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Department of Electronics and Communication Engineering

Bhagat Phool Singh Mahila Vishwavidyalaya, Khanpur Kalan (Sonepat), Haryana-131305

(A state university established by govt. of Haryana vides Act no. 31 of 2006)

www.bpswomenuniversity.ac.in

Course Structure for B. Tech Fifth Semester (Third Year)									
S. No	**Code**	**Course Title**	**Hrs/Week**			**Total Credits**	**Internal Marks**	**External Marks**	**Total Marks**
			L	**T**	**P**				
Subjects									
1.	ECL-351	Linear Integrated Circuits	3	0	0	3	20	80	100
2.	ECL-353	Digital Signal Processing	3	0	0	3	20	80	100
3.	ECL-355	Microwave Theory and Techniques	3	0	0	3	20	80	100
4.	ECL-357	Electromagnetic Waves & Propagation	3	0	0	3	20	80	100
5.	*	Program Elective-I	3	0	0	3	20	80	100
6.	**	Open Elective-I	3	0	0	3	20	80	100
7.	**BSC-234#**	**#Foreign Language**	**3**	**0**	**0**	**0**	**10**	**40**	**50#**
Labs									
8.	ECP-351	Linear Integrated Circuits Lab	0	0	2	1	10	40	50
9.	ECP-353	Digital Signal Processing Lab	0	0	2	1	10	40	50
10.	ECP-357	Community Service Oriented Project	0	0	2	1	10	40	50
11.	IPT-359	Professional Training Assessment– I	0	0	0	1	50	0	50
12.	**HSMC-351#**	**#Non-Verbal Reasoning/ #Generic Open Elective**	**2**	**0**	**0**	**0**	**50**	**0**	**50#**
Total			**23**	**0**	**6**	**22**	**200**	**600**	**800**

Note: 1. **#Foreign Language (BSC-234) & #Non-Verbal Reasoning/ #Generic Open Elective (HSMC-351)** shall be non-credit, mandatory, and qualifying paper. The marks of the same will not be counted in grand total and towards award of degree.

2. Students may opt Generic Open Elective course from CBCS offered by another department.

3. All Professional Training will be done in the summer break in the previous year and the assessment for the same will be done in the first four weeks of the opening of the academic session by the department in the next semester.

4. Students may opt NSS/NCC as per their choice for community service towards social responsibility.

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*PROGRAM ELECTIVE-I		** OPEN ELECTIVE-I	
Code	**Subject**	**Code**	**Subject**
ECEL-351	Wireless and Mobile Communication	OEL-351	Optimization Techniques and Application
ECEL-353	CMOS Design	OEL-353	Cyber Law and Security
ECEL-355	Information Theory and Coding	OEL-355	Marketing Management and HRM
ECEL-357	Internet of Things & Application	OEL-357	Remote Sensing & GIS
******	MOOC / NPTEL Course	******	MOOC / NPTEL Course

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Linear Integrated Circuits

ECL-351
L T P
3 0 0

Total Credits: 3
Internal Marks: 20
External Marks: 80
Total Marks: 100

Course Objective: The objective of this course is:

- To introduce the basic building blocks of linear integrated circuits.
- To impart adequate knowledge and uses for linear integrated circuits such as the 741 OP-AMP, 311 Comparator, and 555 timer.
- Recognize and make use of the DC & AC limitations of OP-AMPS.
- To teach the linear and non - linear applications of operational amplifiers.
- To introduce the theory and applications of analog multipliers and PLL.

Pre-requisite: - Basic knowledge of Electronics Engineering.

Course Outcome: At the end of the course, students will be able to:

- Understand the fundamentals of integrated circuits and designing electronic circuits using it.
- Develop the skill of analysis and design of various circuits using operational amplifiers.
- Develop design skills to design various circuits using different data conversion systems.
- Able to design simple circuits like amplifiers using op-amps, waveform generating circuits, filter circuits for particular application.

Content

Unit – I	**10 Hours**
Basics of Operational Amplifier: Introduction, ICs-Analog, Digital, Hybrid, Op-Amp, Op-Amp models (Ideal & Practical), Block schematic of OP amp, Differential amplifier-dual input balanced output and unbalanced output, Analysis, AC and DC performance parameters of op-amp, ideal op amp, Equivalent circuit of op amp, Circuit simulation and problem solving using PSPICE.	
Unit – II	**10 Hours**
Compensation and Feedback in Op-Amp: Bias current and offset-drift-compensation, Use of offset minimizing resistor and its design, Frequency response of Op amp, stability of op amp, frequency compensation, Slew rate and its effect; Open loop and closed loop configuration: Different feedback configurations-Voltage series feedback and voltage shunt feedback, concept of virtual ground, Differential amplifiers with one op amp and 3 op amps, typical data sheet 741, Circuit simulation and problem solving using PSPICE.	
Unit – III	**12 Hours**
Linear &Non-Linear applications of Op-Amp: Introduction, Linear applications of Op-Amp, Inverting and Non-Inverting amplifiers, Difference amplifier, voltage follower, sign changer, scale changer, summing, averaging amplifiers, adder-sub tractor, Integrator and Differentiator, Instrumentation amplifier, V to I and I to V Converters. **Non-Linear Applications of Op-Amp:** Comparators, Log and Anti Log amplifiers, Precision rectifiers, Clippers, and Clampers. **Active filters &waveform generators:** Comparison between passive and active filters, First Order and Second Order Active Low Pass, High Pass and Band Pass Filters- narrow band, wide	

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band, Band Reject- narrow band and wide band and all pass filters. waveform generators, Principle of operation and types of Oscillators- RC, Wien Bridge Triangular and Square wave Generators.	
Unit – IV	**10 Hours**
D-A and A-D converters: Introduction, Basic DAC Techniques – Weighted Resistor type, R-2R Ladder type, Inverted R-2R Type. **Timers and Phase Locked Loops:** Introduction to 555 timer, functional diagram, Sample & Hold Circuits, Monostable and Astable operations and its applications, Schmitt trigger, **PLL:** operation of basic PLL, description of Individual blocks of 565, 566 VCO.	
Suggested Text Books	
1.	Linear Integrated Circuits, 3rd Edition, D. Roy Chowdhury, New Age International (p) Ltd, 2008.
2.	Op-Amp & Linear ICs, Ramakanth A. Gayakwad, PHI, 1987.
3.	Operational Amplifiers with linear Integrated Circuits, 4th Edition, William D. Stanley, Pearson Education India, 2009.
4.	Operational Amplifiers and Linear Integrated circuits, R. F. Coughlin & F. F. Driscoll, PHI, 1996.

Note: Nine questions will be set in all by the examiners taking two questions from each unit and one question containing short answer type questions from entire syllabus. Students will be required to attempt five questions, selecting one question from each unit. Question No.1 is compulsory which is from entire syllabus.

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Digital Signal Processing

ECL-353 **Total Credits: 3**
L T P **Internal Marks: 20**
3 0 0 **External marks: 80**
Total Marks: 100

Course Objective: The objective of this course is:

- To provide the knowledge and basic concepts of different aspects of digital signal processing, applications, advantage, Discrete Fourier Transform, Fast Fourier Transform algorithms techniques.
- To learn the realization of digital filters, IIR and FIR structure, and finite precision effect and to understand their importance.
- To acquire fundamental concepts of multirate signal processing.
- To learn the different types of DSP processors available and their architecture.

Pre-requisite: Basic knowledge of Signals and Systems.

Course Outcomes: At the end of the course, students will be able to:

- To understand the frequency domain analysis of discrete time signal.
- To understand the need for Discrete Fourier Transform, its properties; Fourier Transform and using these in various applications.
- To understand the various forms for realization of digital FIR and IIR filters.
- To design and analyze different types of FIR & IIR digital filters for various applications.
- To understand the effects of finite register length in FIR and IIR filter design.
- Gain knowledge on different types of DSP processors available and their architecture.

Content

Unit – I	**12 Hours**
Sampling of Continuous Time Signals: Introduction of discrete signals and systems, Limitations of analog signal processing, advantages of digital signal processing, Sampling theorem, frequency domain representation, reconstruction of band limited signal from its samples, discrete time processing of continuous time signals, changing the sampling rate using discrete time processing, Applications of DSP. **Discrete Fourier Transform:** Discrete-Time Fourier Transform, DFT as a linear transformation–relationship to other transforms–properties of DFT–Linear filtering methods based on DFT–frequency analysis of signals using DFT- Efficient computations of the DFT-FFT algorithms–direct computation, divide-and-conquer approach, radix-2, radix-4 and split radix algorithms–implementation of FFT algorithms–Applications of FFT.	
Unit – II	**10 Hours**
Structure for Discrete Time Systems: Solution of difference equations of digital filters, System function, stability criterion, frequency response of stable systems; Realization–direct, canonic, cascade and parallel forms, lattice and transposed structures, signal flow graph representation. **Finite Precision Effects**: Fixed point and floating rrepresentation, errors due to rounding, truncation, quantization of filter coefficients, round off effects in digital filters, limit cycle oscillations, scaling for overflow prevention, State space analysis of discrete filters.	
Unit-III	**10 Hours**
IIR Digital Filters: Fundamentals, analog filter approximations–Butterworth and Chebshev, design of IIR filters from analog filters, bilinear transformation method, step and impulse	

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invariance techniques, spectral transformations. **FIR Digital Filters:** Characteristics, frequency response, Design of FIR filters using window techniques, Frequency sampling technique, Comparison of IIR & FIR filters.	
Unit-IV	**10 Hours**
Multi Rate Signal Processing: Decimation, interpolation, sampling rate conversion, filter design and implementation for sampling rate conversion, Introduction, and applications of adaptive filters. **DSP Processors:** Introduction to programmable DSPs: Multiplier and multiplier accumulator (MAC), Modified bus structures and memory access schemes in DSPs multiple access memory, multiport memory, VLSI Architecture, pipelining, special addressing modes, On-chip peripherals.	
Suggested Text Books	
1.	Digital Signal Processing, 4th Edition, J. G. Proakis and D. G. Manolakis, Prentice Hall, 2007.
2.	Digital Signal Processing, 1st Edition, A. V. Oppenheim and R. W. Schafer, Pearson Education, 2015.
3.	Fundamentals of Digital Signal Processing, Robert J. Schilling, L. Harris.
4.	Digital Signal Processing, S. Salivahanan et al., TataMcaGraw Hill, 2000.
5.	Principles of Signal Processing and Linear Systems, 1st Edition, B.P. Lathi, Oxford International Publication, 2009.
6.	Digital Signal Processing: A Computer Based Approach, 4th Edition, S. K Mitra, TMH, 2011.
7.	Digital Signal and Image Processing, 1st Edition, Tamal Bose, John Wiley & Sons, 2003.
8.	Digital Signal Processing, Thomas J. Cavicchi, John Wiley, 2004.
9.	Digital Signal Processors, Architecture, Programming & Applications, 4th reprint, B. Venkata Ramani, M. Bhaskar, TMH, 2004.
Other Useful Resources: Links to NPTEL course contents	
1.	https://nptel.ac.in/courses/117102060/
2.	https://nptel.ac.in/courses/117102060/1
3.	https://nptel.ac.in/courses/117102060/12
4.	https://nptel.ac.in/courses/117102060/28
5.	https://nptel.ac.in/courses/117102060/4

Note: Nine questions will be set in all by the examiners taking two questions from each unit and one question containing short answer type questions from entire syllabus. Students will be required to attempt five questions, selecting one question from each unit. Question No.1 is compulsory which is from entire syllabus.

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Microwave Theory and Techniques

ECL-355 **Total Credits: 3**
L T P **Internal Marks: 20**
3 0 0 **External Marks: 80**
Total Marks: 100

Course Objective: The objective of this course is:

- Understand the functioning and behavior of devices at microwave frequencies.
- Learn to perform microwave measurements using S parameters.
- Understand the working of various microwave passive and active devices and circuits.
- Understand the basic ideas about the characteristics and applications of microwave components.
- Understand the basic concept of different types of Radar systems.

Pre-requisite: Fundamental of electromagnetic theory.

Course Outcomes: At the end of the course, students will be able to:

- Familiarize with microwave frequencies and components.
- Perform and analyze microwave measurements using S parameters.
- Study the working of various microwave passive and active devices and circuits along with their characteristics and applications.
- Study the working principle of different types of Radar systems.

Content

Unit- I	**10 Hours**
Introduction: Microwave frequencies, standard frequency bands, applications of microwaves, behavior of circuits at conventional and microwave frequencies. **Microwave Tubes:** Limitations of conventional tubes, construction, operation and characteristic of Klystron amplifier, Reflex klystron, TWT, BWO and Magnetron.	
Unit- II	**12 Hours**
Mathematical Model of Microwave Transmission: Concept of mode, features of TE, TM and TEM modes, propagation of rectangular wave guide in TE & TM mode, TEM mode in rectangular wave guide, characteristic impedance, circular waveguides. **Microwave Components:** comparison with transmission lines, scattering parameters, wave-guide Tees, directional coupler, circulator and isolator, corner, bend, twist, attenuators, cavity resonator, phase shifters, wave meter.	
Unit- III	**10 Hours**
Microwave Devices and Circuits: Passive and active microwave devices, strip lines, micro strip lines, microwave transistors and integrated circuits, Varactor diode, Step-recovery diode, Tunnel diode, Gunn diode, IMPATT diode, TRAPATT diode, PIN diode, Schottky Barrier diodes, MASER, and parametric amplifiers.	
Unit- IV	**10 Hours**
Microwave Measurements: Description of Microwave test bench, different blocks and their features, power measurement, impedance measurement, measurement of frequency and wavelength, measurement of unknown loads, VSWR measurement. **Radar Systems:** Fundamentals, Radar frequencies, block diagram and operation, radar range equation, prediction of range performance, pulse repetition frequency and range ambiguities, MTI and Pulse Doppler Radar, CW Radar, FMCW Radar, Tracking Radar, applications of	

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Radar.	
Suggested Text Books	
1.	Microwave devices and Radar Engineering, M. Kulkarni, Umesh Publication.
2.	Microwave Devices and Circuits, Samuel Y Liao, Prentice Hall India.
3.	Electronic and Radio Engineering, 4th Edition, F.E. Terman, McGraw-Hill, 1955.
4.	Microwave Engineering, Sanjeev Gupta, Khanna Publication.
5.	Microwave Technology, Dennis Roddy, PHI.

Note: Nine questions will be set in all by the examiners taking two questions from each unit and one question containing short answer type questions from entire syllabus. Students will be required to attempt five questions, selecting one question from each unit. Question No.1 is compulsory which is from entire syllabus.

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Electromagnetic Waves & Propagation

ECL-357
L T P
3 0 0

Total Credits: 3
Internal Marks: 20
External Marks: 80
Total Marks: 100

Course Objective: The students will be able to:

- Understand the functioning and behavior of devices at microwave frequencies.
- Learn to perform microwave measurements using S parameters.
- Understand the working of various microwave passive and active devices and circuits.
- Understand the basic ideas about the characteristics and applications of microwave components.
- Understand the basic concept of different types of Radar systems.

Pre-requisite: Fundamental of Electromagnetic Theory.

Course Outcomes: After completion of this course, student will be able to:

- Familiarize with microwave frequencies and components.
- Perform and analyze microwave measurements using S parameters.
- Study the working of various microwave passive and active devices and circuits along with their characteristics and applications.
- Study the working principle of different types of Radar systems.

Content

Unit – I	**10 Hours**
Transmission Lines: Introduction, Transmission line parameters, Transmission line equivalent circuit, Transmission line equations and their solutions in their phasor form, input impedance, standing wave ratio, Transmission of finite length-half wave, quarter wave transmission line, Smith chart, Illustrative Problems.	
Unit – II	**12 Hours**
Coulomb's Law, Electric Field Intensity – Fields due to Different Charge Distributions, Electric Flux Density, Gauss Law and Applications, Electric Potential, Relations Between E and V, Maxwell's Two Equations for Electrostatic Fields, Continuity Equation, Poisson's Equations, Capacitance – Parallel Plate, Biot-Savart's Law, Ampere's Circuital Law and Applications, Magnetic Flux Density, Maxwell's Two Equations for Magnetostatic Fields, Forces due to Magnetic Fields, Ampere's Force Law.	
Unit – III	**10 Hours**
Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves – Definitions, Relation between E & H, Sinusoidal Variations, Wave Propagation in Lossless and Conducting Media, Conductors & Dielectrics – Characterization, Wave Propagation in Good Conductors and Good Dielectrics, Polarization. Reflection and Refraction of Plane Waves.	
Unit- IV	**10 Hours**
Wave Propagation: Propagation Mechanism- Reflection, refraction, and Transmission, Scattering and diffraction. Propagation Model- Path Loss, Free space loss, Plane earth Loss. Noise Modeling. Modes of propagation- Ground wave Propagation, Sky wave Propagation, Space wave, Tropospheric Refraction.	
Suggested Text Books	
1.	Microwave devices and Radar Engineering, M. Kulkarni, Umesh Publication.

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2.	Microwave Devices and Circuits, Samuel Y Liao, Prentice Hall India.
3.	Electronic and Radio Engineering, 4th Edition, F.E. Terman, McGraw-Hill, 1955.
4.	Microwave Engineering, Sanjeev Gupta, Khanna Publication.
5.	Microwave Technology, Dennis Roddy, PHI.

Note: Nine questions will be set in all by the examiners taking two questions from each unit and one question containing short answer type questions from entire syllabus. Students will be required to attempt five questions, selecting one question from each unit. Question No.1 is compulsory which is from entire syllabus.

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Foreign Language I (German)

BSC-234
L T P
3 0 0

Total Credits: 3
Internal Marks: 10
External Marks: 40
Total Marks: 50

Course Objective: The objective of this course is:

- To enable the learners to listen and understand the spoken German language which uses the elementary spoken structures.
- To enable the learners to speak and engage in simple dialogues in German.

Pre-requisite: None

Course Outcomes: After completion of this course, student will be able to:

- Familiarize with German terms used in communication.
- Listen and understand the spoken German language.
- Speak and engage in simple dialogues in German

Content

Communicative German –1A	One semester / 45 hours / 3 hours per Week
Suggested Text Books	
1.	Tangram Aktuell Niveau AI/1 Lektion 1-4, Lektionen 1&2, Max Heuber Verlag, Ismaning, 2005, [Published and distributed in India by German book Depot Delhi].
2.	Sprachkurs Deutsch I &2, Moritz Diesterweg Verlag, Frankfurt am Main, 1989, [Published and distributed in India by Goyal Saab Publishers & Distributors, New Delhi 1997]
3.	Deutsche Sprachlehre fuer Auslaender, Max Heuber Verlag, Muenchen, 1967[Published and distributed in India by Goyal Saab Publishers & Distributors, New Delhi 1997]
4.	Schueler Duden Grammatik, Bibliographisches Institut & F.A Brockhaus AG, Mannheim, 1990.

Note: Evaluation consists of two aspects, namely continuous evaluation, and final examinations. Total Marks for each paper is 50 and the ratio of continuous evaluation (internal) and final Examination is 20:80.

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Linear Integrated Circuit Lab

ECP-351 **Total Credits: 1**
L T P **Internal Marks: 10**
0 0 2 **External Marks: 40**
Total Marks: 50

Course Objectives: The objective of this course is:

- To create ability among students about to design and implement the electronic circuits to gain knowledge on performance of the circuit and its application
- To analyze and simulate various linear and non - linear applications of operational amplifiers.

Pre-requisite: Basic knowledge of Electronics Engineering.

Laboratory Outcomes: At the end of the course, students will be able to:

- Understand the fundamentals of integrated circuits and designing of electronic circuits.
- Able to design simple circuits like amplifiers using op-amps, waveform generating circuits, filter circuits for particular application.

List of Experiments

1.	To study of OP AMPs - IC741, IC555, IC565, IC566, IC1496 functioning parameters and specifications.
2.	Analysis of measurement of op-amp parameters - CMRR, slew rate, open loop gain, input, and output impedances.
3.	To study OP AMP Applications - Adder, Subtractor, Comparator Circuits.
4.	Design and analysis of Integrator and Differentiator Circuits using IC 741.
5.	Design and analysis of Instrumentation amplifier - gain, CMRR and input impedance.
6.	Design and analysis of Active Filter applications–LPF, HPF, BPF, Band Reject (Wideband) and Notch Filters.
7.	Design and analysis of Function Generator using OP AMPs.
8.	Design and analysis of IC 741 Oscillator Circuits – Phase Shift and Wien Bridge Oscillators.
9.	Analysis of IC 555 Timer – Stable, Bistable & Monostable Operation Circuit.
10.	Analysis of IC 565 – PLL Applications.
11.	Analysis of 14IC 566 – VCO Applications.
Suggested Text Books	
1.	Linear Integrated Circuits, 3rd Edition, D. Roy Chowdhury, New Age International (p) Ltd, 2008
2.	Op-Amp & Linear ICs, Ramakanth A. Gayakwad, PHI, 1987
3.	Operational Amplifiers with linear Integrated Circuits, 4th Edition, William D. Stanley, Pearson Education India, 2009
4.	Operational Amplifiers and Linear Integrated circuits, R. F. Coughlin & F. F. Driscoll, PHI, 1996

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Note: At least 10 experiments are to be performed by students in the semester. Out of which at least eight experiments should be performed from the above list, remaining two experiments may either be performed from the above list or designed and set by the concerned faculty as per the scope of the syllabus.

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Digital Signal Processing Lab

ECP-353 **Total Credits: 1**
L T P **Internal Marks: 10**
0 0 2 **External Marks: 40**
Total Marks: 50

Course Objective: The objective of this course is:

- To nurture skills among students towards simulation of digital signal processing fundamentals using textual and graphical script implementation through open source/commercial mathematical application package.

Pre-requisite: Fundamental of signal and system, programming.

Laboratory Outcomes: At the end of the course, students will be able to:

- To learn generation of different kind of discrete signals and waveforms using textual and graphical script implementation.
- To understand about frequency response / spectrum of signals and systems.
- To foster ability to design, analyze and implement digital filters using textual and graphical script implementation.
- To have an idea about the functions of the Signal processing tool box and use the same to analyse simple signals and systems.

Textual and graphical script implementation of below tabulated experiments is carried out through open source/commercial mathematical application package Matlab, Simulink and its associated toolbox/Scilab, Xcos /LabView/Python.

List of Experiments

1.	Write a script to simulate to generate various basic signals (unit step, impulse, ramp, exponential, sine, and cosine).
2.	Write a script to simulate to perform discrete convolution & correlation.
3.	Write a script to simulate linear convolution and circular convolution.
4.	Write a script to to compare direct realization of IIR digital filter.
5.	To develop textual/ graphical script implementation for computing parallel realization of IIR digital filter.
6.	To develop textual and graphical script implementation for computing cascade realization of IIR digital filter.
7.	To develop a program for computing inverse Z-transform of a rational transfer function.
8.	To design a program to compare direct realization values of IIR digital filter.
9.	To design FIR filter (LP/HP) using windowing technique: rectangular window, triangular window, and Kaiser Window
10.	To compute power density spectrum of a sequence.
11.	To find the FFT of given 1-D signal and plot.
12.	To understand stability test.
13.	To understand sampling theorem.
14.	To design analog filter (low-pass, high pass, band-pass, band-stop).
15.	To design digital IIR filters (low-pass, high pass, band-pass, band-stop).

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16.	Study of digital signal processing kit (TMS/ADSP).
17.	Study of digital signal processing toolbox.
18.	Implementation of FIR/digital filters using DSP kit.
19.	Getting familiar with LabView Environment.
20.	Digital FIR/IIR filters design using LabView.
Suggested Text Books	
1.	Digital Signal Processing, S. Salivahanan et al., Tata McaGraw Hill, 2000.
2.	Digital Signal Processing, 1st Edition, A. V. Oppenheim and R. W. Schafer, Pearson Education, 2015.
3.	Fundamentals of Digital Signal Processing, Robert J. Schilling, L. Harris.

Note: At least 10 experiments are to be performed by students in the semester. Out of which at least eight experiments should be performed from the above list, remaining two experiments may either be performed from the above list or designed and set by the concerned faculty as per the scope of the syllabus.

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Community Service Oriented Project

ECP-357 **Total Credits: 1**
L T P **Internal Marks: 10**
0 0 2 **External Marks: 40**
Total Marks: 50

Course Objective: The objective of this course is:

- Recognize and understand the importance of social responsibility, global environmental problems, sustainable life styles and community in which they work.
- Utilize their knowledge in finding practical solution to individual and community problems.

Pre-requisite: Basic knowledge of Electronics.

Course Outcomes: At the end of the course, students will be able to:

- Explore problems related to community, global environment, sustainable life styles in which they work.
- Demonstrate skill and knowledge of current information and technological tools and techniques specific to the professional field of study.

Each student will identify issues and challenges pertaining to the society and devise a feasible solution from the domain of Electronics Engineering / ICT background. Students may visit to the Villages / Hospitals / Towns / cities / fields etc. to identify the problem and survey the literature for a feasible solution. The work will be carried independently in V Semester. The student is encouraged to take up real life problems leading to innovative model building.

Note: The evaluation of Community Service Oriented Project is carried out throughout the semester in the analogy of internal assessment. The continuous assessment may be done at the Departmental level.

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Professional Training Assessment– I

IPT-359 **Total Credits: 1**
L T P **Internal Marks: 50**
0 0 0 **Total Marks: 50**

Course Objective: The objective of this course is:

- To increase an individual's skill in one or more areas of expertise.
- To improve the individual's level of awareness and understanding of the engineering workplace environment.
- To increase an individual's motivation to perform their job well.

Pre-requisite: None

Course Learning Outcome: At the end of the course, students will be able to:

- Perceive a better understanding of the engineering workplace environment.
- Acquire skills and adapt competencies necessary for a professional career.
- Value interpersonal and human relationship skills.
- Build the foundation for industrial internship/ major project/ startup.

Syllabus:

The Professional Training/Internship is aimed at providing an opportunity to the students to gain practical experience in the industries/research institutes for a period of 4 to 6 weeks during the summer break after 4th semester. During the Professional Training/Internship, the student will have the exposure to industrial / research environment/startup which will help them to develop the competencies required for a professional career, interpersonal and human relationship skills. The assessment for the same will be done in the first four weeks of the opening of the Academic Session by the department in the next semester. Every student will prepare a technical report of the training undertaken and submit to the department. The presentation/viva-voce of the students will be conducted by a committee consisting of Chairperson of the Department, Training and Placement Officer and Class Coordinator. The evaluation of the student for Professional Training/Internship will be carried out through presentation/viva-voce taken by the committee of examiners.

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Non-Verbal Reasoning

HSMC-351 **Total Credits: 0**
L T P **Internal Marks: 50**
1 1 0 **External Marks: 00**

Course Objective: The objective of this course is:

- To create awareness about spatial aptitude and its uses in Engineering.
- To prepare and explain the fundamentals related to various possibilities and probabilities related to Non- Verbal Reasoning.
- To critically evaluate numerous possibilities related to puzzles.
- To impart right knowledge, skill and aptitude to face competitive examination.

Pre-requisite: None

Course Outcomes: At the end of the course, students will be able to:

- Use their logical thinking and analytical abilities to solve Non- Verbal Reasoning questions from company specific and other competitive tests.
- Understand and solve puzzle related questions from specific and other competitive test.

Content

Unit – I	**12 Hours**
Spatial Aptitude: Transformation of shapes: translation, rotation, scaling, mirroring, assembling, and grouping.	
Unit – II	**10 Hours**
Paper folding , cutting, unfolding ,dot situation and patterns in 2 and 3 dimensions.	
Unit – III	**10 Hours**
Figure Series, Odd one Out Figure, Figure Analogy, Counting Number of Figures, Figure Matrix.	
Unit – IV	**8 Hours**
Non verbal Classification, Non Verbal Series and Non Verbal Analogy.	
Suggested Text Books	
1.	A Modern Approach to Verbal & Non-Verbal, R.S. Aggarwal.
2.	A New Approach to Reasoning Verbal & Non-Verbal, Indu Sijwali.
3.	Non-Verbal Reasoning, Srivastava, Vijay Shankar.
4.	Shortcuts in Reasoning (Verbal, Non-Verbal, Analytical & Critical) for Competitive Exams 2nd Edition, Disha Experts.

Note: Nine questions will be set in all by the examiners taking two questions from each unit and one question containing short answer type questions from entire syllabus. Students will be required to attempt five questions, selecting one question from each unit. Question No.1 is compulsory which is from entire syllabus.

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Wireless and Mobile Communication

ECEL-351 **Total Credits: 3**
L T P **Internal Marks: 20**
3 0 0 **External Marks: 80**
Total Marks: 100

Course Objective: The objective of this course is:

- Understand the basics of wireless mobile communication and cellular concept.
- Understand the limitations and features of previous generations.
- Understand the methods for channel allocation and improving capacity of network.
- Impart knowledge about multiple access techniques like TDMA, FDMA, CDMA and SDMA.
- Understand various path loss models and effect of fading on signal.
- Understand various wireless networks and standards.

Pre-requisite: Basic knowledge of communication.

Course Outcomes: At the end of the course, students will be able to:

- Familiarize with the basics of wireless mobile communication and cellular concept.
- Compare the limitations and features of previous generations.
- Analyze the methods for channel allocation and improving capacity of network.
- Compare different multiple access techniques like TDMA, FDMA, CDMA and SDMA.
- Analyze various path loss models and effect of fading on signal.
- Study various wireless networks and standards.

Content

Unit – I	**10 Hours**
Fundamentals of Mobile Communication: Evolution of mobile communications, examples of wireless communication systems, generation of cellular networks, cellular concept, frequency management and channel assignment, handover concept, co-channel and adjacent channel interference, interference reduction techniques and methods to improve cell coverage. **GSM:** Fundamentals, GSM architecture details, GSM subsystems, GSM logical channels, call flows in GSM.	
Unit – II	**12 Hours**
Mobile Radio Propagation: Free space propagation model, reflection, diffraction, scattering, model for path loss, outdoor propagation models, indoor propagation models, small scale fading and multipath propagation, multipath delay spread, doppler spread, coherence bandwidth, coherence time, equalization, RAKE demodulator, diversity techniques for wireless systems.	
Unit – III	**10 Hours**
Multiple Access Techniques: Introduction to Multiple Access, FDMA, TDMA, spread spectrum multiple access, space division multiple access, synchronization of spread spectrum systems, packet radio protocols, CSMA, pure and slotted ALOHA protocols, CDMA, capacity of a cellular CDMA systems.	
Unit – IV	**10 Hours**
Wireless Networking: Introduction, difference between wireless and fixed telephone networks, development of wireless networks, fixed network transmission hierarchy, traffic routing in wireless networks, wireless data services, ISDN, Wi-Fi, Wi-Max.	

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Intelligent Cell Concept and Application: Intelligent cell concept, applications of intelligent micro-cell systems, in-building communication, CDMA cellular radio networks, advanced intelligent networks.	
Suggested Text Books	
1.	Wireless Communications Principles and Practice, 2nd Edition, T.S. Rappaport, PHI, 2002.
2.	Mobile Cellular Telecommunication, W.C.Y. Lee, McGraw Hill.
3.	Mobile Communications, Jochen Schiller, Pearson.
4.	Principle and Application of GSM, 5th Edition, V. K. Garg, J. E. Wilkes, Pearson Education, 2008.
5.	Mobile Cellular Telecommunications Analog and Digital Systems, 2nd Edition, William C. Y. Lee, TMH, 1995.
6.	A GSM system Engineering, Asha Mehrotra, Artech House Publishers, Bosten.

Note: Nine questions will be set in all by the examiners taking two questions from each unit and one question containing short answer type questions from entire syllabus. Students will be required to attempt five questions, selecting one question from each unit. Question No.1 is compulsory which is from entire syllabus.

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CMOS Design

ECEL-353
L T P
3 0 0

Total Credits: 3
Internal Marks: 20
External Marks: 80
Total Marks: 100

Course Objectives: The objective of this course is:

- To learn and skill about Design different CMOS circuits using various logic families along with their circuit layout.
- To learn and skill about use tools for VLSI IC design.

Pre-requisite: Basic knowledge of semiconductor electronics, transistor, and logic.

Course Outcome: At the end of the course, students will be able to:

- Understand the fundamentals of CMOS Design.
- Design different CMOS circuits using various logic families along with their circuit layout.
- Use EDA tools for VLSI IC design.

Contents

Unit – I	**12 Hours**
Evolution of VLSI technology trends in VLSI, MOS transistor theory, MOS structure, enhancement & depletion transistor, threshold voltage, MOS device design equations, MOSFET scaling, Fabrication of MOSFET, CMOS fabrication process steps, twin well process & latch up problem.	
Unit – II	**10 Hours**
Static and Dynamic Characteristics of CMOs inverter, Power dissipation, Logical effort, Transistor as a switch, Inverter characteristics, Integrated Circuit Layout: Design Rules, Parasitic.	
Unit – III	**10 Hours**
Delay: RC Delay model, linear delay model, logical path efforts. Power, interconnect, and Robustness in CMOS circuit layout.	
Unit – IV	**10 Hours**
Combinational Circuit Design: CMOS logic families including static, dynamic and dual rail logic. Sequential Circuit Design: Static circuits. Design of latches and Flip-flops.	

Suggested Text Books	
1.	John P. Uyemura, Introduction to VLSI Circuits, Wiley India Pvt. Ltd., 2012.
2.	N.H.E. Weste and D.M. Harris, CMOS VLSI design: A Circuits and Systems Perspective, 4thEdition, Pearson Education India, 2011
3.	B. Razavi, Design of Analog CMOS Integrated Circuits, Mcgraw-Hill Education, 2002.
4.	Philip Allen, and Douglas Holberg, CMOS Analog Circuit Design, Oxford University Press, 2002

Note: Nine questions will be set in all by the examiners taking two questions from each unit and one question containing short answer type questions from entire syllabus. Students will be required to attempt five questions, selecting one question from each unit. Question No.1 is compulsory which is from entire syllabus.

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Information Theory and Coding

ECEL-355 **Total Credits: 3**
L T P **Internal Marks: 20**
3 0 0 **External Marks: 80**
Total Marks: 100

Course Objective: The objective of this course is:

- To understand the concept of information
- To understand the limits of error free representation of information signals and the transmission of such signals over a noisy channel
- To design and analyze data compression techniques with varying efficiencies a per requirements
- To understand the concept of various theorems proposed by Shannon for efficient data
- To understand the concept of various theorems proposed by Shannon for efficient data compression and reliable transmission
- To have idea on the different coding techniques for reliable data transmission

Pre-requisites: A good understanding of probability theory is required. Knowledge of communication theory would be advantageous.

Course Outcomes: At the end of the course, students will be able to:

- Learn measurement of information and errors.
- Obtain knowledge in designing various source codes and channel codes
- Design encoders and decoders for block and cyclic codes
- Understand the significance of codes in various applications

Content

Unit – I	**12 Hours**
Introduction, measure of information, information content of message, Logarithmic measure of information, mathematical model of information, average information content of symbols in long independent sequences, average information content of symbols in long dependent sequences average and mutual information and Entropy, Markov Statistical Model of information sources, Entropy, and information rate of Mark off sources	
Unit – II	**10 Hours**
Source coding theorem, Kraft McMillan Inequality property, encoding of the source output, Shannon Fano codes, Huffman codes, arithmetic coding	
Unit – III	**10 Hours**
Communication channels, channel models, channel matrix, Joint Probability matrix, binary symmetric channel, system Entropies, mutual information, channel capacity, channel capacity of: Binary symmetric channel, Binary Erasure channel, Muroga's theorem	
Unit – IV	**10 Hours**
Description, generator, and Parity-check matrices, encoding, Syndrome computation and error detection, decoding, Cyclic Hamming codes, shortened cyclic codes, Error-trapping decoding for cyclic codes, majority logic decoding for cyclic codes, Code Tree, Trellis and state diagram, Viterbi Algorithm	
Suggested Text Books	
1.	Digital Communications, John G. Proakis, 5th Edition, TMH, 2008.
2.	Introduction to Error Control Codes, Salvatore Gravano, Oxford.
3.	Error Correction Coding – Mathematical Methods and Algorithms, Todd K. Moon, Wiley

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	India 2006.
4.	Information Theory, Coding and Cryptography, Ranjan Bose, 2nd Edition, TMH, 2009.

Note: Nine questions will be set in all by the examiners taking two questions from each unit and one question containing short answer type questions from entire syllabus. Students will be required to attempt five questions, selecting one question from each unit. Question No.1 is compulsory which is from entire syllabus.

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Internet of Things and Application

ECEL-357 **Total Credits: 3**
L T P **Internal Marks: 20**
3 0 0 **External Marks: 80**
Total Marks: 100

Course Objective: The objective of this course is:

- Understand the basics of Internet of Things and protocols.
- Learn application areas where Internet of Things can be applied.
- Understand the middleware for Internet of Things.

Pre-requisite: None.

Course Outcomes: At the end of the course, students will be able to:

- Familiarize with the fundamentals of Internet of Things and protocols.
- Demonstrate the open-source architecture of IoT.
- Demonstrate the smart application of IoT for industries.

Content

Unit – I	**10 Hours**
Introduction: Smart cities and IoT revolution, fractal cities, from IT to IoT, M2M and peer networking concepts, Ipv4 and IPV6, Software Defined Networks SDN, from Cloud to Fog and MIST networking for IoT communications, principles of Edge/P2P networking, protocols to support IoT communications, modular design and abstraction, security, and privacy in fog.	
Unit – II	**12 Hours**
Wireless sensor networks: Introduction, IOT networks (PAN, LAN, and WAN), Edge resource pooling and caching, client-side control and configuration, smart objects as building blocks for IoT, open-source hardware and embedded systems platforms for IoT, Edge/gateway, IO drivers, C Programming, multithreading concepts.	
Unit – III	**08 Hours**
Operating systems requirement of IoT: IoT environment, study of MBED, RIoT, and Contiki operating systems, Introductory concepts of big data for IoT applications.	
Unit – IV	**10 Hours**
Applications of IoT: Connected cars IoT Transportation, Smart Grid and Healthcare sectors using IoT, security and legal considerations, IT Act 2000, and scope for IoT legislation.	
Suggested Text Books/ References	
1.	Internet of Things- Hands on approach, A Bahaga, V. Madisetti, VPT publisher, 2014.
2.	Designing the Internet of Things, A. McEwen, H. Cassimally, Wiley, 2013.
3.	Getting started with Internet of Things, CunoPfister, Maker Media, 1st Edition, 2011.
4.	Internet of things, Samuel Greenguard, MIT Press, 2015.
Other Useful Resources: Links to course contents	
1.	http://www.datamation.com/open-source/35-open-source-tools-for-the-internet-ofthings1. html
2.	https://developer.mbed.org/handbook/AnalogIn
3.	http://www.libelium.com/50_sensor_applications/

Note: Nine questions will be set in all by the examiners taking two questions from each unit and one question containing short answer type questions from entire syllabus. Students will be required to attempt five questions, selecting one question from each unit. Question No.1 is compulsory which is from entire syllabus.

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Optimization Techniques and Application

OEL-351
L T P
3 0 0

Total Credits: 3
Internal Marks: 20
External Marks: 80
Total Marks: 100

Course Objective: The objective of this course is:

- Introduce various optimization techniques i.e classical, linear programming, transportation problem, simplex algorithm.
- Constrained and unconstrained optimization techniques for solving and optimizing an electrical and electronic engineering circuits design problems in real world situations.
- Explain the concept of Dynamic programming and its applications to project implementation.

Pre-requisite: Partial differentiation, Matrices.

Course Outcomes: At the end of the course, students will be able to:

- Understand the theory of optimization methods and algorithms developed for solving various types of optimization problems.
- Develop and promote research interest in applying optimization techniques in problems of Engineering and Technology.
- Apply the mathematical results and numerical techniques of optimization theory to concrete Engineering problems.
- Design and produce products and systems both economically and efficiently by using optimization techniques.

Content

Unit – I	**10 Hours**
Introduction and Classical Optimization Techniques: Statement of an Optimization problem, design vector, design constraints, constraint surface, objective function, objective function surfaces, classification of Optimization problems.	
Unit – II	**10 Hours**
Classical Optimization Techniques: Single variable Optimization, multi variable Optimization without constraints, necessary and sufficient conditions for minimum/maximum, multivariable Optimization with equality constraints, solution by method of Lagrange multipliers, Multivariable Optimization with inequality constraints, Kuhn – Tucker conditions.	
Unit – III	**12 Hours**
Linear Programming: Standard form of a linear programming problem, geometry of linear programming problems, definitions and theorems, solution of a system of linear simultaneous equations, pivotal reduction of a general system of equations, motivation to the simplex method, simplex algorithm. **Transportation Problem:** Finding initial basic feasible solution by north – west corner rule, least cost method, and Vogel's approximation method, testing for optimality of balanced transportation problems.	
Unit – IV	**12 Hours**
Unconstrained Nonlinear Programming: One dimensional minimization method, classification, Fibonacci method and Quadratic interpolation method. **Unconstrained Optimization Techniques:** Univariant method, Powell's method, and Steepest	

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Descent method.	
Suggested Text Books	
1.	Engineering Optimization: Theory and Practice, 4th Edition, Singiresu S. Rao, John Wiley, and Sons, 2009.
2.	Introductory Operations Research, H. S. Kasene & K. D. Kumar, Springer (India), 2004.
3.	Linear programming, 3rd Edition, George Bernard Dantzig, Mukund Narain Thapa, Springer series in operations research, 2003.
4.	Operations Research: An Introduction, 8th Edition, H.A. Taha, Pearson/Prentice Hall, 2007.
5.	Optimization for Engineering Design – Algorithms and Examples, Kalyanmoy Deb, PHI Learning Pvt. Ltd, New Delhi, 2005.

Note: Nine questions will be set in all by the examiners taking two questions from each unit and one question containing short answer type questions from entire syllabus. Students will be required to attempt five questions, selecting one question from each unit. Question No.1 is compulsory which is from entire syllabus.

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Cyber Law and Security

OEL-353 **Total Credits: 3**
L T P **Internal Marks: 20**
3 0 0 **External Marks: 80**
Total Marks: 100

Course Objective: The objective of this course is:

- To introduce the cyber world and cyber law in general.
- To explain about the various facets of cyber-crimes.
- To enhance the understanding of problems arising out of online transactions and provoke them to find solutions.
- To clarify the Intellectual Property issues in the cyber space and the growth and development of the law in this regard.
- To educate about the regulation of cyber space at national and international level.

Pre- requisites: None.

Course Outcomes: At the end of the course, students will be able to:

- Understand the concept of cybercrime and its effect on outside world.
- Interpret and apply IT law in various legal issues.
- Distinguish different aspects of cyber law.
- Apply Information Security Standards compliance during software design and development.

Content

Unit – I	**10 Hours**
Introduction: Computers and its impact in society, overview of computer and web technology, need for Cyber Law, Cyber Jurisprudence at International and Indian level **Introduction to Cybercrime:** Cybercrime definition and origins of the world, cybercrime and information security, classifications of cybercrime, cybercrime and the Indian ITA 2000, global perspective on cybercrime	
Unit – II	**12 Hours**
Cyber Law: International perspectives, UN & International Telecommunication Union (ITU) initiatives, Council of Europe - Budapest Convention on Cybercrime, Asia-Pacific Economic Cooperation (APEC), organization for Economic Co-operation and Development (OECD), World Bank, Commonwealth of Nations	
Unit – III	**12 Hours**
Constitutional & Human Rights: Issues in Cyberspace, freedom of speech and expression in Cyberspace, Right to Access Cyberspace – Access to Internet, Right to Privacy, Right to Data Protection, Cyber Crimes & legal framework, Cyber Crimes against individuals, Institution and State, hacking, Digital Forgery, Cyber Stalking/Harassment, Cyber Pornography, Identity Theft, & Fraud Cyber terrorism, Cyber Defamation, different offences under IT Act, 2000	
Unit – IV	**08 Hours**
Information Security Standard compliances SOX, GLBA, HIPAA, ISO, FISMA, NERC, PCI	
Suggested Text Books	
1.	Computer Law, Chris Reed & John Angel, New York, 2007.
2.	Cyber Laws, Justice Yatindra Singh, Universal Law Publishing Co, New Delhi, 2012.
3.	Legal Dimensions of Cyber Space, S. K Verma, Mittal Raman, Indian Law Institute, New Delhi, 2004.

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4.	The Information Technology Act, 2005: A Handbook, Sudhir Naib, OUP, New York, 2011.
5.	Information Technology Act, S. R. Bhansali, University Book House Pvt. Ltd., Jaipur 2003.
6.	Cyber Crimes and Law Enforcement, Vasu Deva, Commonwealth Publishers, New Delhi, 2003.

Note: Nine questions will be set in all by the examiners taking two questions from each unit and one question containing short answer type questions from entire syllabus. Students will be required to attempt five questions, selecting one question from each unit. Question No.1 is compulsory which is from entire syllabus.

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Marketing Management & HRM

OEL-355 **Total Credits: 3**
L T P **Internal Marks: 20**
3 0 0 **External Marks: 80**
Total Marks: 100

Course Objective: The objective of this course is:

- To understand the concepts of marketing management
- To learn about marketing process for different types of products and services
- To understand the tools used by marketing managers in decision situations
- Understand the work force at the managerial and non-managerial levels.
- Familiarize with new trends and skills required for Planning, managing and development of human resources for organizational effectiveness.

Pre- requisites: Basic knowledge of marketing.

Course Outcomes: At the end of the course, students will be able to:

- Students will demonstrate strong conceptual knowledge in the functional area of marketing management.
- Students will demonstrate effective understanding of relevant functional areas of marketing management and its application.

Contents

Unit - I	**10 Hours**
Nature and scope of marketing, corporate orientation towards marketplace, building and delivering customer value and satisfaction, retaining customers strategies, marketing environment, marketing research and Marketing Information system	
Unit - II	**10 Hours**
Market segmentation, positioning and targeting, tools of product differentiation, marketing strategies in the different stage of the product life cycle, new product development process, Advertising: Importance, Limitations	
Unit - III	**10 Hours**
Concept of HRM, difference between HRM and HRD, planning, Job Analysis: Meaning and Importance, processes of Job analysis, Job descriptions and Job specifications, person analysis, difference between Personnel management and HRM	
Unit - IV	**12 Hours**
Role of HR Manager: Recruitments, selection, carrier planning and management, promotion, training and development, potential appraisal, performance appraisal, motivation and motivational theories, Stress Management	
Suggested Text Books	
1.	Marketing Management, Kotler Philip and Keller, PHI, New Delhi.
2.	Marketing Management in South Asian Perspective, Kotler, Philip, Kevin Keller, A. Koshy, and M. Jha, Pearson Education, New Delhi.
3.	Human Resource and Personnel Management, K. Aswathappa, Tata McGraw Hill, New Delhi, 1997.
4.	Human Resource Management, Sixteenth Edition, Gary Dessler & Biju Varrkey,

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	Pearson Paperback, 2020.

Note: Nine questions will be set in all by the examiners taking two questions from each unit and one question containing short answer type questions from entire syllabus. Students will be required to attempt five questions, selecting one question from each unit. Question No.1 is compulsory which is from entire syllabus.

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Remote Sensing and GIS

OEL-357
L T P
3 0 0

Total Credits: 3
Internal Marks: 20
External Marks: 80
Total Marks: 100

Course Objective: - The objective of this course is:

- Know the concepts of Remote Sensing, its interpreting Techniques, and concepts of Digital images.
- Know the concept of Geographical Information System (GIS), coordinate system GIS Data and its types
- Understand the students managing the spatial Data using GIS.
- Understand Implementation of GIS interface for practical usage.

Pre-requisite: - None

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

- Describe different concepts and terms used in Remote Sensing and its data
- Understand the Data conversion and Process in different coordinate systems of Geographic Information System **(**GIS) interface
- Evaluate the accuracy of Data and implementing a GIS
- Understand the applicability of RS and GIS for various applications.

Content

Unit – I	**10 Hours**
Overview of Geographic Information Systems: Definition of a GIS, features, and functions, why GIS is important, how GIS is applied, GIS as an Information System, GIS, and cartography, contributing and allied disciplines, GIS data feeds, historical development of GIS.	
Unit – II	**10 Hours**
Map Projections and Coordinate Systems: Maps and their characteristics (selection, abstraction, scale, etc.), automated cartography versus GIS, map projections, coordinate systems, precision, and error.	
Unit – III	**12 Hours**
Data Sources and Database Concepts: Major data feeds to GIS and their characteristics, maps, GPS, images, databases, commercial data, locating and evaluating data, data formats, data quality, metadata, Database concepts and components, flat files, relational database systems, data modeling, views of the database, normalization, databases and GIS, GIS analytical functions, vector analysis including topological overlay, raster analysis, statistics, integrated spatial analysis.	
Unit – IV	**10 Hours**
Technology involved in GIS & Remote Sensing: GIS application areas and user segments, creating custom GIS software applications, user interfaces, case studies, Future data, future hardware, future software, Object-oriented concepts and GIS, future issues–data ownership, privacy, education, Remote sensing of environment, E.M. Principle, Thermal infrared remote sensing, remote sensing of vegetation, remote sensing of water, urban landscape.	
Suggested Text Books	

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1.	Principles of geographical information systems, P. A. Burrough.
2.	Remote sensing of the environment, J. R. Jensen, Pearson.

Note: Nine questions will be set in all by the examiners taking two questions from each unit and one question containing short answer type questions from entire syllabus. Students will be required to attempt five questions, selecting one question from each unit. Question No.1 is compulsory which is from entire syllabus.