



Subject : Mathematics I

Units: 5

Weekly Hours : Theoretical : 3

Experimental: –

week	Syllabus
1	Definition of functions, Domain , Range, and Graph of Functions.
2	Trigonometric and inverse trigonometric functions.
3	Hyperbolic and inverse hyperbolic functions.
4	Exponential and logarithmic functions.
5	Limits and continuity.
6-7	Vectors in space.
8	Definition of differentiation
9	Basic rules of differentiation.
10-11	Application of differentiation.
12-13	Approximation of functions (McLaurin and Taylor's series).
14	La' Hopital rule.
15	Maximum and minimum problems.
16	Indefinite and definite integrals.
17	Basic rules of integrations.



18	Standard Methods of integration.
19-20	Integration involving powers of trigonometric & hyperbolic function.
21	Integration involving quadratic function.
22	Integration by parts.
23	Integration by partial fractions.
24	Z - Method.
25	Numerical (or approximate) integration, Trapezoidal method and Simpson r
26	Calculation the area under curve.
27	Calculation the Arc length.
28	Determine the Surface area generated by revolving an Arc length.
29-30	Determine the Volume generated by revolving area.



Subject : University physics

Units: 4

**Weekly Hours : Theoretical : 2
Experimental: 2**

week	Syllabus
1-4	The nature and propagation of light, The nature of light, Sources of light, Waves wave fronts , and rays, The speed of light , The laws of reflection and refraction, Index of refraction
5-8	Reflection and refraction at plane surface, Huygens 'principle, Derivation of the law refraction from Huygens, principle, Total internal reflection, Refraction by a prism, Dispersion, The rainbow
9-12	Images formed by a single reflection or refraction, Introduction, Reflection at a plane mirror, Reflection at a spherical mirror, Graphical methods, Refraction at a plane surface
13-16	Lenses and optical Instruments, Images as objects, The Thin lenses, Diverging lenses, Graphical methods, Images as objects for lenses, The Newtonian form of the lens equation, Thick lenses, Lens aberrations, The eye, The magnifier, The camera, The projection lantern, The microscope, The telescope
17-20	Interference and diffraction, Principle of interference, Young's double slit and Pohl's sheet, Intensity distribution in interference fringes, Plane change in reflection, Interference in thin films. Newton's rings, Thin coatings on glass, Energy conservation in interference, The Michelson interferometer, The Michelson – Morley experiment, Fresnel diffraction.
21-24	Polarization, Polarization, Polarization by reflection, Double refraction, Polarization by double refraction, Percentage polarization, The scattering of



	light, Circular and elliptic polarization , Production of colours by polarized light, Optical stress analysis, Study of crystals by convergent polarized light Optical activity
25-30	Atoms, Electrons, and Photons, Conduction in gases, Thermionic emission, The triode, The photoelectric effect, Line spectra, The Bohr atom, Deuterium , Wave mechanics, Absorption spectra, The laser, Band spectra, Band spectra, The X-ray tube, X-ray spectra



Subject : Electrical Circuits

Units: 6

Weekly Hours : Theoretical : 2

Experimental: 2

week	Syllabus
1-4	Passive resistance; and active (ideal voltage and current sources); Ohm's law, power dissipation; resistivity and conductivity, conductance, temperature effects and rating. Voltage and Current sources,
5-8	Internal resistance algebraic and graphic representations, equivalence between Voltage and Current sources, Power Considerations.
9-12	Network simplifications, Concepts of equivalence, resistors in series and parallel, equivalent resistance, voltage and current division, series – parallel combinations, star – delta transformations, sources in series and parallel.
13-16	Network analysis, Kirchhoff's current and voltage law, Nodes, Branches and loops and Ohm's law, Mesh current method and nod voltage method of circuit solutions.
17-20	Thevenin approach, Norton approach, Superposition approach, Reciprocity, Maximum power transfer. Inductance: self-induced voltage, circuit equation, Self – inductance, wire loop and coils ideal and actual coil, series and parallel combinations power and stored energy, sinusoidal conditions (time domain).
21-22	Capacitance: Static electricity, electric field, electric charge, charging of capacitor, capacitance, ideal and actual capacitors, capacitance in series, capacitance in parallel, series and parallel combination circuits.
23-24	Representation of AC circuit parameters: * Complex Representation of voltage and current. * Complex impedance and admittance. * Complex power.



	<ul style="list-style-type: none">* Series and parallel circuit.* Phasor diagrams.
25-27	<p>Resonance:</p> <p>(a) Series resonance:</p> <ul style="list-style-type: none">* Resonant frequency.* Variation of impedance.* Admittance and current against frequency.* Quality factor.* Resonant voltages rise.* Half - power points and bandwidth.* Energy in Resonant Circuit. <p>(b) Parallel resonance:</p> <ul style="list-style-type: none">* Two - branch Circuits with idealized and actual elements.
28-30	<p>Locus Diagrams:</p> <p>(a) Impedance, admittance and current locus of:</p> <ul style="list-style-type: none">* Variable inductance — constant resistance circuit.* Variable capacitance — constant resistance circuit.* Variable resistance — constant inductance circuit.* Variable resistance — constant capacitance circuit. <p>(b) Reactance variation against frequency for series and parallel circuits.</p> <p>Solution of AC - circuits:</p> <ul style="list-style-type: none">* Circuit analysis using the loop equations.* Circuit analysis using the nodal equations.* Matrix solution of loop and nodal equations* Maximum power transfer theorem.



Subject : Engineering Mechanics

Units: 4

Weekly Hours : Theoretical : 2

Experimental: –

week	Syllabus
1-12	Engineering mechanics, Static, introduction, scalar and vector quantities, Resolution of a force into components and resultant, Moment of a force about a point, location of a resultant, Couples, Centroid & centers of area, center of gravity of a body, Equilibrium, Free body diagram, Moment of inertia, Friction, Kinematics Dynamics, Law of linear motion, Motion of projectile.
12-16	Strength of Material Moments.
17-20	Thermodynamics: 1 st and 2 nd laws of thermodynamics.
21-30	Fluid mechanics, the ideal gas, equation of motion, Euler 's equation of motion, Bernoulli's equation, Momentum equation, Force exerted by a flowing fluid on a pipe-bend loss of energy in pipes.



Subject : Engineering Drawing

Units: 4

**Weekly Hours : Theoretical : 1
Experimental: 2**

week	Syllabus
1-15	Hand drawing, tools and devices of engineering Drawing, English writing, vertical projection, Engineering operations, hand drawing, dimensions, practical subjects, the geometry, applicable board.
15-30	Computer drawing (Auto-Cad) Using of Auto-Cad Introduction, Definition of Auto-Cad front page program, Helps, Changing of vision field, Display tools, zoom, and displacement orders. Orders of measurements units (Snap, Units, Limits, Grid) Basic drawing orders (Arc, Point, Circle, Ray, Line, Rectangle, Ellipse, Redraw) Dount, Multi-line, object snap Dealing with files Open and Export orders, re-controlling files. Principles orders of editing: Erase, Scale, Rotate, Move, Copy ...



Editing orders: Extend, Trim, Array, Mirror, Break, ...

Writing inside drawing.

Orders of dimensions drawing.

Hatch,

Block,

Transparent layers

List commands

Printing and displaying commands



Subject : Computer Programming

Units: 6

Weekly Hours : Theoretical : 2

Experimental: 2

week	Syllabus
1-2	Introduction of Programming Language.
3-4	Conversion from math. expression to Basic notation
5-6	Input/output systems
7-8	Restore stat
9-10	Constant & Variables
11-12	Functions
13-14	Control Statement.
15-16	Looping Stat
17-18	While stat.
19-20	Introduction to Matrices
21-22	Matrices in Mathematics
23-24	One Dim. Array, Input/output to Matrices
25-26	MAT stat, Algebra of Matrices
27-28	Second Dim. Matrices, Different Problem
29-30	Subprograms, Matrices of Big Size.



Subject : English Language

Units: Pass

**Weekly Hours : Theoretical : 1
Experimental: –**

week	Syllabus
1-7	Reading and Comprehension (first semester) 1. Vacuum tube, 2. The photoelectric
8-15	Grammar <ul style="list-style-type: none">• English parts of speech.• Structure of English sentences.• The past participle and present participle as adjective.
16-23	Reading and comprehension <ul style="list-style-type: none">• Radar• Computer
24-30	Grammar <ul style="list-style-type: none">• Passive voice• Questions• Reason and purpose



السنة الدراسية الاولى

			الرمز		
			LOT110	حقوق الانسان	
1	-	1			

والمعايير الدولية الحديثة.

لغة التدريس: اللغة العربية.

الموضوع	الاسبوع
<p>مفهوم حقوق الانسان تعريف حقوق الانسان خصائص حقوق الانسان فئات حقوق الانسان الحريات العامة وحقوق الانسان في التاريخ القديم حضارة وادي الرافدين حقوق الانسان في الحضارة الاغريقية حقوق الانسان في الحضارة الرومانية</p>	من ١ الى ٧
<p>موقف الشرائع السماوية من حقوق الانسان: ١. الديانة الاسلامية ٢. الديانة المسيحية</p>	من ٨ الى ١٠
<p>الحضارة الغربية وحقوق الانسان • المصادر القانونية لحقوق الانسان في بريطانيا • الميثاق الاعظم عام ١٢١٥م. • عريضة الحقوق عام ١٦٢٨م. • المدرسة الطبيعية ونظرية العقد الاجتماعي (جون لوك) ١٦٣٢-١٧٠٤ م • جان جاك روسو (١٧١٢ - ١٧٧٨)م • إعلان حقوق الانسان والمواطن الفرنسي في ٢٦ آب ١٧٨٩م.</p>	من ١١ الى ١٦
<p>منظمة الامم المتحدة وحقوق الانسان:</p>	من ١٧-٢٠



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المنظمة الدولية والاجهزة العاملة في قضايا الانسان.
الجمعية العامة لحقوق الانسان.
المجلس الاقتصادي والاجتماعي
الاعلان العالمي لحقوق الانسان.
المواثيق والمنظمات الاقليمية لحقوق الانسان
الاتفاقية الاوروبية لحقوق الانسان
الاتفاقية الامريكية لحقوق الانسان
الميثاق الافريقي لحقوق الانسان
مشروع الميثاق العربي لحقوق الانسان
المنظمات غير الحكومية ودورها في الدفاع عن حقوق الانسان
منظمة العفو الدولية
اللجنة الدولية للصليب الاحمر
المنظمة العربية لحقوق الانسان
منظمات غوث اللاجئين

من ٢١-٢٥

من ٢٥-٣٠

جامعة الفرات الاوسط التقنية
قسم هندسة تقنيات الليزر
والكهربوصريات



وزارة التعليم العالي والبحث العلمي
الكلية التقنية الهندسية - النجف

السنة الدراسية الثانية

السنة الدراسية الثانية



السنة الدراسية الثانية

الساعات الاسبوعية		الرمز	السنة الدراسية الثانية	إسم المادة
مجموع	عملي	LOT201	نظام سنوي (٣٠) إسبوع	الرياضيات ٢
3	-			

هدف المادة: هدف المادة هو تعليم الطالب المهارات اللازمة للتعامل مع منظومات الاحداثيات والمتجهات والطريقة المثلى لحل المعادلات التفاضلية والتكاملية وكذلك المعادلات التفاضلية الجزئية والتكاملات المتعددة وفق منظومات الاحداثيات الثلاثة.

لغة التدريس: اللغة الانكليزية.

week	Syllabus
1-5	<p>Coordinate systems, Cartesian, and polar</p> <ul style="list-style-type: none"> • Polar coordinate system, • Polar functions and polar equations, graph. • Polar equation of conic section and other curves. • The angle between radius vector and tangent line. • Arc length and plane area in polar coordinate system.
6-10	<p>Vector and vector analysis</p> <ul style="list-style-type: none"> • Vector definition and the unit vectors (i,j and k) • Space coordinate (Cartesian cylindrical, and spherical coordinate systems) • Vector algebra (vector operation) • Equation of line and plane. • Cylinders and quadric surfaces. • Vector functions, definitions, limit, and continuity. • Derivative of a vector function. • Tangent vector, curvature, normal vector, and radius of curvature.
11-15	<p>Partial differential equations.</p> <ul style="list-style-type: none"> • Function of two or more variables. • Definition of partial derivative



	<ul style="list-style-type: none"> • The directional derivative • Tangent plane and normal line, • Approximate value of W, $W=f(x,y)$ • The gradient, chain rule, total differential, exact differential. • Maximum and minimum of functions. • Lagrange multiplier. • High order derivative.
16-20	<p>Multiple integral</p> <ul style="list-style-type: none"> • Double integrals • Area and double integrals • Physical applications • Polar coordinate system • Triple integrals • Volume, physical applications of triple integral. • Cylindrical and Spherical coordinate • Surface area.
21-25	<p>Ordinary differential equations (O.D.E's)</p> <ul style="list-style-type: none"> • Definition, order, degree, solution • First order – first degree D.E. (Separable, Homogeneous, Linear, and Exact) • Special types of second order D.E. • Linear D.E. with constant coefficients • Linear 2nd order non-homogeneous D.E. with constant coefficients, method of variation of parameters, method of undetermined coefficient. • High order linear D.E. with constant coefficients.
26-30	<p>Infinite series</p> <ul style="list-style-type: none"> • Sequences • Certain limits • Infinite series, definition, convergence, divergence, and the sum of the series. • Test of convergence (comparison, integral ratio, root, and other test) • Alternating series • Absolute and conditional convergence • Power series of functions



- Maclaurin & Tylor series, Tylor theory.



السنة الدراسية الثانية

			الرمز		
			LOT202	اجهزة وقياسات	
2	-	2			

المراد قياسها والاجهزة المستخدمة لتحقيق هذا الغرض لمختلف التغيرات الفيزيائية وطرق التعامل مع النتائج المستحصلة من ذلك.

لغة التدريس: اللغة الانكليزية.

week	Syllabus
1-4	<p>Basic concepts of measurements</p> <ul style="list-style-type: none">• Introduction• Measurements and units.• Units obtained from SI unit system• Multiple and sub-multiples for SI units• Definitions• Systems configuration• Basic elements of measuring devices.• Classification of errors.• Random errors.• Other sources of errors.• Unit conversion.
5-7	<p>Electrical measuring instruments</p> <ul style="list-style-type: none">• Absolute instrument• Secondary instrument• Electrical principle of operation.• Indicating instrument• Torque• Controlling torque.



	<ul style="list-style-type: none"> • Deflecting torque • Damping torque
8-9	<p>Moving iron instrument</p> <ul style="list-style-type: none"> • Source of error in moving • Iron instrument
10-13	<p>Moving coil instrument</p> <ul style="list-style-type: none"> • Extension of range • Ammeter • Voltmeter • Dynamometer type <ul style="list-style-type: none"> - Dynamometer as ammeter - Dynamometer as voltmeter
14-16	<p>Resistance and measurements</p> <ul style="list-style-type: none"> • Bridge method • Wheatstone bridge method • Cary – Foster (slide – wire) method • Kelvin bridge method
17-19	<p>Ohmmeter method of resistance measurements</p> <ul style="list-style-type: none"> • shunt type • series type
20-22	Mega Ohmmeter (Megger)
23-25	Measurements of inductance and capacitance by using A.C bridges
26-28	<p>Measurement of system dynamics</p> <ul style="list-style-type: none"> • Force function • Zero – order system • First – order system • Second – order system



29-30	Measurement of power (wattmeter) <ul style="list-style-type: none">• wattmeter method• wattmeter method
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السنة الدراسية الثانية

			الرمز		
			LOT203	الالكترونيك	
4	2	2			

وطريقة عملها.

لغة التدريس: اللغة الانكليزية.

week	Syllabus
1-4	<ul style="list-style-type: none">• p-n junction• Introduction to p-n junction• Diode applications• Rectifiers• Clipping and clamping• Zener diode
5-10	<p>Transistor circuits</p> <ul style="list-style-type: none">• Biasing of transistor• Configuration of transistor• Equivalent circuit of transistor• Graphical analysis• Operating point of transistor• DC & AC load line of Transistor• Bias stability• Quiescent point operation• Effect of temperature on Q-point.• Stability factor analysis• Temperature compensation using diode biasing• Thermal consideration in Tr.Amp.



11-15	Transistor amplifie السنة الدراسية الثانية <ul style="list-style-type: none">• Common – Base transistor amplifier• Common emitter transistor amplifier• Common collector transistor amplifier.
16-20	h-parameter of transistor <ul style="list-style-type: none">• Common – base transistor• Common – emitter transistor• Common – collector transistor
21-25	Classes of Amplifiers <ul style="list-style-type: none">• Class A amplifier• Class B amplifier• Class C amplifier• Class D amplifier
26-30	The Field effect transistor: <ul style="list-style-type: none">• Theory of JFET & MOSFET• P-channel FET• FET amplifier• FET switch



السنة الدراسية الثانية

الساعات الاسبوعية		الرمز	السنة الدراسية الثانية	إسم المادة
مجموع	عملي	LOT204	نظام سنوي (٣٠) إسبوع	البصريات الهندسية
2	-			

هدف المادة: تهدف هذه المادة الى تعليم الطالب على انواع الادوات البصرية وتصرفاتها حيال الحزمة الضوئية المارة خلالها ودراسة الموشور والمحرز والفائده المتوخاة منها والمرايا بالاضافة الى العدسات وانواعها.

لغة التدريس: اللغة الانكليزية.

week	Syllabus
1-10	<p>GEOMETRICAL OPTICS</p> <ul style="list-style-type: none"> • Introduction • Paraxial Approximation • Ray Matrix Approach to Gaussian Optics • The Lens Matrix • Ray Transformation between Principal Planes • Image Formation • Ray Tracing • Ray Matrix for Reflection • Apertures and Stops • Two-Lens Optical Systems • Optics of a Laser Cavity • Optics of the Human Eye • Defects of the Human Eye • Cylindrical Lens
11-15	<p>LENS ABERRATIONS</p> <ul style="list-style-type: none"> • Stigmatic Image • Aplanatic Points • Image Formation with Non-paraxial Rays • Wave front Aberration Function



	<ul style="list-style-type: none">• Ray Deviations• Focusing Errors <p>السنة الدراسية الثانية</p>
16-20	<p>INTERFERENCE OF LIGHT WAVES</p> <ul style="list-style-type: none">• Interference• Two-Wave Interference• Interference by Division of Wavefront• Interference by Division of Amplitude• Testing Flatness of Surfaces• Interference with Extended Sources
21-30	<p>FRINGES & INTERFEROMETER</p> <ul style="list-style-type: none">• Haidinger Fringes• Fizeau Fringes• Newton's Rings• Straight Fringes• Two-Wave Interferometers• Michelson Interferometer• Mach-Zehnder Interferometer• Multi-wave Interference• Fabry-Perot Interferometer• Widths of Transmission Peaks• Fabry-Perot Interferometer as a Spectrometer• Free Spectral Range• Spectral Resolution• Thin Optical Coatings• Interference filter



السنة الدراسية الثانية

			الرمز		
			LOT204		ثرموداينمك
2	-	2			

الجسم الحار والجسم البارد رياضياً إضافة الى تعليمه الدورات الحرارية في الطبيعة والحرارة النوعية والحرارة الكامنة للانصهار للمواد والاجسام.

لغة التدريس: اللغة الانكليزية.

week	Syllabus
1-2	Definitions: force, pressure, systems, atmospheric pressure, absolute pressure, pressure units.
3-5	Temperature: units, conversion, methods of temperature measuring, zero law, energy definition, types of energy: potential energy, kinetic energy, work, power, and pressure diagram.
6-7	Internal energy, Enthalpy, first law of thermodynamics. Systems energy equation: open systems, close systems, applications.
8-10	Ideal gas, Boil's law, Charles's law, equation of state. Specific heat at constant pressure, specific heat at constant temperature. Processes of closed systems, volume constant and pressure constant.
11-15	(T-V) diagram, Polytropic process (P-V & P-T) diagrams. Open system procedures. Vapor, matter and phase changing and phase changing on (P-V) diagram.
16-20	Volume fraction – liquid line – vapor line – wet vapor. Saturated vapor, second law of thermodynamics, thermal machine and thermal pump.
21-24	Carnot's cycle and inverse Carnot's cycle, Reverse and inverse procedures. Definition of 2 nd law in thermodynamics, Entropy and gas entropy calculations, T-S diagram.



25-28	Entropy computation of vapors, Entropy of system and its surrounding environment. Adiabatic efficiency.
29-30	Standard air cycles, Auto-Cycle, Diesel cycle, Diol Cycle.



السنة الدراسية الثانية

			الرمز		
			LOT205		إنتشار الموجات
2	-	2			

العوامل المؤثرة في ذلك.

لغة التدريس: اللغة الانكليزية.

week	Syllabus
1-2	Definitions: force, pressure, systems, atmospheric pressure, absolute pressure, pressure units.
3-4	Standing wave, Energy of standing waves and Wave propagation in free space
5-8	Wave propagation in dielectrics, the pointing vector and power considerations.
9-11	Propagation in good conductors: skin effect.
12-15	Polarization, wave polarization
16-20	Radio wave propagation, Light wave propagation.
21-23	Radio wave propagation in vacuum and in matter, attenuations and damping factors.
24-27	Electromagnetic wave propagation in vacuum and matters, reflections, refractions, and scattering. Riely Scattering, Raman scattering.
28-30	Light wave propagation in free space, Laser light propagation in free space and in matter, gain, losses, reflection, refraction, and scattering.



السنة الدراسية الثانية

			الرمز		
			LOT206	مبادئ الليزر	
4	2	2			

الانتقالات الالكترونية، والفلورة والفسفرة وغيره من الظواهر التي تحصل اثناء الانتقالات الالكترونية. انواع المرنانات الليزرية وانواع المرايا وتضخيم الضوء بالانبعاث المحفز وتضخيم الاشعة المايكروية بالانبعاث المحفز والفرق بينهما.

لغة التدريس: اللغة الانكليزية.

week	Syllabus
1-3	<p>Light and Blackbody Emission</p> <ul style="list-style-type: none">• Emission of Thermal Light• Electromagnetic Spectrum• Blackbody Radiation and the Stefan –Boltzmann Law• Wein’s Law• Cavity Radiation and Cavity Modes• Quantum Nature of Light• Absorption and Emission Processes• Boltzmann Distribution and Thermal Equilibrium
4-7	<p>Atomic Emission</p> <ul style="list-style-type: none">• Line Spectra• Spectroscope• Einstein and Planck: $E = h\nu$• Photoelectric Effect• Atomic Models and Light Emission• Franck –Hertz Experiment• Spontaneous Emission and Level Lifetime• Fluorescence



	<ul style="list-style-type: none"> • Semiconductor Devices • Light-Emitting Diodes
8-15	<p>Lasing Processes</p> <ul style="list-style-type: none"> • Characteristics of Coherent and incoherent Light • Boltzmann Distribution and Thermal Equilibrium • Creating an Inversion • Stimulated Emission • Rate Equations and Criteria for Lasing • Laser Gain • Linewidth • Thresholds for Lasing • Calculating Threshold Gain • Selective Pumping • Three- and Four-Level Lasers • CW Lasing Action • Thermal Population Effects
16- 18	<p>Population inversion and depopulation of low energy level in three and four level systems. Rate Equation Analysis for Atomic Transitions, Rate Equation Analysis for Three- and Four-Level Lasers, Gain, Saturation. Required Pump Power and Efficiency. Output power.</p>
19-25	<p>Cavity Optics</p> <ul style="list-style-type: none"> • Requirements for a Resonator • Gain and Loss in a Cavity • Resonator as an Interferometer • Longitudinal Modes • Wavelength Selection in Multiline Lasers • Single-Frequency Operation • Characterization of a Resonator • Gaussian Beam • Resonator Stability • Common Cavity Configurations • Spatial Energy Distributions: Transverse Modes

	<ul style="list-style-type: none">• Limiting Modes• Resonator Alignment: A Practical Approach
26-30	<p>Fast-Pulse Production</p> <ul style="list-style-type: none">• Concept of Q-Switching• Intracavity Switches• Energy Storage in Laser Media• Pulse Power and Energy• Electro-optic Modulators• Acousto-optic Modulators• Cavity Dumping• Mode locking• Mode locking in the Frequency Domain

الساعات الاسبوعية		الرمز	السنة الدراسية الثانية	إسم المادة
مجموع	عملي	LOT206	نظام سنوي (٣٠) إسبوع	المجالات الكهرومغناطيسية
4	-			

هدف المادة: تهدف هذه المادة الى تعريف الطالب على الاشعاع الكهرومغناطيسي ومكوناته وكيفية وطرق انتشار المجال الكهربائي والنظريات المؤثرة فيه وكذلك المجال المغناطيسي وانواع القوى الكهربائية والمغناطيسية والقوى الكهرومغناطيسية وانواع المواد الموصله وانسبها الموصله والعازلة وفي النهاية اشتقاق معادلات ماكسويل.

لغة التدريس: اللغة الانكليزية.

week	Syllabus
1-4	<p>Vector analysis</p> <ul style="list-style-type: none"> • Scalar and vector • Vector algebra • The Cartesian coordinate system • Vector components and unit vector • Vector field • The Dot product • The cross product • Polar coordinate system
5-15	<p>Electric Field</p> <ul style="list-style-type: none"> • Coulomb's law • The experimental law of coulomb • Electric field intensity • Field of line charge • Field of a sheet charge • Stream lines and sketches of field • Electric flux density • Gauss's law



	<ul style="list-style-type: none">• Integral form of Gauss's law• Differential form of Gauss's law• Divergence theorem• Stock's theorem• Maxwell's first equation• The vector operator ∇ and the divergence theorem
16-30	<ul style="list-style-type: none">• The Line integral• Potential and potential difference• Potential field of a point charge• Potential field of a system of charges: conservative property• Potential gradient• The dipole• Energy density in the electrostatic field• Poisson's and Laplace's equations• The magnetic field.• Steady magnetic field• Biot – Savart law• Ampere's Circuital law• Curl• Stocke's theorem• Magnetic flux and magnetic flux density• Scalar and vector magnetic potential.• Other Maxwell's equations



السنة الدراسية الثانية

الساعات الاسبوعية		الرمز	السنة الدراسية الثانية	إسم المادة
مجموع	عملي	LOT207	نظام سنوي (٣٠) إسبوع	البرمجة بلغة فيجوال بيسك
3	2			

هدف المادة: تهدف هذه المادة الى جعل الطالب يكتسب المهارة اللازمة في التعامل مع الحاسبة عن طريق التعامل بلغات البرمجة مثل برنامج فيجوال بيسك والوامر والايعاات والرسم والتصميم عن طريق لغة البرمجة هذه.

لغة التدريس: اللغة الانكليزية.

week	Syllabus
1	<ul style="list-style-type: none"> Introduction to visual basic: Integrated development Environment.
2-3	<ul style="list-style-type: none"> Basic definition: Application, Code, Controls, Declaration, Procedure, Object, Property Event procedure, method, form, Class, modules.
4-8	<ul style="list-style-type: none"> Common properties: name, position, size. Font, container font, color, other properties. common method: move, et focus, z order, refresh examples with command button, text and label common events mouse events, keyboard events and Examples and application code
9-19	<ul style="list-style-type: none"> Variables a) Use variables for input box b) Use variables for msg box c) Data type Constants Basic and advance mathematical parameters Mathematical functions Convert the mathematical equations to code Examples

	<ul style="list-style-type: none">• Arrays and their declaration with application• if then procedure with application on checkbox and option Buttons
20-30	<ul style="list-style-type: none">• procedure of for~ next, do~ loop, do~ while, do~ until, While ~ wend• timer tools and examples• subroutine, functions, sub and their calling• V-scrollbar and H-scrollbar with application• Examples of scrollbar and sub, subroutine, function• drawing in visual basic, pset, line, circle, print, Cls, Scale• line chart, bar chart and Examples

جامعة الفرات الاوسط التقنية
قسم هندسة تقنيات الليزر
والكهربوصريات



وزارة التعليم العالي والبحث العلمي
الكلية التقنية الهندسية - النجف

السنة الدراسية الثالثة



السنة الدراسية الثالثة

الساعات الاسبوعية		الرمز	السنة الدراسية الثالثة	إسم المادة
مجموع	عملي	LOT301	نظام سنوي (٣٠) إسبوع	تحليلات عددية وهندسية
٢	-			

هدف المادة: الهدف الرئيسي لهذه المادة هو الربط ما بين المشاكل الهندسية والرياضيات وجعل حل هذه المشاكل عن طريق التحليل العددي او الهندسي حسب نوع المشكلة وطرق حلها وتمثيلها الرياضي

لغة التدريس: اللغة الانكليزية.

week	Syllabus
1-6	Laplace Transformation <ul style="list-style-type: none"> • Properties, Forward and Inverse transformation and associated theorems. • Convolution and Translation and their properties. • Solving differential equations using Laplace transformation. • Applications
7-12	General power series methods <ul style="list-style-type: none"> • Convergence of the power series. • Solution of differential equations • Legendre equation, Legendre polynomials. • Bessel equation, Bessel functions
13-18	Function of complex variables. <ul style="list-style-type: none"> • Cartesian and polar coordinates of complex numbers. • Analytical function, Cauchy-Riemann equations. • Cauchy integral theorem. • Integration in the complex plane.
19-24	Matrix Theory <ul style="list-style-type: none"> • Definitions, Ad joint, Inverse of a matrix, sum and multiply of matrices. • System of linear equations. • Characteristic equation, Eigen values and Eigen vectors



	<ul style="list-style-type: none">• Matrix differential equations
25-30	<p>Fourier series and Transformation</p> <ul style="list-style-type: none">• Derivation of Fourier series• Odd and Even Functions• Half-wave Fourier series• Frequency spectra of different time functions, Fourier transformation• Applications



السنة الدراسية الثالثة

			الرمز		
			LOT302		فيزياء الليزر

ودراسة خصائصها وفوائدها ومضارها.

لغة التدريس: اللغة الانكليزية.

week	Syllabus
1-10	<p>Laser Gain</p> <ul style="list-style-type: none">• Fluorescence line shape of the laser• Fluorescence linewidth.• Mathematical expressions of fluorescence linewidth• Laser Gain curve• Broadening the fluorescence line.• Natural broadening.• Doppler broadening.• Pressure broadening• Loop Gain.• Calculating loop gain (GL) without losses.• Calculating loop gain (CL) with losses.• Calculating gain threshold (GL)th.• Hole Burning in the laser gain curve• Active medium gain with lasing and without - Hole Burning• Saturation gain in a continuous wave laser• Gain and Output power of CW laser• Continuous wave laser• Pulsed laser• Pulse shape out of a pulsed Ruby laser.



<p>11-20</p>	<p>Laser Radiation Properties</p> <ul style="list-style-type: none"> • Radiometry and units measuring electromagnetic radiation. • Spatial distribution of the emitted radiation at the output coupler. • Transverse electromagnetic modes of the laser radiation. • Gaussian Laser Beam. • Beam Divergence. • Divergence Angle. • Near field and far field. • Rayleigh range and Gaussian beam divergence • Diffraction through a circular hole. • Fresnel number. • Beam focusing. • Characteristics of Laser Radiation Pulses • Single pulse of laser radiation. • Excitation of the laser with pulsed energy. • Different types of pulses. • Special mechanisms for creating short pulses • Control of the duration of the laser radiation pulse by the excitation Mechanism • Q-switched lasers. • Q (Quality) factor. • Q switch • Different methods for Q Switching • Cavity Dumped Lasers • Mode-Locked Lasers
<p>21-30</p>	<p>Controlling the laser radiation properties</p> <ul style="list-style-type: none"> • Controlling the transverse optical modes of the beam. • Some common laser resonators • Plane-plane optical cavity. • Circular mirrors with large radius of curvature. • Confocal optical cavity • Circular optical cavity • Half circular optical cavity. • Unstable optical cavity. • Controlling the wavelength spectrum emitted from the laser



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| <ul style="list-style-type: none">• Selective excitation of the active medium.• Selective coating on the cavity mirrors.• Special optical element inside the optical cavity• Prism.• Diffraction Grating• Etalon |
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السنة الدراسية الثالثة

الساعات الاسبوعية		الرمز	السنة الدراسية الثالثة	إسم المادة
مجموع	عملي	LOT303	نظام سنوي (٣٠) إسبوع	إتصالات لا سلكية والكترونيك٢
4	٢			

هدف المادة: تهدف هذه المادة الى تعريف الطالب حول انتشار الموجة في الفضاء وحركتها الموجية واستغلالها في عملية الاتصالات والدوائر الالكترونية المستخدمه في تشفيرها وفك التشفير وارسالها واستقبالها.
لغة التدريس: اللغة الانكليزية.

week	Syllabus
1	Introduction: Communication and propagation systems
2-10	Modulation <ul style="list-style-type: none"> • Analogue Modulation • AM Modulation • FM Modulation • PM Modulation • Digital Modulation systems • Pulse modulation systems (PM) • A/D and D/A convertors • PCM • TDM • FDM • ASK • FSK • PSK • PSK & BPSK
11-15	Noise <ul style="list-style-type: none"> • External noise figure • Internal noise figure



	<ul style="list-style-type: none">• Maximum power transfer• SN ratio• Noise figure and noise factor• Noise temperature• Carrier to noise ratio• BER
16-20	Transistor and amplifiers properties
20-25	Rectifier, Thyristor, and trigger
25-30	Power supply, generator, and Max generator



السنة الدراسية الثالثة

			الرمز		
			LOT304		الالكترونيات القدرة
2	-				

تعمل على تجهيز قدرات عالية او استهلاك قدرات عالية وطريقة تصميمها والمكونات الداخلة فيها.

لغة التدريس: اللغة الانكليزية.

week	Syllabus
1	Introduction
2-5	<p>Power Electronics Defined and power diodes</p> <ul style="list-style-type: none"> • Key Characteristics • Trends in Power Supplies • Conversion Examples • Tools For Analysis and Design • Diode as a Switch • Some Properties of PN Junction • Common Diode Types • Typical Diode Ratings • Snubber Circuits for Diode • Series and Parallel Connection of Power Diodes • Typical Applications of Diodes
6-10	<p>Thyristors and Gate Trun-OFF Thyristors</p> <ul style="list-style-type: none"> • Basic Structure and Operation • Static Characteristics • Dynamic Switching Characteristics • Thyristor Parameters • Types of Thyristors • Gate Drive Requirements



	<ul style="list-style-type: none"> • PSpice Model • Gate Turn-Off Thyristors; Basic Structure and Operation • GTO Thyristor Models • Static Characteristics • Switching Phases • SPICE GTO Model
11-20	<ul style="list-style-type: none"> • Power Bipolar Transistors • Basic Structure and Operation • Static Characteristics • Dynamic Switching Characteristics • Transistor Base Drive Applications • SPICE Simulation of Bipolar Junction Transistors • BJT Applications • The Power MOSFET • The Need for Switching in Power Electronic Circuits • General Switching Characteristics • The Power MOSFET • MOSFET Structure • MOSFET Regions of Operation • MOSFET PSPICE Model • Comparison of Power Devices
21-30	<ul style="list-style-type: none"> • Insulated Gate Bipolar Transistor • Basic Structure and Operation • Static Characteristics • Dynamic Switching Characteristics • IGBT Performance Parameters • Gate-Drive Requirements • Circuit Models • MOS Controlled Thyristors (MCTs) • Equivalent Circuit and Switching Characteristics • Comparison of MCT and Other Power Devices • Gate Drive for MCTs • Protection of MCTs. • Generation-1 and Generation-2 MCTs



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| <ul style="list-style-type: none">• N-channel MCT• Base Resistance-Controlled Thyristor• MOS Turn-Off Thyristor• Applications of PMCT |
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السنة الدراسية الثالثة

			LOT305		أشباه الموصلات
2	-				

وتركيبتها وخصائصها الفيزيائية وطرق تحويلها الى مواد فائقة التوصيل او مواد فائقة العزل. وطرق استخدامها كأجهزة للكشف عن الليزر وباقي الاشعاع الكهرومغناطيسي.

لغة التدريس: اللغة الانكليزية.

week	Syllabus
1	Introduction
2-10	<ul style="list-style-type: none">• Energy bands in typical semiconductors• Structure of atom.• Degeneracy of energy levels in free atoms• Formation of energy bands in crystals• Filling of energy bands by electrons• Division of solids into conductors , semiconductors and Insulators• Bad structure of semiconductors• Free electrons and holes concentrations in semiconductors• Types of semiconductors (doping)• Intrinsic semiconductors (pure)• Extrinsic semiconductors (doping)• The general equations of intrinsic and Extrinsic semiconductor• Semiconductor in Equilibrium• Non- Equilibrium Excess carriers in Semiconductor• Fermi-level in semiconductor• Movement of charge carrier in semiconductor (majority and minority carriers)• Hall effect and carrier density



11-20	<ul style="list-style-type: none">• Elementary transport in semiconductors.• Electric field transport.• Mobility• Conduction by diffusion• Carrier lifetime• diffusion length• Contact phenomena• Electron-Hole junction.• Methods of producing pn junction.• Equilibrium state of a pn junction.• Rectifying properties a pn junction.• Breakdown of a pn junction.
21-25	<ul style="list-style-type: none">• Semiconductor diode• P-N junction Zero applied bias.• P-N junction forward biasing.• P-N junction reverses biasing.• V/I characteristics of diode.• Current components in a pn junction.• Load Line.• Linear diode model equivalent circuit.• Zener diode• Zener Breakdown.• Avalanche Breakdown.• Transistor• Junction transistor.• Bipolar transistor.• Field effect transistor (JFET ,MOSFET[DE-MOSFET,EMOSFET])
26-30	<ul style="list-style-type: none">• Measuring the electromagnetic spectrum,• Photo detectors• Vacuum photodetectors• Semiconductor detectors• P-N photodetectors• P-i-N diodes• Avalanche photodiode



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| | <ul style="list-style-type: none">• Basic principle of photo detector• Detector arrays• CCD detector |
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السنة الدراسية الثالثة

			الرمز		
			LOT306		أطياف ومواد
2	-				

عملية التحليل الطيفي. والمواد التي تكون ذات فاعلية في اجهزة الليزر وكواشفه.

لغة التدريس: اللغة الانكليزية.

week	Syllabus
1	Introduction
2-15	<p>Adiabatic Approximation and the Concept of Molecular Potentials</p> <ul style="list-style-type: none"> • Quantum-Mechanical Description of Free Molecules • Separation of Electronic and Nuclear Wavefunctions • Born-Oppenheimer Approximation • Adiabatic Approximation • Potentials, Curves and Surfaces, Molecular Term Diagrams and Spectra • Electronic States of Diatomic Molecules • Exact Treatment of the Rigid H_2^+ Molecule • Classification of Electronic Molecular State • Energetic Ordering of Electronic States • Symmetries of Electronic Wavefunction
16-30	<ul style="list-style-type: none"> • Electronic Angular Momenta • Electron Configurations and Electronic States • The Approximation of Separated Atom • The “United Atom” Approximation • Approximation Methods for the Calculation of Electronic Wavefunction • The H_2 Molecule • Quantum-mechanical Treatment



- Rotation of Diatomic Molecules
- The Rigid Rotor
- Centrifugal Distortion
- The Influence of Electron Rotation
- Molecular Vibrations
- The Harmonic Oscillator
- Vibration-Rotation Interaction
- The material structure
- PN junction
- P-I-N junction
- Hetero junction structure
- Alloys



السنة الدراسية الثالثة

			الرمز		
			LOT307		الميكانيك الكمي
2	-				

الثوابت الفيزيائية الكمية الخاصة بالجسيمات التي تقترب اوزانها من الصفر وكيف يتم حساب كثافة الحالات لها وطاقتها والتوزيعات المتوقعة لها في القشرات الخارجية للذرات والجزيئات وتفاعلها مع بعضها البعض.

لغة التدريس: اللغة الانكليزية.

week	Syllabus
1	Introduction
2-10	<ul style="list-style-type: none">• The structure of matter• Length scales from cosmology to elementary particles• States of matter• Elementary constituents• The fundamental interactions• Black-body radiation• The photoelectric effect• Wave–particle duality• Wave quantisation• Heisenberg uncertainty principle• Schrödinger’s equation• Expectation values and the momentum operator• Some properties of Wavefunctions• The variational principle
11-20	<ul style="list-style-type: none">• Energy levels• Energy levels in classical mechanics and classical models of the atom• The Bohr atom

	<ul style="list-style-type: none">• Orders of magnitude in atomic physics• Hilbert spaces of finite dimension• Linear operators on \mathcal{H}• Linear, Hermitian, unitary operators• Projection operators and Dirac notation• Unitary operators and Hermitian operators• Operator-valued functions
21-30	<ul style="list-style-type: none">• Dirac – Delta function• One dimensional Dirac – Delta function• Helm Holts theorem• Potentials

			الرمز		
			LOT30		معالج مايكروبي

والكودات المستخدمة فيها.

لغة التدريس: اللغة الانكليزية.

week	Syllabus
1	Introduction
2-10	<ul style="list-style-type: none"> • Architecture of 8085 microprocessor: Block diagram; registers ALU; control unit. • Instructions set and programming of 8085 microprocessors • Stack and Subroutine
11-20	<ul style="list-style-type: none"> • Time delay and Counters • Interrupts • Addressing modes • Pin out of 8085 microprocessor, Buses system, and Control signals.
21-30	<ul style="list-style-type: none"> • Memories: Type of memory; storage element; memory addressing multi chips memory. • fetch and execute cycle • Interfacing I/O devices • 8086 microprocessor: Block diagram; architecture; registers; pin out; Introduction to programming.



السنة الدراسية الثالثة

الساعات الاسبوعية		الرمز	السنة الدراسية الثالثة	إسم المادة
مجموع	عملي	LOT309	نظام سنوي (٣٠) إسبوع	تطبيقات حاسبة
٣	٢			

هدف المادة: تهدف هذه المادة الى تعريف الطالب على طريقة المعالجة المايكروية في الاجهزة والكودات المستخدمة فيها.

لغة التدريس: اللغة الانكليزية.

week	Syllabus
1	Introduction
2-15	Mat lab Design
16-30	Programing with C++ language

جامعة الفرات الاوسط التقنية
قسم هندسة تقنيات الليزر
والكهربوصريات



وزارة التعليم العالي والبحث العلمي
الكلية التقنية الهندسية - النجف

السنة الدراسية الرابعة

السنة الدراسية الرابعة

			الرمز		
			LOT ٤٠١		تطبيقات الليزر

الصناعية وغيرها..

لغة التدريس: اللغة الانكليزية.

week	Syllabus
1	Introduction
2-10	<ul style="list-style-type: none"> • Material & Laser Parameters • Material Parameters • Laser Parameters • Beam Transport • Beam Focusing • Controlling the beam after it is emitted out of the optical cavity • Beam Expander • Applications of Lasers with Beam Expanders • Types of Beam Delivery System • Optical Processes • Energy • Balance Approximation
11-20	<ul style="list-style-type: none"> • Industrial Applications • Laser Drilling • Laser Cutting • Laser Welding • Materials –Processing Applications • Surface Hardening



	<ul style="list-style-type: none">• Re-melting (Glazing)• Alloying• Cladding• Annealing• Micromaching• Laser marking• Laser Scribing
21-30	<ul style="list-style-type: none">• Metrological & Scientific Applications• Scatter Measurement• Optical Alignment• Applications of Lasers in Chemistry• Pollution Detection• Laser Doppler Velocimeter• Digital Optical Storage of Information• Laser Spectroscopy• Free Space Optical Communications• Optical computer.• Laser Depth Sounder.• Laser Printer.• Ring Laser Gyroscope• Interaction between Laser Radiation and Biological Tissue• The effects of the laser beam on the biological tissue• Military Applications• Laser Range-finder• Detecting the Laser signal• Classification of Laser Range Finders• Laser Tracking Systems• Laser Target Designator• Laser weapons ("Star War")• Laser blinding for man and sensitive equipment.



السنة الدراسية الرابعة

الساعات الاسبوعية		الرمز	السنة الدراسية الرابعة	إسم المادة
مجموع	عملي	LOT 402	نظام سنوي (30) إسبوع	أنظمة ليزر متقدمة
4	2			

هدف المادة: تهدف هذه المادة الى تعريف الطالب بالانظمة المتعددة لتوليد وتشغيل الليزر

لغة التدريس: اللغة الانكليزية.

week	Syllabus
1	Introduction
2-10	<ul style="list-style-type: none"> • Operation of practical Lasers • The Laser: Background • The Active Medium. • Lasing thresholds • Types of energy levels in lasers. • Level Lifetime. • The Pump Source • The Optical Cavity. • Population Inversion in Lasing Mediums. • Operational Modes of Lasers. • Continuous mode of operation. • Pulsed mode of operation. • Output Parameters • Laser power and Laser energy. • Laser efficiency. • Operating Wavelengths. • Classification of Lasers
11-20	<ul style="list-style-type: none"> • Gas Lasers • Excitation of Gas Laser by Electrical Discharge.



	<ul style="list-style-type: none">• Excitation of Laser by Optical Pumping .• Atomic Gas Lasers (Neutral Gas Lasers)• He-Ne Lasers.• The Copper Vapor Laser .• Ion Lasers• The Argon ion Laser• He-Cd Laser.• The Krypton Laser.• Molecular Gas Laser .• The Carbon Dioxide Laser .• The Carbon Monoxide Laser.• The Nitrogen Laser .• The Excimer Laser .• The Chemical Laser .• Far Infra- Red Laser (FIR)
21-30	<ul style="list-style-type: none">• Solid State Insulator Laser• Structure of the Active Medium in Solid State Laser.• Pumping Methods• Optically Pumped Solid State Lasers• Arrangement of Pump and Laser rod• Diode Pumped solid state Lasers.• Fresnel Losses.• The Ruby Laser($Cr^{3+} : Al_2O_3$)• The Nd:YAG Lasers• The Nd : glass Laser• Alexandrite Laser($Cr^{3+} : BeAl_2O_4$)• Color or F Center Laser• Titanium Sapphire Laser• Semiconductor Lasers• Energy Bands in Semiconductors• Laser Action in A semiconductor Laser• Diode Lasers• The Difference between Diode Laser and LED• Dye Lasers



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| <ul style="list-style-type: none">• Special Lasers• Free Electron Laser(FEL)• X-Ray Laser• Fiber Laser• Gamma- Ray Laser• Mid- Infrared Advanced Chemical Laser (MIRACL). |
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السنة الدراسية الرابعة

			الرمز		
			LOT ٤٠٣		اتصالات ضوئية

في الفضاء الحر وفي الليف الضوئي. وكذلك دراسة الرق بين الليزر والدايود الباعث للضوء في عملية النقل للبيانات.

لغة التدريس: اللغة الانكليزية.

week	Syllabus
1	Introduction
2-10	<ul style="list-style-type: none">• Optical Fiber : Structures and wave guiding Fundamentals• Nature of Light• Optical Fiber modes and configurations• Mode Theory for circular waveguides• Graded-Index Fiber structure• Signal Degradation in optical Fiber.• Fiber Material and Fabrication Methods• Attenuation• Signal Distortion in Optical Waveguide
11-20	<ul style="list-style-type: none">• Optical Sources• Light Emitting Diodes (LED's)• Laser Diodes (LD)• Power Launching and Coupling• Source -to- Fiber Power Launching• Fiber-to- FIBER Joints• Photodetectors.• PIN Photodiode.



	<ul style="list-style-type: none">• ADD Photodiode
21-30	<ul style="list-style-type: none">• Optical Receiver Operation• Fundamental Receiver Operation.• Digital Receiver Performance Calculation.• Analogue Receiver.• Transmission Link Analyses• Point -to- Point Links• Wavelength Division Multiplexing (WDM)• Line Coding



السنة الدراسية الرابعة

الساعات الاسبوعية		الرمز	السنة الدراسية الرابعة	إسم المادة
مجموع	عملي	LOT 404	نظام سنوي (٣٠) إسبوع	معالج إشارة رقمية
٢	-			

هدف المادة: تهدف هذه المادة الى تمكين الطالب من استخدام معالج الاشارة الرقمية لغرض
تمكينه من التعامل مع الاشارات الرقمية التي يمكن تحميلها على شعاع الليزر.

لغة التدريس: اللغة الانكليزية.

week	Syllabus
1	Introduction
2-10	<ul style="list-style-type: none">• Continuous and discrete signals and systems• Convolution
11-20	<ul style="list-style-type: none">• Fourier analysis continuous signals and system• Discrete Fourier transform (DFT), Fast Fourier transform (FFT).
21-30	<ul style="list-style-type: none">• Fast Fourier transforms (FFT).• The Laplace transform and the z-transform, solution of difference equations.• Feedback system• Signal processing, filtering



السنة الدراسية الرابعة

الساعات الاسبوعية		الرمز	السنة الدراسية الرابعة	إسم المادة
مجموع	عملي	نظري	LOT ٤٠٥	نظام سنوي (٣٠) إسبوع
٤	٢	٢		

هدف المادة: تهدف هذه المادة الى تمكين الطالب من استخدام الاجهزة ذات البلورات الالكترونية البصرية التي تسمح بمرور الضوء بداخلها بعد إجرائها لعمليات التداخل لتحميل الضوء للبيانات اللازمة.

لغة التدريس: اللغة الانكليزية.

week	Syllabus
1	Introduction
2-10	<ul style="list-style-type: none"> • Remote sensing elements • Energy source or illumination • Radiation and atmosphere • Interaction with target • Recording of energy by the sensor • Transmission , Reception ,and processing • Interpretation and Analysis • Application • The electromagnetic spectrums used in remote sensing • Ultraviolet or UV Spectrum • Visible spectrum • Infrared spectrum • Microwaves spectrum . • Interaction with Atmosphere • Scattering • Absorption • Remote sensing system



	<ul style="list-style-type: none"> • Passive remote sensing • Active remote sensing
11-20	<ul style="list-style-type: none"> • Platforms of recording energy by sensors • Ground-based sensors • Aerial platforms • Space- based sensors • Satellite characteristics • Resolution • Spatial resolution • Spectral resolution • Radiometric resolution • Temporal resolution • Multi spectral scanning • Scanning systems • IFOV • Across – track scanning • Along – track scanning • Thermal imaging • Weather satellites and sensors • GOES
21-30	<ul style="list-style-type: none"> • Retardation and Birefringence • Electro-Optic Effect And Pockls Cell And Optical Activity • Materials Kerr Modulation And Optical Frequency Kerr Effect • Scanning and Switching • Magneto- Optic Device And Faraday Effect • Acousto- Optic Effect • Raman-Nath Regime • Bragg Regime • Non Linear Optics • Harmonic Generation • Parametric Oscillation •



السنة الدراسية الرابعة

			الرمز		
			LOT		تصميم الليزر

لغة التدريس: اللغة الانكليزية.

week	Syllabus
1	Introduction
2-10	<ul style="list-style-type: none"> • Gas laser • Power supplies for continuous-wave gas lasers • Electrical Characteristics of Gas Discharges • Power Supplies for Helium-Neon Lasers Switching Elements • Carbon Dioxide Laser Power Supplies • Flash lamps For Pulsed Lasers and Flash lamp Power Supplies • Electrical Characteristics of Flash lamps • Triggering • Power Supplies for Flash lamps • Charging Power Supply • Control of Pulse Shape • Optical Characteristics • Mechanical Characteristics • Cooling for Flash lamps • Failure Mechanisms and Lifetime • Selection of Flash lamps • Maintenance and Care
11-20	<ul style="list-style-type: none"> • DIODE LASER POWER SUPPLIES • Description of Laser Diodes • Semiconductor Laser Materials



	<ul style="list-style-type: none">• Structures of Laser Diodes• Laser Diode Damage and Lifetime• Mounting and Cooling of Laser Diodes• Power Supplies for Laser Diodes
21-30	<ul style="list-style-type: none">• PULSED SOLID-STATE LASER• Pulsed Solid-State Laser Components• Laser Rod• Optical Pumping System• Optical Cavity• Cooling System• Output Characteristics Of Pulsed Solid-State Lasers• Active resonators• Resonators sensitivity• Mode selection technique• Resonators configuration used in the generation of TEM00mode output• Large radius mirror configuration• Resonators with internal beam focusing• Unstable resonator



السنة الدراسية الرابعة

			الرمز		
			LOT		صلبة

منها.

لغة التدريس: اللغة الانكليزية.

week	Syllabus
1	Introduction
2-10	<ul style="list-style-type: none">• Photons• The photoelectric Effect• Compton Scattering• Energy Quantization in Atoms• The De Broglie Hypothesis• Electron Interference and Diffraction• Sate Functions• Operators• Corollary 1• Corollary 2• Commutation relation
11-20	<ul style="list-style-type: none">• Uncertainty Principle• Eigen Value and Eigen Function• The Schrödinger Equation• Three-dimensional Time Dependent Schrödinger Eq. for free particle• Time Dependent Schrödinger Eq. for a particle in a field• Hamiltonian Operator• Physical Interpretation of and the probability current density• The General Solution of the One-dimensional Schrödinger Equation for a Free



	<ul style="list-style-type: none">• Particle• Time Independents One-dimensional Schrödinger Equation• Particle in a One-Dimension Box• Partials in infinite well• The concept to of parity• Partials in finite well• Particles at Potential Step• Particles At A Barrier and The Quantum Mechanical Tunnelling Effect
21-30	<ul style="list-style-type: none">• The harmonic oscillators• Dirac's notation• Heisenberg's equation of motion• The harmonic oscillator based on Heisenberg's formalism of quantum mechanics• Photons• Quantization of free electromagnetic wave• Black Body Radiation• Quantum theory of coherent optical states• The Hamiltonian of the hydrogen atom• Angular momentum of the hydrogen atom• Structure of the hydrogen atom• Electron spin and the theory of generalized