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**Department of Communication Engineering**

**Common to all Divisions**

 **Physics of Optics CE 2101**

 Year : SECOND Theoretical : 2 hrs./Week

 Tutorial : - hrs./Week

**Geometrical optics 4Hrs.**

Optical rays, Refractive index, Fermat’s principle, Reflection and refraction from planar mirrors and boundaries between media of different refractive indexes , Snell's Law ,Total internal reflection.

**Electromagnetic Nature of light 6Hrs.**

 Light as an Electromagnetic wave , spectrum of EM waves ,Wave Equation, The Poynting Vector; Reflection and Refraction of Electromagnetic waves, Normal and Oblique Incidence, Fresnel’s Relations; Idealization of Waves as Light Rays,Polarization of Light.

**Principle of Superposition of Waves 6Hrs.**

Young's Experiment, Fringe Width, Intensity Distribution; Interference with White Light, Fresnel's Biprism and Lloyd's Single Mirror; Interference by Division of Amplitude, Phase Change on Reflection, Interference with Multiple Reflection.

 **Fresnel's Diffraction**  **6Hrs.**

 Fresnel's construction, Fresnel’s Half Period Zones, Zone Plate; Diffraction Patterns of Simple Obstacles; Fraunhofer’s Single Slit Diffraction Pattern, Intensity Distribution; Diffraction by a Circular Aperture and Double Slit, Intensity Distribution, Position of Maxima, Missing Orders; Diffraction by N-Parallel and Identical Slits.

**Coherence and Observable Interference of Waves**  **8Hrs.**

 Temporal Coherence, Coherence Time and Coherence Length, Width of a Spectral Line, Spatial Coherence, Lateral Coherence Width, Angular Diameter of Stars; Visibility of Fringes. Emission and Absorption of Light, Stimulated Emission, Einstein's Relations, Population Inversion; Optical Pumping.

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**Department of Communication Engineering**

**Common to all Divisions**

 **Mathematics III CE 2102**

 Year : SECOND Theoretical : 4hrs./Week

 Tutorial : - hrs./Week

**Fourier Series**  **16Hrs.**

 i) Periodic functions. ii) Fourier series – Euler formulas. iii) Even and odd functions . (Half –

 Range expansions). iv) Applications in electrical engineering .

**Fourier Transform 16Hrs.**

Complex exponential form, Fourier Integral, Fourier transforms and inverse, Properties, convolution theorem, power spectral density and convolution signals and linear system applications.

**Partial Differentiation**  **12Hrs**

 i) Function of two or more variables

 ii) Partial derivatives

 iii) Directional derivative.

 iv) Gradient, divergence and curl. v) Tangent plane and normal line. vi) Maxima, minima & saddle point.

**Ordinary differential Equations**  **16Hrs.**

i) First order (variables separable, homogeneous, linear – Bernoulli and exact).

ii) Second order (Homogeneous and non homogeneous). iii) Higher order differential equations.

**Text Books :**

1. Advanced Engineering Mathematics : F. Kreyszig .
2. Higher Engineering Mathematics : B. S. Grewal

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**Department of Communication Engineering**

**Common to all Divisions**

 **Electronics II CE 2103**

 Year : SECOND Theoretical : 2hrs./Week

 Tutorial : 1 hr. /Week

**Multistage Amplifiers 4Hrs.**

BJT and FET RC Coupled Amplifiers – Frequency Response. Cascaded Amplifiers. Calculation of Band Width of Single and Multistage Amplifiers. Concept of Gain Bandwidth Product.

**Feed back amplifiers**   **6Hrs.**

 Concept of Feedback Amplifiers – Effect of Negative feed back on the amplifier Characteristics. Four Feedback Amplifier Topologies. Method of Analysis of Voltage Series, Current Series, Voltage Shunt and Current Shunt feedback Amplifiers.

**Sinusoidal Oscillators 4Hrs.**

 Condition for oscillations –LC Oscillators – Hartley, Colpitts, Clapp and Tuned Collector Oscillators – Frequency and amplitude Stability of Oscillators – Crystal Oscillators – RC Oscillators -- RC Phase Shift and Weinbridge Oscillators .

 **Power Amplifiers 6Hrs.**

Classification of Power Amplifiers – Class A, Class B and Class AB power Amplifiers. Series Fed, Single Ended Transformer Coupled and Push Pull Class A and Class B Power Amplifiers. Cross-over Distortion in Pure Class B Power Amplifier, Class AB Power Amplifier – Complementary Push Pull Amplifier with trickle Bias, Derating Factor – Heat Sinks.

**Tuned Voltage Amplifiers 4Hrs.**

Single Tuned and Stagger Tuned Amplifiers – Analysis – Double Tuned Amplifier – Bandwidth Calculation.

**Operational Amplifiers 6Hrs.**

Concept of Direct Coupled Amplifiers. Ideal Characteristics of an operational Amplifier – Differential Amplifier - Calculation of common mode Rejection ratio – Differential Amplifier supplied with a constant current – Normalized Transfer Characteristics of a differential Amplifier – Applications of OP-Amplifiers .

**Text Books :**

1. Integrated Electronics – Millman and Halkias

2. Electronic Devices and Circuits, G.S.N. Raju, IK International Publications, New Delhi, 2006.

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**Department of Communication Engineering**

**Common to all Divisions**

 **Computer Programming CE 2104**

 Year : SECOND Theoretical : 1 hr./Week

 Practical : 1 hr./Week

**Introduction to Matlab 2 Hrs.**

Matlab Interactive Sessions , Menus and the toolbar , Computing with Matlab , Script files and the Editor Debugger , Matlab Help System , Programming in Matlab .

**Arrays 3 Hrs.**

 Arrays , Multidimensional Arrays , Element by Element Operations , Polynomial , Operations Using Arrays , Cell Arrays , Structure Arrays .

**Functions & Files 2 Hrs.**

 Elementary Mathematical Functions , User Defined Functions , Advanced Function Programming , Working with Data Files .

**Programming Techniques 3 Hrs.**

 Program Design and Development , Relational Operators and Logical Variables , Logical Operators and Functions , Conditional Statements , Loops , The Switch Structure , Debugging Mat Lab Programs .

**Plotting 3 Hrs.**

 XY- plotting functions , Subplots and Overlay plots , Special Plot types , Interactive plotting , Function Discovery , Regression , 3-D plots .

**Linear Algebraic Equations 2 Hrs.**

 Elementary Solution Methods , Matrix Methods for (LE) , Cramer’s Method , Undetermined Systems , Order Systems .

**Textbook:**

Introduction to Matlab 7 for Engineers, by William J. Palm III, McGraw Hill 2005.

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**Department of Communication Engineering**

**Common to all Divisions**

 **Electromagnetic Fields I CE 2105**

 Year : SECOND Theoretical : 2 hrs./Week

 Tutorial : 1 hr./Week

**Vector Analysis 6Hrs.**

Vector algebra, the Cartesian coordinate system, vector components and unit vectors, vector field, dot product, cross product, circular cylindrical coordinate system, spherical coordinate system.

**Coulombs Law and Electric Field Intensity 6Hrs.** Coulomb’s law, electric field intensity, field of n point charges, field due to a continuous volume charge distribution, field of a line charge, field of a sheet of charge, streamlines and sketches of fields.

**Electric Flux Density,** **Gauss's Law, and Divergence 6Hrs.** Electric flux density, Gauss’s law, applications of Gauss’s law, differential volume element divergence, Maxwell’ first equation, and the divergence theorem.

**Energy and Potential**  **6Hrs.** Energy expended in moving a point charge, definition of potential difference and potential, the potential field of a point charge, the potential field of a system of charges, potential gradient, the dipole, energy density in electrostatic field.

**Conductors, Dielectrics and Capacitance**  **6 Hrs.** Current and current density, continuity of current, conductor properties and boundary conditions, method of images, dielectric materials and boundary conditions, capacitance, several capacitance examples.

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**Department of Communication Engineering**

**Optical & Communication Systems Engineering Division**

 **Analog Communication Systems I CEO 2106**

 Year : SECOND Theoretical : 2 hrs/Week

 Tutorial : 1 hr./Week

**Introduction 2Hrs.**

Elements of communication System and its Fundamental limitations, Need of Modulation .

 **Amplitude Modulation Systems 12Hrs.**

Need for Modulation, Frequency Translation, Method of Frequency Translation, Amplitude Modulation, Modulation Index, Spectrum of AM Signal, Modulators and Demodulators (Diode detector), DSB-SC Signal and its Spectrum, Balanced Modulator, Synchronous Detectors, SSB Signal, SSB Generation Methods, Power Calculations in AM Systems, Application of AM Systems.

**Angle Modulation Systems 10Hrs.**

Angle Modulation, Phase and Frequency Modulation and their Relationship, Phase and Frequency Deviation, Spectrum of an FM Signal, Bandwidth of Sinusoidally Modulated FM Signal, Effect of the Modulation Index on Bandwidth, Spectrum of Constant Bandwidth FM, Phasor Diagram for FM Signals,Frequency DivisionMultiplexing (FDM).

**FM Generation 6Hrs.**

Parameter variation method, Indirect method of Frequency Modulation (Armstrong Method), Frequency Multiplication, PLL FM Demodulator, Pre –emphasis and De – emphasis, Comparison of FM and AM.

**Text books:**

1. Communication Systems S. Haykin, John Willy & Sons.

2. Communication Systems: A.B. Carlson, Mc-Graw-HW.

3. Modem Analog & Digital Communication Systems : B.P. Lathi; Oxford Univ. Press.

4. Analog Communication Systems : Pchakrabarti Dhanpat Rai.

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 **Department of Communication Engineering**

**Common to all Divisions**

 **Ethics of Higher Education CEO 2107**

 Year : SECOND Theoretical : 1 hr./Week

 Tutorial : - hr./Week

a. Review of selected ethical theories, concepts, and frameworks.

b. Reflection (written and oral) upon each student's personal and professional values and ethics as they relate to higher education.

c. Examination of relevant professional codes of ethics.

d. Discover how to find resources related to ethics in higher education.

e. Discussion of findings of student interviews of higher education leaders.

 f. Examination of different ethical perspectives and experiences due to an individual's gender, race, and culture.

 g. Discussion and readings to assist the students in discovering the conflicts of interest inherent in nearly every aspect of leadership and teaching activities.

h. Completion of writing, reading, and discussion assignments, some of which will involve group work.

i. Practice in ethical decision making through active participation in case study, reflection, and role playing.

j. Active use of Web CT software, including mail, bulletin board, assignment uploading, the development of student home pages, and other features.

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**Department of Communication Engineering**

**Common to all Divisions**

 **Transmission Lines CE 2108**

 Year : SECOND Theoretical : 2 hrs./Week

 Tutorial : 1 hr./Week

 **Transmission Line Theory 12Hrs.**

Common types of transmission lines used in circuits, lumped circuit model for transmission line and formal solutions. Characteristic impedance, propagation constant, attenuation and phase constants. Open circuited and short circuited lines. Reflection of line not terminated in Z0- Reflection coefficient- standing wave ratio- reflection factor return loss. Generator and mismatches- distortion in transmission lines. Smith Chart .

**Planar Transmission Lines 8Hrs.**

Microstrip lines- Characteristic impedance-Losses in microstrip lines – Q-factor of microstrip line. Parallel strip lines- distributed parameters- characteristic impedance- losses Coplanar strip line- shielded strip line- tapered strip line-microstrip resonator CAT cable .

**Matching and Measurement 10Hrs.**

Transmission line resonator- impedance matching-single and double stub. Narrowband and broadband matching- quarter wave transformer. Measurement of VSWR, impedance, insertion loss and attenuation using Smith chart .

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**Department of Communication Engineering**

**Common to all Divisions**

 **Physics of Optical Elements CE 2201**

Year : SECOND Theoretical : 2 hrs./Week

 Tutorial : 1 hr./Week

**Optical Fibers 4Hrs.**

The Nature of Light , Light as an Electromagnetic Wave, Polarisation , Interference , types of Optical Fibers , Fiber Manufacture , Joining Fibers , Transmitting Light on a Fiber .

**Optical Sources 8Hrs.**

Light Production, Spontaneous Emission , Light Emitting Diodes (LEDs) , Lasers , Principle of the LASER , Semiconductor Laser Diodes , Fabry-Perot Lasers , Distributed Feedback (DFB) Lasers Gas Lasers , Free Electron Lasers (FELs) .

**Optical Detectors 8Hrs.**

Photoconductors , Photodiodes , P-N Diodes , P-I-N Diodes , Schottky-Barrier Photodiodes , Avalanche Photodiodes (APDs) , Hetero-Interface Photodetectors , Travelling-Wave Photodetectors , Resonant-Cavity Photodetectors , Phototransistors **.**

**Optical Devices 10Hrs.**

Planar Optical Devices **,** Optical Amplifiers **,** Erbium Doped Fibre Amplifiers (EDFAs) **,** Semiconductor Optical/Laser Amplifiers , Raman Effect Amplifiers , Splitters and Couplers **,** Lenses and Prisms **,** Diffraction Gratings **,** Planar Diffraction Gratings , In-Fibre Bragg Gratings (FBGs) , Filters **,** Fabry-Perot Filter , In-Fibre Bragg Grating Filters, Fibre Ring Resonators , Modulators and Switches **,** Repeaters **.**

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**Department of Communication Engineering**

**Common to all Divisions**

 **Mathematics IV CE 2202**

 Year : SECOND Theoretical : 4hrs./Week

 Tutorial : - hrs./Week

**Laplace Transform** **18Hrs.**

 Unit step function, Gamma function, Definition of Laplace Transform, Properties, Inverse of Laplace Transform, properties, partial fractions ,convolution theorem , integral equation , solution of differential equations using Laplace transform. Applications.

**Multiple Integrals** **18Hrs.** i)Double Integral. ii) Areas and volumes. iii) Double integral polar coordinates.iv) Evaluation of volume and triple integral. v) Evaluation of surface & surface integrals.

**Sequences and series 12Hrs.** i) Sequences: convergence, test of monotone ii) Series: geometric series, nth partial sum, test of convergence, alternating series. iii) Power and Taylor’s series.

**Vectors Analysis** **12Hrs.**

 i) Equations of lines and planes. ii) Product of three or more vectors. iii) Vector function & motion: velocity and acceleration. iv) Tangential vectors. v) Curvature and normal vector.

**Text Books :**

1. Advanced Engineering Mathematics : F. Kreyszig .
2. Higher Engineering Mathematics : B. S. Grewal

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**Department of Communication Engineering**

**Optical & Communication Systems Engineering Division**

 **Optical Sensors CEO 2203**

 Year : SECOND Theoretical :2 hrs./Week

 Tutorial : - hrs. /Week

**Sensor Overview 8Hrs.**

Photometry and Radiometry, Radiation Sources and characteristics. Detectors-Imaging and non imaging [Thermal detectors , Photon detectors, Detector arrays : CCDs, CID, FLIR etc.] and their characteristics. Sensor optics, Sensor instrumentation, Signal processing techniques .

**Space craft sensors 8Hrs.**

Optical Attitude Sensors, Fiber Optic gyros [with integrated optics], Ring Laser Gyros,Star sensors - Space craft attitude determination and control. Line of Sight Sensors- IR Earth sensor, Sun Sensors, Star Sensor &Trackers. Sensors/System for Space craft precision Pointing and navigation.

 **Imaging sensors 6Hrs.**

 Remote sensing sensors for Earth observation, Cartography Hyper spectral Sensors. Modeling, design, analysis, calibration and Performance evaluation of the above. System Integration and Testing.

**Optical, Integrated and Fiber optic sensors 4Hrs.**

Acceleration, Displacement and Velocity sensors [anemometer], Position –linear and Angle encoders, temperature , strain etc.

 **Fiber optics based smart sensors for Space applications 4Hrs.**

 MOEM Sensors, Large optical Systems for space born camera applications.: Design, Fabrication and Testing.

**Textbooks:**

 1. Fundamentals of Space Systems by Vincent L. Pisacane, Oxford University Press, 2005 .

 2. Spacecraft dynamics and Control: A practical Engineering approach- Marcel J.Sidi, Contributor Michael

 J.Rycroft, Wei Shyy, Cambridge University Press, 2000**.**

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**Department of Communication Engineering**

**Common to all Divisions**

 **Microprocessor CE 2204**

 Year : SECOND Theoretical : 2 hrs./Week

 Tutorial : - hr./Week

**Introduction to the Microprocessor and Computer 2Hrs.**

A Historical Background, The Microprocessor-Based Personal Computer System, High Level and Low Level Languages.

**The 8086 Hardware Specifications 4Hrs.**

Internal Architecture, Pin-outs and The pin Functions ,Clock Generator (8284A), Bus Timing, Ready and The Wait State, Minimum and Maximum Mode, 8288 Bus controller.

**Addressing Modes 2Hrs.**

Register, Immediate, Direct, Register Indirect, Based-Plus-Index Register . Relative, and Base Relative-Plus-Index Addressing.

**Instruction Set and Programming 8Hrs.**

An Instruction Set, Data Movement Instructions, Arithmetic and Logical Instructions, Program Control Instruction, Programming The Microprocessor, Using Debugger , Using Assembler.

**Memory Interface 6Hrs.**

Memory Devices. ROM, EEPROM, SRAM, DRAM, Address Decoding, Memory System Design , Memory Interfacing.

**Input /Output 6Hrs.**

Bus Buffering and Latching ,, Demultiplexing The Busses, The Buffered System I/O Instructions , Isolated and Memory-Mapped I/O, I/O Map, Handshaking , I/O Port Address Decoding, 8 and 16-Bit I/O Port, The PPI (8255) Key Matrix Interface, The 8279 Programmable Keyboard/ Display Interface, 8254 Programmable Interval Timer. ADC and DAC.

**Interrupts 2Hrs.**

Basic Interrupt Processing, Hardware Interrupts, Expanding The Interrupt Structure, 8259 PIC , Interrupt Examples .

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**Department of Communication Engineering**

**Common to all Divisions**

 **Electromagnetic Fields II CE 2205**

 Year : SECOND Theoretical : 2 hrs./Week

 Tutorial : 1 hr./Week

**Poisson’s and Laplace's Equations**  **4Hrs.** Examples of the solution of Laplace's equation (1-D), examples of the solution of Poisson’s equation (1-D).

**The steady Magnetic Field 8Hrs.** Boit-Savart law, Ampere's circuital law, curl, Stokes theorem, magnetic flux and magnetic flux density, the scalar and vector magnetic potentials, derivation of steady-magnetic-field laws.

**Magnetic Forces**  **6Hrs.** Force on a moving charge, force on differential current element, force between differential current elements, force and torque on a closed circuit.

**Magnetic Materials and Inductance 6Hrs.** Magnetization and permeability, magnetic boundary conditions, the magnetic circuit, potential energy and forces on magnetic materials, inductance and mutual inductance.

**Time-Varying Fields and Maxwell's Equations 6Hrs.** Faraday's law, Displacement current, Maxwell's Equations in point forms, Maxwell's Equations in integral form, and Retard Potentials.

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**Department of Communication Engineering**

**Optical & Communication Systems Engineering Division**

 **Analog Communication Systems II CEO 2206**

 Year : SECOND Theoretical : 2 hrs./Week

 Tutorial : 1 hr./Week

**Noise In AM and FM Systems 6Hrs.**

Sources of Noise, Resistor Noise, Shot Noise, Calculation of Noise in a Linear System, Noise in AM Systems, Noise in Angle Modulation Systems, Comparison between AM and FM with respect to Noise, Threshold Improvement in Discriminators, Comparisons between AM and FM.

 **Radio Transmitters 6Hrs.**

Classification of Radio Transmitters, AM and FM Transmitters, Radio Telegraph and Telephone Transmitters, SSB Transmitters.

**Radio Receivers 6Hrs.**

Radio receiver Types, AM Receivers – RF Section, Frequency Changing and Tracking, Intermediate Frequency and IF Amplifiers, Automatic Gain Control (AGC); FM Receivers – Amplitude Limiting, FM Demodulators, Ratio

Detectors, ISB Receiver, Comparison with AM Receivers.

**Pulse Modulation 12Hrs.**

Sampling Theorem, Pulse Amplitude Modulation (PAM), Time Division Multiplexing (TDM), Pulse Position & Pulse Width Modulation (PPM & PWM), S/N in Analog pulse modulation.

**Text books:**

1. Communication Systems S. Haykin, John Willy & Sons.

2. Communication Systems: A.B. Carlson, Mc-Graw-HW.

3. Modem Analog & Digital Communication Systems : B.P. Lathi; Oxford Univ. Press.

4. Analog Communication Systems : Pchakrabarti Dhanpat Rai.

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**Department of Communication Engineering**

**Common to all Divisions**

 **Human Rights CE 2207**

 Year : SECOND Theoretical : 1 hr./Week

 Tutorial : - hrs./Week

1- التطور التاريخي لحقوق الانسان

2- الإعلان العالمي لحقوق الإنسان

3- حقوق الإنسان في الحضارات القديمة

السماوية 4- حقوق الإنسان في الديانات

5- حقوق الإنسان في الديانة اليهودية

المسيحية 6- حقوق الإنسان في الديانة

7- حقوق الإنسان في الدين الاسلامي

8- الاتفاقات الدولية لحقوق الإنسان

9- حقوق الإنسان في العصر الحديث

10- الديمقراطية و حقوق الإنسان

11- حق المرأة في الحضارات القديمة

12- حق المرأة في العصر الحديث

العامة 13- الاتفاقات الدولية و الحريات

الدولية 14- الحريات العامة و المنظمات

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**Department of Communication Engineering**

**Common to all Divisions**

 **Electronic Communication CE 2208**

 Year : SECOND Theoretical : 2 hrs./Week

 Tutorial : 1 hr./Week

**Filters: 4Hrs.**

RC Filters, LC Filters , Types of filters, Active filters, Crystal and Ceramic Filter, Switched Capacitor Filters.

**RF and Broadband Amplifier 6 Hrs.**

Tuned RF Amplifier, Frequency Conversions and Mixers, IF Amplifiers, Video Amplifiers, Class C Amplifiers, Push-Pull Class C Amplifier, Transmitter and Amplifier Matching.

**Amplitude Modulator and Demodulator Circuits 6Hrs.**

Low-level AM, Differential Amplifier Modulator, Amplifying Low-Level AM Signals, High Level AM, Diode Detectors, Crystal Radio Receivers, Synchronous Detection, Balaned Modulators , Generating SSB Signals, DSB and SSB Demodulation.

**FM Circuits 6Hrs.**

Varactor Modulators, Frequency Modulating a Crystal Oscillator, Voltage Controlled Oscillator, Reactance Modulators, Phase Modulators, Varactor Phase Modulators ,Tuned Circuit Phase Modulators, Slope Detectors Pulse Averages Descriminators , Phase Locked Loops.

**Receivers 4Hrs.**

Superherodyne Receivers, Image Rejection, Adjacent Channel Selectivity, Tracking Automatic Gain Control, Double Conversion Receivers, HF Communication Receivers.

**Digital Communication Circuits: 4Hrs.**

Parallel and serial transmission, Data Conversion , Sigma-Delta Modulator, Pulse Modulation Methods, Time Division Multiplexer and De-Multiplexer, Serial Transmission, Modem Concepts and Methods of Broadband Modems.