. B.Tech. Electronics & Telecommunication Engineering

W.E.F. 2023-24

Electronics and Telecommunication Engineering Department

Department Vision

To be a distinguished center for nurturing the holistic development of competent young engineers in the electronics and allied field.

Department Mission

1. To inculcate and stimulate Electronics & allied Engineering proficiency amongst students through quality education and innovative educational practices.
2. To create engineering professionals with social consciousness.
3. To foster technical skills of students through creativity and critical thinking.
4. To enhance soft skill set of students which is crucial for career success through effectual training.

Electronics and Telecommunication Engineering
Under Graduate Program
Program Educational Objectives (PEOs)

1. Graduates will exhibit strong fundamental knowledge and technical skills in Electronics and Telecommunication Engineering and allied fields.

2. Graduates will manifest technological progression, hardware & software skills to fabricate sustainable, energy efficient and futuristic solutions to pursue successful professional careers in multidisciplinary fields.

3. Graduates will demonstrate professional ethics, effective communication, teamwork, leadership qualities and ability to relate engineering issues to broader social context along with lifelong learning.

Program Outcomes (POs)

The program outcomes of B. Tech. E&TC Engineering Program are summarized as following:

1. **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem Analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
3. **Design/Development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct Investigations of Complex Problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. **The Engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities, relevant to the professional engineering practice.
7. **Environment and Sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project Management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long Learning:** Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

Program Specific Outcomes (PSOs)

Engineering graduate in Electronics and Telecommunication Engineering Programme will be able to do-

1. Graduates will be able to attain a solid foundation in Electronics and Telecommunication Engineering with an ability to function in multidisciplinary environment.
2. Graduates will be able to use techniques and skills to design, analyze, synthesize, and simulate Electronics and Telecommunication Engineering components and systems.
3. Graduate will be capable of developing programs in Assembly, High level and HDL languages using contemporary tools for software development.

Legends used–

L	Lecture Hours / week
T	Tutorial Hours / week
P	Practical Hours / week
FA	Formative Assessment
SA	Summative Assessment
ESE	End Semester Examination
ISE	In Semester Evaluation
ICA	Internal Continuous Assessment
POE	Practical and Oral Exam
OE	Oral Exam
MOOC	Massive Open Online Course
HSS	Humanity and Social Science
NPTEL	National Programme on Technology Enhanced Learning
F.Y.	First Year
S.Y.	Second Year
T.Y.	Third Year
B.Tech.	Bachelor of Technology

Course Code Format:

2	1	E	T	U/P	2	C	C	1	T / L
Batch Entry Year		Program Code		U-Under Graduate, P-Post Graduate	Semester No. / Year 1/2/3/…8	Course Type		Course Serial No. 1-9	T-Theory, L-Lab session A-Tutorial P-Programming/ Design / Drawing / Tools

Program Code ET	Electronics and Telecommunication Engineering
Course Type	
BS	Basic Science
ES	Engineering Science
HU	Humanities & Social Science
MC	Mandatory Course
CC	Core Compulsory Course
SN*	Self-Learning **N*** *indicates the serial number of electives offered in the respective category*
EN*	Core Elective **N*** *indicates the serial number of electives offered in the respective category*
SK	Skill Based Course
SM	Seminar
MP	Mini project
PR	Project
IN	Internship

Sample Course Code:

21ETU1BS1T	Engineering Physics (Group A)

Walchand Institute of Technology, Solapur

Structure of T. Y. B. Tech. Electronics and Telecommunication Engineering,
(W. E.F. 2023-2024)

Semester- V

Course Code	Name of Course	Engagement Hours			Credits	FA		SA		Total
		L	T	P		ESE		ISE	ICA	
21ETU5CC1T	Electromagnetic Field Theory	3		-	3	60		40		100
21ETU5CC1A	Electromagnetic Field Theory Tutorial		1	-	1				25	25
21ETU5CC2T	Principles of Digital Communication	3	-	-	3	60		40	-	100
21ETU5CC3T	Microcontrollers and Applications	3	-	-	3	60		40	-	100
21ETU5CC4T	Digital Signal Processing	3	-	-	3	60		40	-	100
21ETU5S**N*5**T	Self-Learning I - Humanities and Social Science	-	-	-	2	50		-		50
21ETU5CC6P	Programming with Java	2	-	-	2	-		25	-	25
	Total	**14**	**1**	**-**	**17**	**290**		**185**	**25**	**500**
	Laboratory:					**POE**	**OE**			
21ETU5CC2L	Principles of Digital Communication	-	-	2	1	25			25	50
21ETU5CC3L	Microcontrollers and Applications	-	-	2	1	25	-		25	50
21ETU5CC4L	Digital Signal Processing	-	-	2	1	-	-		25	25
21ETU5CC6P	Programming with Java	-	-	2	1	50	-		25	75
21ETU5IN7L	Internship I	_	_	_	2	_	--		50	50
	Total	**-**	**-**	**8**	**6**	**100**		**-**	**150**	**250**
	Grand Total	**14**	**1**	**8**	**23**	**390**		**185**	**175**	**750**

- **N*** *indicates the serial number of electives offered in the respective category*

Note: Internship I - Four weeks of the internship can be completed by students from Semester I up to the end of Semester V, the report of which will be assessed in Semester V. Students can complete two separate internships of two weeks each or one internship of four weeks. The internship can be done in the form of an Industrial Internship / Vocational Training/ MOOC course / Industry offered Certification course / Workshop/ other activity as specified by the department.

Walchand Institute of Technology, Solapur

Structure of T. Y. B. Tech. Electronics and Telecommunication Engineering,
(W. E.F. 2023-2024)

Semester –VI

Course Code	Name of Course	Engagement Hours			Credits	FA		SA		Total
		L	T	P		ESE		ISE	ICA	
21ETU6CC1T	Embedded System Design	4	-	-	4	60		40	-	100
21ETU6CC2T	Database Management System	3	-	-	3	60		40	-	100
21ETU6CC3T	Project Management and Operation Research	3		-	3	60		40		100
21ETU6CC3A	Project Management and Operation Research Tut		1	-	1				25	25
21ETU6E**N*** 4T	Core Elective –I	3	-	-	3	60		40		100
21ETU6CC5P	Open Source Technology	2	-	-	2	-		25	-	25
	Total	**15**	**1**	**-**	**16**	**240**		**185**	**25**	**450**
	Laboratory:					**POE**	**OE**			
21ETU6CC1L	Embedded System Design	-	-	2	1	50#	-		25	75
21ETU6CC2L	Database Management System	-	-	2	1	25	-		25	50
21ETU6E**N*** 4L	Core Elective –I	-	-	2	1	-	-		25	25
21ETU6CC5P	Open Source Technology	-	-	2	1	50	-		25	75
21ETU6MP6L	Mini Project	-	-	2	1				25	25
21ETU6IN7L	Internship II	_	_	_	-	_	--		-	
	Total		**_**	**10**	**5**	**125**		**_**	**125**	**250**
	Grand Total	**15**	**1**	**10**	**21**	**365**		**185**	**150**	**700**

- **N*** *indicates the serial number of electives offered in the respective category*
- **#** The Practical oral exam of the Mini Project will be included in the Practical oral exam of the Embedded System Design

Note:

1. Internal Continuous Assessment (ICA): ICA shall be a continuous process based on the performance of the student in assignments, class tests, quizzes, attendance and interaction during theory and lab sessions, journal writing, report presentation etc., as applicable.
2. The batch size for the practical/tutorial will be of 20 students. On forming the batches, if the number of remaining students exceeds 9 students, then a new batch be formed.

3. Hardware Mini Project will be carried out under the course Sensor Protocols and Applications and Project group shall not be of more than **three** students.
5. Internship II - Four weeks of the internship can be completed by students from after the completion of Semester V up to the end of Semester VII, the report of which will be assessed at Semester VII. Students can complete two separate internships of two weeks each or one internship of four weeks. The internship can be done in the form of an Industrial Internship / Vocational Training/ MOOC course / Industry offered Certification course / Workshop / other activity as specified by the department.
6. Student shall select one Self Learning course on Humanities and Social Sciences (HSS) at T.Y. Part I i.e. at Semester V. Curriculum for Humanities and Social Sciences, Self-Learning (HSS) is common for all under graduate engineering programs. Student have a choice to either select a Self-Learning (HSS) from the following Course List and appear for examination of the Institute.

21ETU5SN*5T Self Learning I – HSS List

Course Code	Course title
21ETU5S16T	Economics
21ETU5S26T	Intellectual Property Rights for Technology Development and Management
21ETU5S36T	Introduction to Sociology
21ETU5S46T	Stress and Coping
21ETU5S56T	Professional Ethics & Human Value

OR

The list of approved NPTEL/Online courses/Industry MOOC of minimum eight weeks duration for 'Self Learning (HSS)' shall be announced by the BOS chairman at the commencement of Semester V. Students shall register and complete one of the courses from approved lists successfully and submit the passing certificate to the department.

7. List of Core Elective - I at T.Y. B. Tech. E&TC Engineering, part II, Semester VI

21ETU6EN*4T Core Elective – I

List of Core Electives – I offered to students pursuing Honors in Artificial Intelligence and Machine Learning	
Course Code	**Course title**
21ETU6E24T	Optical Communication
21ETU6E34T	Image and Video Processing

List of Core Electives – I offered to all other students	
Course Code	**Course title**
21ETU6E14T	Data Analytics
21ETU6E24T	Optical Communication
21ETU6E34T	Image and Video Processing

Walchand Institute of Technology, Solapur

T.Y. B. Tech. (Electronics & Telecommunication Engineering), Semester-V

21ETU5CC1T – Electromagnetic Field Theory

Teaching Scheme:	**Examination Scheme:**
Lecture: 3 hrs/week, 3 credits	ESE: 60 Marks
Tutorial: 1hr/week, 1 credit	ISE: 40 Marks
	ICA: 25 Marks

This course introduces electromagnetic field theory which deals with electric and magnetic field vectors. The course introduces theoretical and analytical aspects of electromagnetic field, electromagnetic wave propagation and antennas.

Course Prerequisite:
Student shall have knowledge of vector operations.

Course Objectives:
1. Define different co-ordinate systems and apply divergence, gradient, curl to vector field.
2. Derive the laws of electrostatic and magnetostatic field.
3. Determine electric and magnetic field produced at a given point due to different sources.
4. Derive Maxwell's equations and analyze wave propagation.
5. Explain antenna radiation principle and types of antennas.

Course Outcomes:
At the end of the course, students will be able to-
1. Apply divergence, gradient, curl to a given vector field.
2. State and Derive the laws of electrostatic and magnetostatic field.
3. Determine the EM field produced at a given point.
4. Derive Maxwell's equations and analyze wave propagation.
5. Explain types of antennas and basic principle of radiation.

SECTION I

Unit 1: Mathematical Fundamentals [5 Hrs.]
Vector analysis, Coordinate systems & transformations, line, surface & volume integrals, DEL operator (gradient, divergence and curl in different co-ordinate systems).

Unit 2: Electrostatic field - I [8 Hrs.]
Coulomb's law, electric field intensity, electric field due to continuous line charge, sheet charge, volume charge distribution, electric flux density, gauss law with applications, divergence theorem.

Unit 3: Electrostatic field - II [8 Hrs.]
Work done due to point charge, electric potential, relation between E & V, electric dipole, electrostatic energy & energy density, boundary conditions for electrostatic field(conductor-free space, dielectric-dielectric), Divergence Theorem

SECTION II

Unit 4: Magneto static field [7 Hrs.]

Biot-Savart law & its Applications, Ampere's circuital law & its application, Stoke's theorem, Magnetic flux density, boundary condition for magnetic field, energy stored in magnetic field.

5: Electromagnetic waves [7 Hrs.]

Maxwell's equation in point form & integral form (Time varying field, harmonically varying fields), Helmholtz wave equation, plane waves in lossless & lossy medium, Poynting theorem and power flow in EM – field, polarization of plane waves.

Unit 6: Antennas [7 Hrs.]

Basic principle of radiation, basic antenna parameters, Antenna field Zones, short dipole antenna and it's radiation resistance, slot antenna, Micro strip Patch antenna, parabolic reflector antenna. Antenna Array- Pattern multiplication, Broad side array, end-fire –array, Yagi Uda array.

Internal Continuous Assessment:

ICA consists of minimum of eight tutorials based upon above curriculum. Tutorial shall include numerical problems, derivations.

Text Books:

1. Electromagnetics by John D. Kraus - Mc Graw Hill Third Edition
2. Electromagnetic Engineering by William Hyte - Mc Graw Hill
3. Electromagnetic field theory & transmission lines by G.S.N. Raju - Pearson Education
4. Antennas and Wave Propagation by G.S.N. Raju- Pearson Education
5. Antenna and Wave Propagation by K.D. Prasad-Tech India

Reference Books:

1. Electromagnetic Schaum's outline series by J.A.Edminister -TATA Mc Graw Hill Second Edition
2. Electromagnetic waves & transmission lines by R.S. Rao – PHI
3. Antenna for all applications by John D. Kraus, Marhefka, Khan - Mc Graw Hill Third Edition
4. Applied Electromagnetics by F. Ulaby (2001 Media Edition) - PHI
5. Antenna theory analysis and design by C.A. Balanis (second edition) - Wiley

Walchand Institute of Technology, Solapur

T.Y. B. Tech. (Electronics & Telecommunication Engineering), Semester-V

21ETU5CC2T – Principles of Digital Communication

Teaching Scheme:	**Examination Scheme:**
Lecture: 3 hrs/week, 3 credits	ESE: 60 Marks
Practical: 2hrs/week, 1 credit	ISE: 40 Marks
	ICA: 25 Marks
	POE: 25 Marks

This course introduces the basic principles of design and analysis of digital communication systems. It also deals with significance of information theory, various coding techniques, synchronization methods, pulse and digital modulation techniques along with their performance analyses.

Course Prerequisite:

Student shall have knowledge of sampling theorem, analog modulation / demodulation techniques, probability theory, pulse amplitude modulation / demodulation techniques. They shall also have knowledge of Fourier transform and inverse Fourier transform.

Course Objectives:

1. To make student understand the significance of information theory in communication system.
2. To introduce basic components of digital communication system for different pulse code and digital modulation schemes with their performance analysis.
3. To explain various synchronizing techniques as well as coherent and non- coherent type of receivers used for demodulation techniques.
4. To introduce the concept and significance of Error Control Codes.

Course Outcomes:

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

1. Calculate information measures
2. Evaluate parameters of source coding techniques for the discrete memoryless sources and error detection & correction capabilities of block code.
3. Analyze different pulse code modulation and baseband data transmission methods.
4. Analyze binary and M-ary digital modulation techniques.
5. Describe the concepts of the matched filter, correlation receiver, and synchronization techniques.

SECTION – I

Unit 1–Introduction to Information Theory [08 Hrs]

Introduction to information theory, entropy, joint entropy and conditional entropy, rate of information, mutual information, channel capacity, transmission efficiency, redundancy, Shannon's theorem, Shannon – Hartley theorem, bandwidth and S/N trade off, Shannon Fano coding, Huffman coding technique.

Unit 2–Pulse Code Modulation Technique [07 Hrs]
Quantization – Uniform & Non-uniform, PCM System, Differential PCM, Bandwidth requirement of PCM, Delta Modulation – Noise in DM, ADM, Eye pattern, Inter symbol interference.

Unit 3- Baseband Data Transmission System [07 Hrs]
Binary Baseband Data Transmission System, Duo-binary baseband PAM system – use of controlled ISI in duo binary signaling scheme, Shaping of transmitted signal spectrum, Effect of precoding, Line Coding Techniques, Equalization, Scrambler & unscrambler.

SECTION – II

Unit 4–Binary Digital Modulations Techniques [09 Hrs]
Binary ASK, FSK, PSK, DPSK, Coherent and non-coherent Detection. Comparison of digital modulation schemes–Bandwidth, Power requirements & Equipment complexity, Probability of error, Matched filter receiver, Correlation receiver, Carrier recovery circuits, Synchronization, Symbol Synchronization, Frame synchronization

Unit 5– M-ary Digital Modulations Techniques [07 Hrs]
M–ary Signaling scheme, Types of M-ary signaling scheme, constellation diagram and its modulators and demodulators: QPSK signaling scheme, M-ary wideband FSK signaling scheme, QAM signaling scheme, MSK signaling scheme.

Unit 6–Error Control Codes [06 Hrs]
Introduction to linear block code, linear block code examples, generator matrix, systematic linear block codes, Parity-check matrix, Syndrome testing, and Error correction.

Internal Continuous Assessment:
ICA consists of a Minimum of 8 experiments based on the above syllabus.

Text Books:

1. Communication System Analog & Digital – Singh & Sapre.-TMH.
2. Digital Communication System Design – M. S. Roden.-PHI
3. Digital Communication -John G. Proakis- Pearson Education
4. Communication Systems (Analog and Digital) – Sanjay Sharma –Katsons Publication

Reference Books:

1. Principles of Communication System – Taub & Schling-TMH
2. Digital & Analog Communication systems – K. Sam Shanmugan-Wiley
3. Digital communication Fundamentals and Applications–2nd edition by Bernard Sklar Pearson Education.
4. Contemporary Communication system using MATLAB by John G. Proakis, M Asonid Salehi, Genhard Bauch

Walchand Institute of Technology, Solapur

T.Y. B. Tech. (Electronics & Telecommunication Engineering), Semester-V

21ETU5CC3T : Microcontrollers And Applications

Teaching Scheme:	**Examination Scheme:**
Lecture: 3hrs/week, 3 credits	ESE: 60 Marks
Practical: 2hrs/week, 1 credit	ISE: 40 Marks
	ICA: 25 Marks
	POE: 25Marks

This course introduces Basics of microcontroller's theory which includes internal details of MCS51 series and PIC Microcontroller. The course also introduces Assembly level as well Embedded C Level programming aspects of both microcontrollers, Memory interfacing and Interfacing various I/O devices.

Course Prerequisite:
Student shall have knowledge of Digital Electronics.

Course Objectives:
1. To provide an introduction to microcontroller families and details of MCS51.
2. To describe core and peripheral features of PIC16f877a
3. To introduce assembly language and Embedded C programming techniques
4. To introduce hardware interfacing for I/O devices.

Course Outcomes:
At the end of the course, students will be able to
1. Explain the architecture styles of microcontrollers
2. Describe the architecture, memory organization and features of 8051 microcontroller.
3. Describe the architecture, memory organization and features of PIC16f877a microcontroller.
4. Develop Program using assembly language and embedded C for embedded applications.

SECTION I

Unit 1: Introduction to Microcontroller [04 Hrs]
Introduction, Microprocessor and Microcontrollers, CISC & RISC Microcontroller, Harvard and Von Neumann architecture, Development system for Microcontroller.

Unit 2: The 8051 Architecture and Instructions [10 Hrs]
8051 Microcontroller Hardware, Addressing modes, Instruction set, Input / Output Pins, ports and Circuits, External Memory, Counters and Timers, Serial Data Input/output, interrupts.

Unit 3: Programming Microcontroller (8051) [08 Hrs]
The mechanics of Programming, The assembly Language and C programming concepts, Serial Port Programming, Timer Programming and Interrupt Programming, Program for interfacing Switches, LED, Relay, Buzzer. LCD display, Matrix keyboard, ADC 0809, DAC 0808, Stepper Motor.

SECTION II

Unit 4: PIC Microcontrollers: [04 Hrs]
PIC Microcontrollers Introduction, Architecture features, Configuration word and Instruction Set

Unit 5: PIC16F877A Microcontroller Core Features: [08 Hrs]
Functional pin description, various registers, Program memory and data memory organization, Input/ output ports, Interrupts, various kinds of RESET

Unit 6: Peripheral Features and Programming: [10 Hrs]
Timers, Capture/ compare / PWM (CCP) Modules in PIC 16F877, Internal ADC, The Watchdog Timer. Master synchronous serial port (MSSP) module: SPI, I2C, The Universal Synchronous Asynchronous Receiver Transmitter (USART) module.

Internal Continuous Assessment (ICA):
ICA consists of a minimum of eight experiments and mini-projectct based on the above syllabus.

Suggestive List of Experiments:
1. Arithmetic and Logic operations
2. Interfacing of Switches, LEDs and Buzzer.
3. Interfacing of Matrix Keyboard
4. Interfacing of LCD Display.
5. Interfacing of DAC 0808 and generation of various waveforms.
6. Interfacing of ADC 0809
7. Use of Timer for generation of time delays
8. Use of Timer as counter.
9. Interfacing of Stepper motor
10. Speed control of DC Motor using PWM.
11. Use of ADC of PIC Microcontrollers.
12. Use of Interrupts for any Application.
13. Use of CCP Module of PIC Controller
14. Serial communication.

Text Books:

1. The 8051 Microcontroller Architecture, programming and Applications by Kenneth Ayala Penram International (Third Edition)
2. The 8051 Microcontroller and Embedded systems by Muhammad Ali Mazidi Pearson Education Asia LPE (Second Edition)
3. Designs with PIC Microcontrollers by John B. Peatman Pearson Education Asia LPE
4. PIC Microcontroller & Embedded Systems – Mazidi – Pearson Education
5. Microcontrollers [Theory and Applications] by Ajay V Deshmukh- Tata McGraw Hill Education.

Reference Books:

1. Data sheets of MCS51 family microcontrollers, PIC 16F877A Flash microcontrollers,
2. 8051 Microcontroller by I Stott, Mackenzie, Rathel & Phan – Fourth Edition – Pearson Publication.

Walchand Institute of Technology, Solapur

T.Y. B. Tech. (Electronics & Telecommunication Engineering), Semester-V

21ETU5CC4T : Digital Signal Processing

Teaching Scheme:	**Examination Scheme:**
Lecture: 3hrs/week, 3 credits	ESE: 60 Marks
Practical: 2hrs/week, 1 credit	ISE: 40 Marks
	ICA: 25 Marks

This course covers basic analysis tools and techniques for digital signal processing of signals. The course presents design and implementation of Finite and Infinite Impulse response filters and applications of DSP.

Course Prerequisite:
Student shall have knowledge of signals and system. Student shall also have basic knowledge of mathematics and transforming tools like Laplace and Z-transform.

Course Objectives:
1. To make students use suitable tools for time domain and frequency domain transformations.
2. To apply properties of DFT to determine DFT, IDFT by direct computation and FFT algorithms.
3. To design, analyze and compare DSP systems like FIR and IIR Filter.
4. To draw the structure for the realization of a given system.

Course Outcomes:
At the end of the course, student will be able to
1. Apply suitable tools for time domain and frequency domain transformations.
2. Apply properties of DFT to determine DFT, IDFT by direct computation and FFT algorithms.
3. Design FIR and IIR Filters.
4. Draw the structure for the realization of a given system.

SECTION – I

Unit 1–Discrete Fourier Transform [08 Hrs]
Introduction to DSP system. Frequency Domain Sampling and Reconstruction of Discrete Time Signals, DFT as linear Transformation, relation between DFT and Z transform, Properties of DFT, Computation of DFT & IDFT, multiplication of two DFTs and circular convolution.

Unit 2– Linear Filtering Method Based on DFT [05 Hrs]
Use of DFT in linear filtering, Filtering of long data sequences such as Overlap-save and Overlap-add method, Frequency analysis of signals using DFT.

Unit 3– FFT Algorithm [08 Hrs]
Divide & conquer approach to computation of DFT. Radix-2 FFT algorithm for the computation of DFT and IDFT, decimation in time (DIT) and decimation in frequency (DIF) algorithms.

SECTION II

Unit 4- FIR Filter Design [07 Hrs]

FIR filter design: Introduction to FIR filters, design of FIR filters using -Rectangular, Hamming and Bartlet windows, FIR filter design using frequency sampling technique, finite word length effects in FIR filters, FIR Implementation techniques.

Unit 5- IIR Filter Design [07 Hrs]

IIR Filter Design by Impulse Invariance, IIR Filter Design by Bilinear Transformation, Characteristic of commonly used Analog Filters (Butterworth Filter), Some examples of Digital Filter Design Based on above Transformation, finite word length effects in IIR filter, IIR implementation technique.

Unit 6- Realization of Digital Linear Systems [07 Hrs]

Structures for realization of Discrete time systems, Structures for FIR Filters: Direct form, Cascade form& Lattice Structure, Structures for IIR Filters: Direct form, Cascade form & parallel form.

Internal Continuous Assessment (ICA):

ICA consists of a minimum of eight experiments based on the above syllabus.

Suggestive List of Experiments:

1. Waveform generation using discrete time signals.
2. To implement linear convolution.
3. Implementation of DFT and IDFT.
4. To implement circular convolution.
5. Fast convolution using Overlap add/Overlap save method.
6. Realization of FIR system.
7. Realization of IIR system.
8. Design of FIR filter using frequency sampling method.
9. Design of FIR filter using windowing technique.
10. Design of IIR filter using impulse invariant technique.
11. To design Butterworth filter using Bilinear transformation technique.

Text Books:

1. Digital Signal Processing – Principles, Algorithms and Applications by John G Proakis-4th edition, Pearson Education.
2. Digital Signal Processing by S Salivahanan, A Vallavaraj & C Gnanapriya –2nd edition, TMH.
3. Discrete time signal Processing by A.V. Oppenheim & R.W. Schafer. - Low price edition, John Wiley

Reference Books:

1. Digital Signal Processing by Ramesh Babu -4th Edition, Scientic Publication.
2. Digital Signal Processing by Dr. Shaila D. Apte, Second edition, Wiley India.
3. Essentials of Digital Signal Processing using MATLAB by Vinay K. Ingle & John G. Proakis, Cengage Learning, 2012.
4. Digital Signal Processing- A Practical Approach, by E. C. Ifleachor and B. W. Jervis, Second Edition, Pearson education.
5. Theory and Application of Digital Signal Processing Digital by Rabiner& Gold-First edition, Prentice Hall.
6. Digital Signal Processing by S. Palani & D. Kalaiyarasi, Ane's Student Edition, Ane Books Pvt. Ltd New Delhi.

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T.Y. B. Tech. (Electronics & Telecommunication Engineering), Semester-V

21ETU5CC6P : Programming with Java

Teaching Scheme:	**Examination Scheme:**
Lecture: 2 hrs/week, 2 credits	ISE: 25 Marks
Practical: 2hrs/week, 1 credit	ICA: 25 Marks
	POE: 50 Marks

This course introduces Java Programming from basics to advanced Java concepts. The importance of Java language cannot be denied as it has already started ruling over the entire Software Industry. The aim of this course is to provide students with an understanding of the object-oriented design and programming techniques. Java, a prime object-oriented programming language, is used to illustrate this programming paradigm

Course Prerequisite:
Students must be familiar with basic programming languages like C.

Course Objectives:
6. To make students aware of Object Oriented features in Java.
7. To introduce students the ability of Java runtime library APIs
8. To make students facilitate error handling exceptions.
9. To make students aware of Java runtime library APIs for designing GUI applications

Course Outcomes:
At the end of the course, students will be able to-
6. Implement an Object-oriented concept with its features .
7. Use Java runtime library APIs for implementing functionality of various applications.
8. Implement exceptional handling through Java programming for a given problem
9. Select appropriate Java runtime library APIs to create GUI and web application using Java language.

Unit 1: Basics of Java and Strings in Java [7 Hrs.]
Basics: Java Runtime Environment, Naming Conventions, Language Basics: Variables, Operators, Expressions, Statements, Blocks, Control flow Statements, Input and Output, Data Types, Arrays, Type Casting. Fundamentals: String Class and Methods, Immutability of Strings, String Buffer Class and Methods, String Builder class and Methods.

Unit 2: Introduction to OOPs [5 Hrs.]
Objects and Classes, Fields and Methods, Abstraction, Encapsulation, Inheritance, Polymorphism, Type Compatibility and Conversion, Overriding Methods, Access control, Modifiers, Constructors, Abstract classes, Nested classes, Packages, Wrapper classes, Interfaces, Object Life time & Garbage Collection.

Unit 3: Exceptions, Error Handling and Basic IO [6 Hrs.]

Exceptions and Error Handling: Exceptions and Errors, Catching and Handling Exceptions, The try Block, The catch Blocks, The finally Block, Throwing Exceptions, Chained Exceptions, Custom Exceptions. JUnit Testing Framework. Basic I/O: I/O Streams, Byte Streams, Character Streams, Buffered Streams, Scanning and Formatting, Data Streams, Object Streams , File I/O Classes: Reading, Writing, and Creating Files and Directories.

Unit 4: Java Collections Framework [4 Hrs.]

Introduction, The Arrays Class, Searching and sorting arrays of primitive data types, Sorting Arrays of Objects, The Comparable and Comparator Interfaces, Sorting using Comparable & Comparator, Collections: Lists, Sets, Maps, Trees, Iterators and Collections, The Collection Class.

Unit 5 : Multithreading and Networking [4 Hrs.]

Multithreading: Creating Threads, Thread scheduling and priority, Thread interruptions and Synchronization. Network Programming: InetAddress, URLs, Socket (TCP & UDP) communication in Java.

Unit 6: GUI Programming using Swing & JDBC [4 Hrs.]

Swing package, Layouts, Events, Listeners and Event handling, and Swing Components. Introduction to JDBC, JDBC Drivers & Architecture, CRUD operations Using JDBC API.

Internal Continuous Assessment (ICA):

ICA consists of a minimum of eight experiments and a mini-project based on the above syllabus.

Text Book:

1. Head First Java – Kathy Sierra, Bert Bates, O'Reily Publication
2. The Java TM Programming Language By Ken Arnold, James Gosling, David Holmes, Pearson Publication
3. Core Java for Beginners- RashmiKanta Das, Vikas Publishing House Pvt. Ltd
4. Programming with Java, Balaguruswamy, TMH
5. Internet and Java Programming, Tanweer Alam, Khanna Publishing House

Reference Books:

1. The Java Language Specification, Java SE 8 Edition Book by James Gosling, Oracle Inc. (eResource: http://docs.oracle.com/javase/specs/)
2. Java: The Complete Reference 8 Edition - Herbert Schildt , Tata McGraw - Hill Education
3. Head First Servlets and JSP – Bryan Bosham, Kathy Sierra, Bert Bates, O'Reily Publication
4. The JavaTM Tutorials. Oracle Inc. (e-Resource: http://docs.oracle.com/javase/tutorial/)
5. Java Server Programming for Professionals - Ivan Bayross, Sharanam Shah, Cynthia Bayross And Vaishali Shah, Shroff Publishers and Distributors Pvt. Ltd, 2nd Edition

Walchand Institute of Technology, Solapur

T.Y. B. Tech. (Electronics & Telecommunication Engineering), Semester-VI

21ETU6CC1T : Embedded System Design

Teaching Scheme:	**Examination Scheme:**
Lecture: 4hrs/week, 4 credits	ESE: 60 Marks
Practical: 2hrs/week, 1 credit	ISE: 40 Marks
	ICA: 25 Marks
	POE: 50 Marks

This course introduces Embedded System Design with software and hardware perspective. The course also introduces practical design aspects of embedded system.

Course Prerequisite:
Student shall have knowledge of digital circuits, basic C programming, Microcontroller fundamentals.

Course Objectives:
1. To make student realize different aspects and application areas of embedded systems.
2. To make student understand ARM core architecture.
3. To make student understand interfacing of input & output devices
4. To introduce to student concepts of Real time operating system
5. To interface various sensors with Arduino

Course Outcomes:
At the end of the course, students will be able to
1. Explore design challenges for embedded system development.
2. Describe ARM core architecture and Instruction set.
3. Implement programs using ARM development boards.
4. Explain various functions of RTOS.
5. Interface different sensors with Arduino

SECTION–I

Unit 1: Embedded System Introduction [06 Hrs]
Introduction to Embedded System, History, Design challenges, optimizing design metrics, time to market, applications of embedded systems and recent trends in embedded systems, embedded design concepts and definitions.

Unit 2: System Architecture [12 Hrs]
Introduction to ARM7TDMI core architecture, ARM extension family, Pipeline, LPC2148, ARM instruction set, thumb instruction set, memory management, Bus architecture.

Unit 3: On Chip Peripherals [10 Hrs]
Study of on-chip peripherals like I/O ports, PLL, timers/counters, interrupts, chip ADC, DAC, WDT, PWM

SECTION–II

Unit 4: Interfacing and Programming [12 Hrs]

Introduction to Embedded C Programming, Basic embedded C programs for on-chip peripherals studied in system architecture like PLL, timers, ADC, WDT, PWM. Interfacing of devices – LED, Switches (buttons), 4x 4MatrixKeypad, 7-segment display, LCD display, DC motor.

Unit 5: Real Time Operating System [10 Hrs]

Architecture of kernel, task scheduler, ISR, Semaphores, mailbox, message queues, pipes, events, timers, memory management, RTOS services in contrast with traditional OS, introduction to μcosII.

Unit 6: Interface various Sensors using Arduino [06 Hrs]

Introduction to Arduino, Arduino setup and installation. Interfacing of LED , Ultrasonic Sensor, PIR Sensor, IR Sensor, Temperature Sensor, LDR with Arduino.

Internal Continuous Assessment (ICA):

ICA consists of a minimum of eight experiments and a mini-project based on the above syllabus.

Note: # The Practical oral exam of the Mini Project will be included in the Practical oral exam of the Embedded System Design

Suggestive List of Experiments:

1. Arithmetic and Logic operations
2. Interfacing of Switch, LED/ Buzzer/Relay
3. Interfacing of LCD Display.
4. Interfacing matrix Keypad and display key pressed on LCD/Seven Segment Display
5. Use of Timer for generation of time delays
6. Use of Interrupts for any Application
7. Use of ADC of Microcontroller.
8. Interfacing of Stepper motor.
9. Interfacing of DC Motor.
10. USART Serial communication.
11. Interfacing of IR Sensor, Temperature Sensor, LDR with arduino
12. Creating two tasks, which will print some characters on the serial port, Start the scheduler and observe the behavior.

Textbooks:

1. Embedded Systems: Architecture, Programming And Design by Rajkamal Tata McGraw-Hill Education
2. Frank Vahid-Embedded Systems-Wiley India
3. ARM System Developer's Guide, Designing and Optimizing System Software – Andrew N. Sloss, Dominic Symes, Chris Wright-Morgan Kaufmann Publisher.
4. Arduino: The Complete Guide to Arduino for beginners- James Arthur Daniel Jones

Reference Books:

1. DR. K. V. K. K. Prasad -Embedded/real time system–Dreamtech
2. Embedded real systems Programming–Iyer, Gupta, TMH
3. Embedded systems: a contemporary design tool, James K. Peckol – Wiley India
4. Datasheet of LPC2148.
5. Programming and Interfacing with Arduino -Dr. Yogesh Misra ,CRC press.

Walchand Institute of Technology, Solapur

T.Y. B. Tech. (Electronics & Telecommunication Engineering), Semester-VI

21ETU6CC2T: Database Management System

Teaching Scheme:	**Examination Scheme:**
Lecture: 3hrs/week, 3 credits	ESE: 60 Marks
Practical: 2hrs/week, 1 credit	ISE: 40 Marks
	ICA: 25 Marks
	POE: 25 Marks

This course introduces a Database Management System, which is the system software for easy, efficient and reliable data processing and management. It covers ER Model, Relational Model, Structured Query Language, Relational Database Design and Concurrency Control techniques.

Course Objectives:

1. To understand the basics of database design, structure, implementation and applications.
2. To develop the logical design of the database using data modeling concepts such as entity relationship diagrams.
3. To understand and use Structured Query Language to query, update, and manage a database.
4. To apply normalization techniques to normalize the database.
5. To familiarize the students with the fundamentals of database transaction processing, learn techniques for concurrency control and recovery methods.

Course Outcomes:

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

1. Apply the basic concepts of database systems to design relational models and schemas.
2. Design schema using E-R model and normalization.
3. Extract data using relational algebra and SQL.
4. Access data using Indexing and Hashing techniques.
5. Apply ACID properties for transaction processing.
6. Explain concurrency control and recovery methods.

SECTION– I

Unit 1: Introduction to DBMS **[03 Hrs]**

Database- System Applications, Purpose of Database Systems, View of data, Database Languages, Database Architectures, Database users and administrators, history of databases system.

Unit 2: E-R model **[05 Hrs]**

Overview of design process, E-R Model, Constraints, E-R diagrams, E-R design issues, Weak Entity Sets, Extended E-R features, Reduction to relational schema.

Unit 3: Relational Model **[06 Hrs]**

Relational Model: Basic structure of relational databases, Database schema, keys, Schema diagrams, Relational Query languages, Relational algebra-Fundamental, Additional and Extended Relational Algebra Operations.

Unit 4: Introduction to SQL **[08 Hrs]**

Overview, SQL data definition, SQL data types, Integrity constraints, Basic structure of SQL Queries, Types of SQL Commands: DDL, DML, DCL and TCL statements, Basic SQL clauses [select, from, where, group by, having, order by etc.].

SECTION-II

Unit 5: Intermediate SQL **[07 Hrs]**

Additional basic operations, Set operations, NULL values, Aggregate functions, Nested sub queries, Modification of the databases. Join operations, Views, Integrity constraints, Authorization.

Unit 6: Normalization **[05 Hrs]**

Features of good Relational Designs, Atomic Domains, First Normal Form, Keys and Functional dependencies, Second Normal Form, Boyce-Codd Normal Form, Third Normal Form, Functional dependency theory.

Unit 7: Indexing and Hashing **[05 Hrs]**

Basic Concepts, Ordered Indices, B+ Tree Index Files, B Tree Index Files, Multiple Key Access, Introduction to Indexing, Comparison of Indexing and Hashing, Index definition in SQL.

Unit 8: Transactions and Concurrency Control **[06 Hrs]**

Transaction concept, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions. Concurrency Control - Lock based protocol: Locks, Granting of Locks, Two-Phase Locking Protocol. Time Stamp-based protocols, Deadlock handling.

Internal Continuous Assessment (ICA):

ICA shall consist of a minimum eight experiments/Assignments based on the above syllabus.

Suggestive list of Experiments

1. Implementation of Basic SQL DDL commands
2. Implementation of SQL DML commands
3. Draw E-R diagram for any specific database application
4. Write simple queries in SQL on the schema created for a specific application
5. Write SQL queries using aggregate function and nested subqueries,
6. Write SQL queries using Views and Join operation
7. Write SQL queries for different integrity constraints and authorization commands.
8. Convert the created database into 1NF, 2NF, 3NF and BCNF.
9. Write a program to implement dynamic hashing on the database previously created.
10. Write a program to simulate log-based protocol using immediate database modification.
11. Write a program to simulate concurrency control protocol

Text books:

1. Database system concepts by Abraham Silberschatz, Henry F. Korth, S. Sudarshan (McGraw Hill International Edition) sixth edition.
2. Database system concepts by Peter Rob, Carlos Coronel (Cengage Learning) ninth edition.

Reference Books:

1. Fundamentals of Database systems by Ramez El Masri, S. B. Navathe (Pearson Education) 5thedition.
2. Database Management Systems by Ramkrishnan Gehreke (Tata McGraw Hill) third edition.
3. Principles of Database Systems by J. D. Ullman (Galgotia Publications)
4. Advanced Database Management System by Rini Chakrabarti, Shilbhadra Dasgupta (Dreamtech Press Publication).

Walchand Institute of Technology, Solapur

T.Y. B. Tech. (Electronics & Telecommunication Engineering), Semester-VI

21ETU6CC3T – Project Management and Operation Research

Teaching Scheme:	**Examination Scheme:**
Lecture: 3 hrs/week, 3 credits	ESE: 60 Marks
Tutorial: 1hr/week, 1 credit	ISE: 40 Marks
	ICA: 25 Marks

Course Prerequisite:
Basic understanding of management fundamentals and project development.

Course Objectives:
1. To introduce students to the project development life cycle
2. To make students aware of different methods used for project planning, scheduling, and risk management.
3. To impart knowledge in concepts of Operations Research
4. To analyze models associated with Operations Research.

Course Outcomes:
At the end of the course, students will be able to
1. Apply Project Management Life Cycle to real-time projects
2. Apply project planning and scheduling concepts for project development and compare various techniques.
3. Use risk management planning techniques for project development.
4. Explain the significance of Operation Research and various models for solving a problem under consideration.
5. Find the optimal solution for the Linear Programming Problem and explain replacement models.
6. Apply Assignment models for effective utilization of facilities and explicate the factors associated with the Location and Layout of facilities.

SECTION – I

Unit 1: Project Management **[07 Hrs.]**
Concepts of project management, objectives and function of project management, categories of project, project evaluation, project planning, project failure, project life cycle concept and cost components.

Unit 2: Project Planning and Scheduling **[08 Hrs.]**
Work Breakdown structure (WBS) and linear responsibility chart, Interface Co-ordination and concurrent engineering, Project cost estimation and budgeting, Top down and bottoms up budgeting, Networking and Scheduling techniques (PERT, GANTT chart (no numerical)).

Unit 3: Risk Management **[06 Hrs.]**
Risk & its categories, risk management planning, risk identification and risk register, Qualitative and quantitative risk assessment, Risk response strategies for positive and negative risks.

SECTION – II

Unit 4: Introduction of Operation Research [07 Hrs.]
Definition of operations research, Characteristics of operations research and its other aspects, Models of operations research, Limitations of operations research.

Unit 5: Linear Programming Problem & Replacement Model [08 Hrs.]
Introduction to LPP, Applications of LPP, Advantages of LPP, Formulation of problem, Graphical Method, Simplex method. Replacement Model–Introduction**,** Need for replacement, failure mechanism, Categories of replacement problems.

Unit 6: Assignment Model, Location and Layouts of facilities [06 Hrs.]
Introduction, applications of assignment models, types of assignment problems, Methods to solve balanced and unbalanced assignment problems, facility location, General Procedure for making location decisions, factors affecting location decision.

Internal Continuous Assessment (ICA):
ICA consists of a minimum of eight tutorials based on the above curriculum. The tutorial shall include case studies related to the above syllabus.

Text Books:
1. Hamdy Taha, "Operations Research – An Introduction", 7th edition PHI (2003)
2. S. D. Sharma, "Operation Research", Kedarnath and Rannalt Pub.
3. Hira and Gupta, "Operation Research", S. Chand and Co.
4. K Nagarajan, "Project Management", New Age International Publication
5. Bob Hughes, Mike Cotterell, Rajib Mall, "Software project management" McGraw Hill

Reference Books:
1. Richard Newton, "Project Management- Step by Step", PEARSON
2. P Rama Murthy, "Operations Research", 2 nd edition New Age International Publication

Walchand Institute of Technology, Solapur

T.Y. B. Tech. (Electronics & Telecommunication Engineering), Semester-VI

21ETU6E14T : Core Elective –I

Data Analytics

Teaching Scheme:	**Examination Scheme:**
Lecture: 3 hrs/week, 3 credits	ESE: 60 Marks
Practical: 2hrs/week, 1 credit	ISE: 40 Marks
	ICA: 25 Marks

This course provides foundation-level training that enables immediate and effective participation in data and other data analytics projects. It includes an introduction to data and data analytics. The course provides a grounding in basic analytic methods and an introduction to data analytics technology and tools.

Course Prerequisite:
Student shall have knowledge of Statistics, Probability theory.

Course Objectives:
At the end of the course, students will be able to
1. To understand Data Analytics Life Cycle and Business Challenges.
2. To understand Analytical Techniques and Statically Models.
3. To understand methods for data analytics practitioners.

Course Outcomes:
On completion of the course, student will be able to–
1. Deploying the Data Analytics Lifecycle to address data analytics projects.
2. Use the right method to solve real problem.
3. Selecting appropriate data visualizations to clearly communicate analytic insights.
4. Use the tools and techniques to apply different algorithms and methodologies.

SECTION – I

Unit 1– Data Analytics Lifecycle and Big Data [05 Hrs]
Background and Overview of Data Analytics Lifecycle, Discovery, Data Preparation, Model Planning, Model Building, Communicate Results, Operationalize, Case Study: Global Innovation Network and Analysis (GINA)
What Can We Do With Data? Big Data and Data Science, Big Data Architectures, Small Data, What is Data? A Short Taxonomy of Data Analytics, Examples of Data Use.

Unit 2: Descriptive statistics and analysis: [09 Hrs]
Scale Types , Descriptive Univariate Analysis , Univariate Frequencies , Univariate Data Visualization , Univariate Statistics , Common Univariate Probability Distributions , Descriptive Bivariate Analysis , Multivariate Frequencies , Multivariate Data Visualization , Multivariate Statistics.

Unit 3: Data Quality and Pre-processing: [08 Hrs]
Data Quality, Converting to a Different Scale Type, Converting to a Different Scale, Data Transformation, Dimensionality Reduction.

SECTION – II

Unit 4: Clustering and FPM: [08 Hrs]
Clustering: Distance Measures, Clustering Validation, Clustering Techniques, **Frequent Pattern Mining**: Frequent Item sets, Association Rules, Behind Support and Confidence, Other Types of Pattern

Unit 5: Regression and Classification: [08 Hrs]
Regression: Predictive Performance Estimation, Finding the Parameters of the Model, Technique and Model Selection, **Classification**: Binary Classification, Predictive Performance Measures for Classification, Distance-based Learning Algorithms, Probabilistic Classification Algorithms.

Unit 6- Big Data Analytics [06 Hrs]
Definition of Big Data, Big data characteristics & considerations, Data repositories- analyst perspective, Business drivers for analytics, Typical analytical architecture, Business Intelligence Vs Data science, Drivers of Big data analytics, Role of data scientist in Big data ecosystem, Applications of Big data analytics.

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Internal Continuous Assessment (ICA):
ICA shall consist of minimum 8 assignments based on the syllabus contents.

Text Books:

1. David Dietrich, Barry Hiller, "Data Science and Big Data Analytics", EMC education services, Wiley publications, 2012, ISBN0-07-120413-X
2. A General Introduction to Data Analytics, by Joao Moreira, Andre Carvalho, Tomas Horvath, Wiley Publication.
3. Michael Berthold, David J. Hand, Intelligent Data Analysis, Springer
4. Ashutosh Nandeshwar , "Tableau Data Visualization Codebook", Packt Publishing, ISBN 978-1-84968-978-6

References:

1. Maheshwari Anil, Rakshit, Acharya, "Data Analytics", McGraw Hill, ISBN: 789353160258.
2. Mark Gardner, "Beginning R: The Statistical Programming Language", Wrox Publication, ISBN: 978-1-118-16430-3
3. Luís Torgo, "Data Mining with R, Learning with Case Studies", CRC Press, Talay and Francis Group, ISBN9781482234893
4. Carlo Vercellis, "Business Intelligence - Data Mining and Optimization for Decision Making", Wiley Publications, ISBN: 9780470753866.

Walchand Institute of Technology, Solapur

T.Y. B. Tech. (Electronics & Telecommunication Engineering), Semester-VI

21ETU6E24T: Core Elective –I

Optical Fiber Communication

Teaching Scheme:	**Examination Scheme:**
Lecture: 3hrs/week, 3 credits	ESE: 60 Marks
Practical: 2hrs/week, 1 credit	ISE: 40 Marks
	ICA: 25 Marks

This course introduces the basic concept of optical communication. It explains the basic working principle of optical fiber. It covers the study of basic optical devices as optical source, optical detector and optical joints. It also introduces aspects of practical design of optical communication system.

Course Prerequisite:

Student should have knowledge of basic communication system, light reflection, refraction process.

Course Objectives:

1. To make students to understand basic working principle of optical fiber.
2. To introduce to student basic losses in optical fiber & reasons behind the losses.
3. To make students to understand the basics of optical sources (LASER & LED).
4. To make students to understand the basics of optical detectors.
5. To study the concepts of optical networks.

Course Outcomes:

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

1. Demonstrate working of optical fiber.
2. Explain transmission characteristics of optical fibers & concept of optical joints.
3. Illustrate different optical sources & optical detectors.
4. Solve the numerical to calculate the various parameters of optical sources & detectors.
5. Explain the different types of optical amplifiers & optical networks.
6. Analyze the functional blocks in optical communication system.

SECTION I

Unit 1– Introduction **[06 Hrs.]**

Introduction, Historical development, general optical communication system, advantages, disadvantages, optical fiber waveguides, ray theory, mode theory, Types of optical fibers, single mode, multimode fiber, step index & graded index fibers, applications of optical fiber communication.

Unit 2– Optical Fiber losses and Joints **[07 Hrs.]**

Introduction, Attenuation, absorption- intrinsic & extrinsic, linear &nonlinear scattering losses, bending loss, dispersion- intermodal & intramodal, Fiber's alignment and joint loss, fiber splices, connectors, fiber couplers & its types.

Unit 3– Optical Sources **[08 Hrs.]**

LASER: Requirements of optical source, basic concept of LASER, optical emission from semiconductors, double heterojunction (DH) structure, Semiconductor injection laser and structures, Injection laser characteristics. LED: LED structures, LED characteristics. Introduction of Light Modulation.

SECTION II

Unit 4-Optical Detectors **[08 Hrs.]**

Introduction, requirements of optical detector, optical detection principles, performance parameters of detector- absorption, quantum efficiency, responsivity, cut off wavelength. Semiconductor photo diodes with and without internal gain: - PN, PIN, Avalanche Photo diodes, Phototransistors.

Unit 5-Optical Networks **[06 Hrs.]**

Optical Networks: Introduction, networking terminology, optical network modes, SONET / SDH, Optical Ethernet, Fiber Distributed Data Interface (FDDI), data buses.

Unit 6-Fiber Optical Communication Systems **[07 Hrs.]**

Introduction, Transmitter Design, Receiver Design, Noise equivalent model of receiver, Link Design, Wavelength Division Multiplexing (WDM), DWDM, Optical Time Division Multiplexing (OTDM).

Internal Continuous Assessment (ICA):

ICA consists of a minimum of eight experiments based on the above syllabus.

Suggestive list of experiments

1. Setting up fiber optic analog & digital link.
2. Frequency modulation using fiber optic cable.
3. Pulse width Modulation using fiber optic cable.
4. Study of propagation loss in optical fiber.
5. Study of bending loss in optical fiber.
6. Measurement of optical power using optical power meter.
7. Measurement of Numerical Aperture.
8. Transmission of voice signal using FOC.
9. Study of WDM.
10. Study of LED output characteristics.

Text Books:

1. Optical Fiber Communications, John M. Senior, Pearson Education. 3rd Impression, 2007
2. Optical Fiber Communications, Gerd Keiser, 4th Ed., MGH, 2008
3. Optical Fiber Communications, D.C. Agarwal - S. Chand and company

Reference Books:

1. Optical Communications, David Gover – PHI
2. Fiber Optics communication, Hozold Kolimbiris - Pearson Education.
3. Fiber Optics Communication – 5th Edition, Palais-Pear

Walchand Institute of Technology, Solapur

T.Y. B. Tech. (Electronics & Telecommunication Engineering), Semester-VI

21ETU6E34T: Core Elective –I

Image and Video Processing

Teaching Scheme:	**Examination Scheme:**
Lecture: 3hrs/week, 3 credits	ESE: 60 Marks
Practical: 2hrs/week, 1 credit	ISE: 40 Marks
	ICA: 25 Marks

This course covers fundamental notions in image and video processing, as well as covers most popular techniques used, such as edge detection, motion estimation, segmentation, and case studies.

Course Prerequisite:
Student shall have knowledge of Digital Signal Processing

Course Objectives:
1. To describe and performs basic operations on image and video.
2. To design and apply filter on images in spatial and frequency domain.
3. To analyze and implement algorithm for image and video processing application using modern tools.
4. To select and apply appropriate technique for preprocessing, segmentation and feature extraction of images and videos in real time applications.

Course Outcomes:
At the end of the course, students will be able to
1. Perform basic operations on image and video.
2. Apply filter on images in spatial and frequency domain.
3. Implement algorithm for image and video processing application using modern tools.
4. Apply appropriate technique for preprocessing, segmentation and feature extraction of images and videos in real time applications.

SECTION I

Unit 1: Image fundamentals [06 Hrs]
Image acquisition, sampling and quantization, image resolution, basic relationship between pixels, color model: RGB, HIS and CMY, Discrete Fourier Transform, Discrete Cosine Transform, KL Transform

Unit 2: Image Enhancement [08 Hrs]
Spatial Domain: Point Processing: Digital Negative, contrast stretching, thresholding, gray level slicing, log transform and power law transform. Neighborhood Processing: Averaging filters, order statistics filters, high pass filters and high boost filters.
Frequency Domain: DFT for filtering, Ideal, Gaussian and Butterworth filters for smoothening and sharpening, Histogram Modeling: Histogram equalization and histogram specification.

Unit 3: Image segmentation and Morphology: [07 Hrs]
Point, line and edge detection, edge linking using Hough transform and graph theoretic approach, thresholding and region-based segmentation. Dilation, erosion, opening, closing, hit or miss transform, thinning and thickening and boundary extraction on binary images

SECTION II

Unit 4: Image Restoration [06 Hrs]
Degradation model, noise models, estimation of degradation function by modeling, restoration using spatial filters.

Unit 5: Video Formation, Perception and Representation: [07 Hrs]
Digital Video Sampling: Video Frame classifications, I, P and B frames, Notation.
Video Capture and display: Principle of color video camera, digital video.
Sampling of video Signals: Required sampling rates, progressive versus interlaced scans.

Unit 6: Two-Dimensional Motion Estimation [08 Hrs]
Optical Flow: 2-D motion Vs Apparent Motion, optical flow equations, motion representation, motion estimation criteria, optimization method.
Block Based Methods: Block motion models, Phase correlation method, Block matching method

Internal Continuous Assessment (ICA):
ICA consists of minimum eight experiments based upon above syllabus.

Text Books:

1. Gonzales and Woods--Digital Image Processing, Pearson Education, India, Third Edition
2. Murat Tekalp—Digital Video Processing, Pearson, 2010.
3. A. I. Bovik—Handbook on Image and Video Processing", Academic Press.

Reference Books:

1. Anil K. Jain,―Fundamentals of Image Processing, Prentice Hall of India, First Edition, 1989.
2. John W. Woods,―Multidimensional Signal, Image and Video Processing, Academic Press 2012
3. J. R. Ohm,―Multimedia Communication Technology", Springer Publication.

Walchand Institute of Technology, Solapur

T.Y. B. Tech. (Electronics & Telecommunication Engineering), Semester-VI

21ETU6CC5P : Open Source Technologies

Teaching Scheme:	**Examination Scheme:**
Lecture: 2hrs/week, 2 credits	ISE: 25 Marks
Practical: 2hrs/week, 1 credit	ICA: 25 Marks
	POE: 50 Marks

The Open Source Technologies course is designed to provide students with a comprehensive understanding of two essential components of modern software development: Linux Shell Scripting and Git. In this course, students will explore the fundamental concepts, tools, and techniques used in Linux shell scripting and version control using Git. By gaining practical hands-on experience, students will develop the skills necessary to work efficiently and effectively in open-source environments.

Course Prerequisite:

1. Basic knowledge of Linux operating system
2. Familiarity with command-line interfaces
3. Understanding of programming concepts (e.g., variables, loops, conditionals)

Course Objectives:

1. To introduce the concept of Open Source Software.
2. To enable students to learn Linux Environment.6
3. To make students well versed Shell Programming
4. To make students understand working of Version Control System

Course Outcomes:

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

1. To work on Open Source Software platforms.
2. To install and work on Linux.
3. To perform Shell Programming.
4. To install and work on Version Control System (GIT)

SECTION-I

Unit 1: Open Source Operating System **[05 Hrs]**

Installation of Linux: Theory about Multiboot Environment, Hard DiskPartitioning, Swap space, LVM, and Boot loader Command Line: Basic File System Management Task, Working with files, Piping and Redirection, Working with VI editor, use of sed and understanding FHSof Linux, Job management, Process Management and Common kernel Management Task in Linux.

Unit 2: Open Source Operating System: Network and Security Administration [05 Hrs]

Basic networking commands, Configuration of Apache Web servers, DNS servers, DHCP servers, mail Servers, NFS, FTP servers. Securing servers with IP tables. Setting up cryptographic services, SSL, Managing Certificate with Open SSL, working with the GNU Privacy guard.

Unit 3: Open Source Operating System: Shell Programming [05 Hrs]

Bash Shell Scripting, Executing Script, Working with Variables and Input, Using Control Structures, Script control, handling with signals, Creating functions, working sed and gawk - Working with web using shell script: Downloading web page as formatted text file and parsingfor data, working URL etc.

SECTION-II

Unit 4: Version Control Systems GIT [05 Hrs]

Introduction: What is a Version Control System (VCS). Distributed vs Non-distributed VCS. What is Git and where did it come from. Alternatives to Git Cloud-based solutions (Github, Gitlab, BitBucket, etc). Installation and Configuration: Obtaining Git, installing Git, Common configuration options, GUI tools. Key Terminology: Clone, Working Tree, Checkout, Staging area, Add, Commit, Push, Pull, Stash

Unit 5: GIT Local and Remote Repository Actions [05 Hrs]

Git - Local Repository Actions, Creating a repository (git init), Checking status (git status), Adding files to a repository (git add), Committing files (git commit), Removing staged files (git reset), Removing committed files (git rm), Checking logs (git log), Git - Remote Repository Actions, Creating a remote repository (git init), Cloning repositories (git clone), Updating the remote repository from the local (git push), Updating the local repository from the remote (git pull), Tagging in Git, What are Git Tags?, Listing tags, Lightweight tags, Displaying tag details (tag show), Annotated tags, Checking out tags, Pushing tags, Pulling tags

Unit 6: Branching in Git [05 Hrs]

What is a branch, A note about and lt; HEAD and gt; Listing branches, Create new branch, Checkout branch, Pushing branches, Pulling branches, Merging in Git, Fetching Changes (git fetch), Rebasing (git rebase), Git Pull, Git Workflows, Different ways of using Git, Centralized, Feature Branch, Gitflow Workflow, Forking Workflow. Git - Stashing Changes, What is Stashing? Creating a branch from a Stash.

Internal Continuous Assessment (ICA):

ICA shall be based upon minimum Eight Experiments from following list.

Suggestive List of Experiments

1. Linux installation, disk partitioning, logical volume manager
2. Commands for files and directory handling(cd, ls, cp, rm, mkdir, rmdir, pwd, file, more, less,cat).
3. File permission, changing permission and ownership (chmod, chown)Process commands (kill,ps, who, top), Creating and editing files with Vi-editor

4. Managing user accounts (add, delete, modify users), Becoming super user, Creating and managing groups, Disk partition and sizes (df, du, dd etc.), Installing and removing packages (RPM, apt-get, yum..)
5. Service monitoring commands (uname, hostname, dnsip, nslookup, dig), Setting IPv4 andIPv6 static addressing
6. Remote file transfer (sshscp, ftp)
7. Shell programming in bash: Statement (Conditional, looping, case)
8. Installation and Configuration of GIT
9. Creating a repository, Addition and deletion of files to repository
10. Create and checkout a new branch.
11. Pushing branches, Pulling branches, Merging in Git
12. Create branch from stash

Textbooks:

1. Open Source Technology by Kailash Vadera and Bhavyesh Gandhi
2. Linux Command Line and Shell Scripting Bible by Richard Blum (Author), ChristineBresnahan
3. Learn Version Control with Git: A step-by-step course for the complete beginner, byTobias Günther
4. Online Content: https://docs.github.com/en/get-started/using-git/about-git
5. Understanding Open Source and Free Software Licensing - By Andrew M. St. Laurent,Oreily Media
6. E- Resource available at: http://oreilly.com/openbook/osfreesoft/book/index.html

Reference Books:

1. Managing Open Source Projects: A Wiley Tech Brief (Technology Briefs Series Book24) by Jan Sandred
2. Open Source: Technology and Policy By Fadi P. Deek and James A.M .McHugh,Cambridge University Press.
3. Ubuntu 20.04 Essentials: A Guide to Ubuntu 20.04 Desktop and Server Editions Ubuntu
4. 20.04 Essentials: A Guide to Ubuntu 20.04 Desktop and Server Editions
5. Beginning Git and GitHub: A Comprehensive Guide to Version Control, Project Management, and Teamwork for the New Developer Beginning Git and GitHub: A Comprehensive Guide to Version Control, Project Management, and Teamwork for the New Developer, by Tsitoara.

Walchand Institute of Technology, Solapur

T.Y. B. Tech. (Electronics & Telecommunication Engineering), Semester-VI

21ETU6MP6L : Hardware Mini Project

Teaching Scheme:
Practical: 2hrs/week, 1 credit

Examination Scheme:
ICA: 25 Marks

This course is introduced to enable students to apply the knowledge and skills learnt in various courses to solve/implement predefined practical problem. The Project work imparts learning additional skills to develop the ability to define, design, analyze and implement solutions for the given problem and lead to its accomplishment with proper planning.

Course Prerequisite:
Student shall have knowledge of basic circuit designing, testing, soldering.

Course Objectives:
1. To practice acquired knowledge within the chosen area of technology for project development.
2. To plan and execute a Mini Project with team.
3. To build electronic hardware by learning PCB artwork design, simulation, soldering techniques, testing and troubleshooting etc.
4. To prepare a technical report based on the Mini project.

Course Outcomes:
At the end of the course, students will be able to-
1. Practice acquired knowledge within the chosen area of technology for project development.
2. Plan and execute a Mini Project with team.
3. Build electronic hardware by learning PCB artwork design, simulation, soldering techniques, testing and troubleshooting etc.
4. Prepare a technical report based on the Mini project.

Guidelines for project implementation:
1. Project group should be not more than 3 students per group.
2. Domains for projects may be based on a particular application from the following, but not limited to:
    i. Instrumentation and Control Systems
    ii. Electronic Communication Systems
    iii. Biomedical Electronics
    iv. Power Electronics
    v. Audio, Video Systems
    vi. Embedded Systems
    vii. Mechatronics Systems
    viii. Internet of Things
3. Week 1 & 2: Formation of groups, searching of an application-based hardware project
4. Week 3 & 4: Finalization of Mini project & Distribution of work.

5. Week 5 & 6: PCB artwork design using an appropriate EDA tool & Simulation.
6. Week 7 & 8: Procurement of electronic components for the project & PCB manufacturing.
7. Week 9, 10 & 11: Hardware assembly, testing, fabrication
8. Week 12: Demo, Group presentation & report submission

Internal Continuous Assessment:

1. The seminar shall consist of the Literature Survey, Market survey, Basic project work and applications of Mini project.
2. Seminar Assessment shall be based on Innovative Idea, Presentation skill, depth of understanding, Applications, Future Scope and Individual Contribution.
3. A certified copy of seminar/ project report shall be required to be presented at the time of final submission.

Note: # The Practical oral exam of the Mini Project will be included in the Practical oral exam of the Embedded System Design

Text Books:

1. Thomas C Hayes, Paul Horowitz, ―The Art of Electronics, Newens Publication
2. Jim Williams (Editor) ― Analog Circuit Design: Art, Science and Personalities, EDN series for Design Engineers
3. M Ashraf Rizvi ― Effective Technical Communication, Tata McGraw Hill Education Pvt. Ltd.

Reference Books:

1. Robert Boylested, ― Essentials of Circuit Analysis‖, PHI Publications
2. Meenakshi Raman, Sangeeta Sharma ― Technical Communication, Principles and Practice, Oxford University Press
3. A.E. Ward, Angus ― Electronic Product Design, Stanley Thornes Publishers, UK.
4. C Muralikrishna, Sunita Mishra, ― Communication Skills for Engineers, Pearson