



# كلية التقنية الإلكترونية بني وليد

نظم معلومات  
تقنية المعلومات  
الأجهزة الدقيقة للنفط والغاز  
تقنيات النانو والاتصالات والموجات الدقيقة  
الوسائط المتعددة  
الحاسوب  
الالكترونيات طيران  
التحكم الآلي  
القوى  
الالكترونيات الطبية  
الدراسات العليا

## قسم هندسة الأجهزة الدقيقة للنفط والغاز Oil and Gas Instrumentation Engineering

دليل القسم لسنة  
2017/2016



### قسم الأجهزة الدقيقة للنفط والغاز

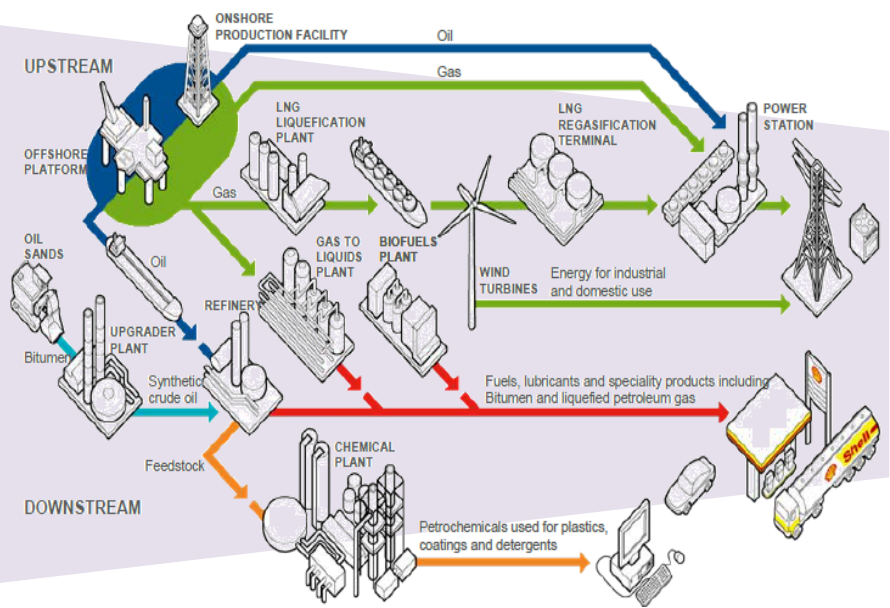
تتمثل مهمة القسم في توفير بيئة تعليمية وعملية متميزة للطلاب في مجال هندسة الأجهزة الدقيقة للنفط والغاز، وذلك من خلال توفير أحدث التقنيات والأجهزة المستخدمة في هذا المجال، وذلك بالتعاون مع المؤسسات البحثية والأكاديمية ذات الصلة.

**الاهداف:**

- 1- توفير بيئة تعليمية وعملية متميزة للطلاب في مجال هندسة الأجهزة الدقيقة للنفط والغاز.
- 2- توفير أحدث التقنيات والأجهزة المستخدمة في هذا المجال.
- 3- التعاون مع المؤسسات البحثية والأكاديمية ذات الصلة.
- 4- توفير بيئة عمل مناسبة للطلاب في مجال هندسة الأجهزة الدقيقة للنفط والغاز.

**مهام القسم:**

- 1- عمل العمليات الصناعية.
- 2- عمل الأبحاث والتجارب.
- 3- عمل الدراسات والأجهزة الدقيقة.
- 4- عمل الصيانة والتفتيش.



# فهرس الدليل

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## 1- نبذة عن القسم

تمتاز ليبيا بثرواتها الطبيعية من النفط والغاز، والتي تحتاج إلى كوادر وطنية متخصصة في عملية الانتاج والتصنيع والذي بدوره بحاجة الى عمليات التحكم والقياس ومراقبة العمليات الصناعية المتعددة، ولما تحتاجه عملية النقل من مراقبة ومتابعة من قبل كوادر وطنية ذات كفاءة، لذا أرتئينا من جانبنا ضرورة المساهمة في تطوير وتأهيل كوادرنا الوطنية وذلك بإنشاء قسم علمي هندسي في هذا المجال تحت مسمى (هندسة الأجهزة الدقيقة للنفط والغاز).

ولما تمتاز به كلية التقنية الالكترونية بني وليد من كفاءة وخبرة في مجال الالكترونيات، ولوجود علاقة وطيدة بين تخصص الاجهزه الدقيقة والاجهزه الالكترونية. فانه تم انشاء قسم مستقل في شهر مايو من سنة 2013 بمسمى ( هندسة الأجهزة الدقيقة للنفط والغاز) وإدراجه من ضمن الاقسام العلمية للكلية، حيث يدرس الطلاب الفصول الاربعه التمهيديه مع باقي اقسام الكلية وبعد ذلك يتجه الطلاب الراغبين في هذا المجال الى قسم هندسة الاجهزة الدقيقة.

الهيئة الأكاديمية للقسم تتكون من 17 عضواً، بدرجات علمية ما بين ( أستاذ، أستاذ مساعد، محاضر، مساعد محاضر، مهندس). يقوم فريق الأكاديمي بتسيير العملية التعليمية داخل القسم، القيام بالندوات و ورش العمل، بالإضافة إلى الإشراف على مشاريع التخرج والقيام بالأبحاث العلمية بالقسم والكلية والتي يتم نشرها عادة في مجلات علمية محكمة دولياً.

## 2- أهداف القسم

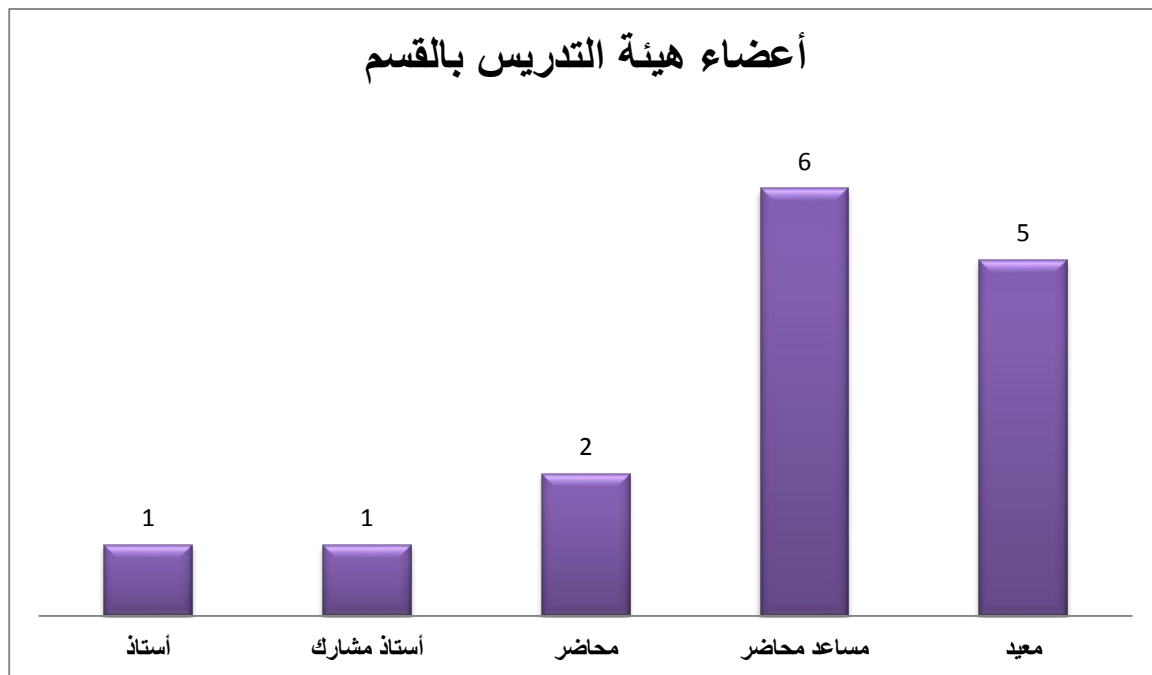
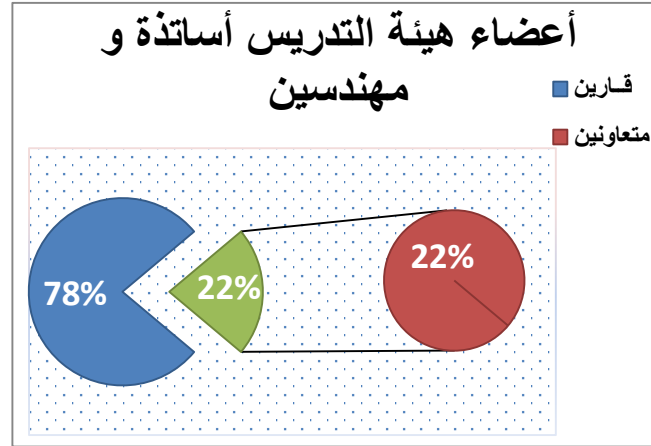
1. تعزيز وترصين خريجي القسم بأساس قوي في مجال عمليات القياس والتحكم والمراقبة.
2. توفير احتياجات الشركات المستثمره في مجال النفط والغاز الطبيعي بالدولة الليبيه من المهندسين المؤهلين للعمل في المجالات التقنيه المتعلقة بصناعه النفط الغاز الطبيعي .
3. مساعده الكلية في اتاحه فرص عمل للشباب الراغبين في العمل في مجالات النفط والغاز وذلك برفع كفاءتهم من خلال دراستهم في هذا القسم.
4. المساهمه في بناء ليبيا الجديدة بتخريج كوادر بشرية محلية قادرة على سد احتياجات قطاع البترول والغاز الطبيعي .
5. المساهمه في تأهيل الشباب الليبي لاستيعاب التقنيات الحديثه واكتساب المهارات العلميه والتقنية ذات العلاقة بصناعه وإنتاج النفط والغاز.

## رسالتنا

من أجل تعليم يحظى بثقة الطلاب والمجتمع.

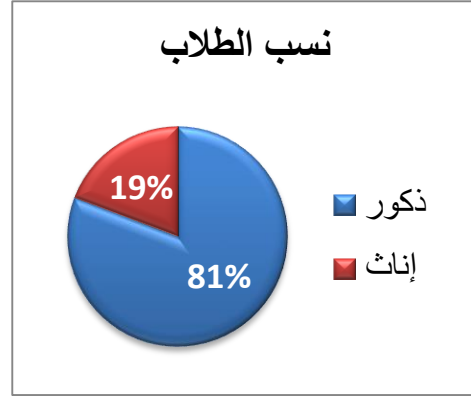
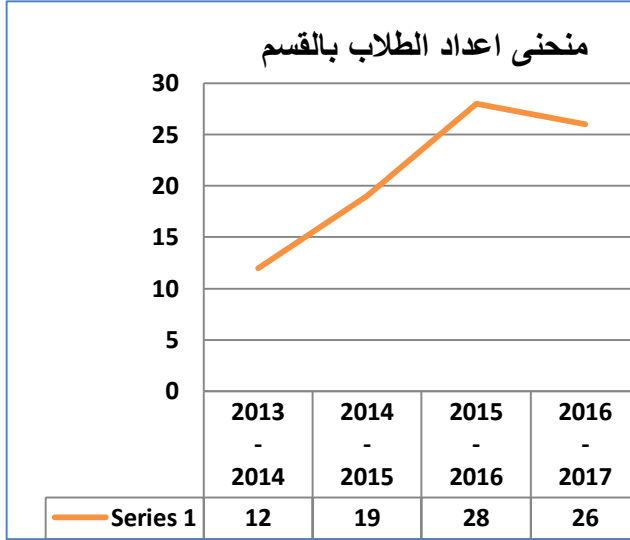
## 3- رؤيتنا

نتطلع بأن نكون على درجة عالية من الريادة والتميز في العلوم الالكترونية والأجهزة الدقيقة للنفط والغاز من خلال تخريج مهندسين ذو كفاءة عالية لتلبية حاجة سوق العمل المحلي والدولي.





## التوزيع الطلابي



## مقررات الفصول التمهيدية

## الفصل الدراسي الأول:

ت	الرمز	المقرر	الوحدات	الساعات	تدريبات نظرية
1	GS 100	Mathematics I	4	3	2
2	GS 102	Physics I	4	3	2
3	GS 103	Physics I Lab	1	2	-
4	GS 104	English I	3	2	2
5	GS 106	Electrical Circuit I	4	3	2
6	GS 107	Electrical Circuit I Lab	1	2	-
		المجموع	17	15	8

## الفصل الدراسي الثاني:

ت	الرمز	المقرر	الوحدات	الساعات
1	GS 150	Mathematics II	3	3
2	GS 152	Physics II	3	3
3	GS 153	Physics II Lab	1	2
4	GS 154	English II	2	3
6	GS 156	Electrical Circuit II	3	3
7	GS 157	Electrical Circuit II Lab	1	2
8	GS 158	Electronic Circuit I	3	3
9	GS 159	Electronic Circuit I Lab	1	2
10	GS 160	Engineering Drawing	1	3
		المجموع	18	42

## الفصل الدراسي الثالث:

ت	الرمز	المقرر	الوحدات	الساعات
1	GS 200	Mathematics III	3	3
2	GS 202	English III	2	3
3	GS 204	Digital Electronics	3	3
4	GS 205	Digital Electronics Lab	1	2
5	GS 206	Electronic Circuit II	3	3
6	GS 207	Electronic Circuit II Lab	1	2
7	GS 208	Computer Programming I	3	3
8	GS 209	Computer Programming I Lab	1	2
9	GS 210	Workshop Technology	1	3
		المجموع	<b>18</b>	<b>24</b>

## الفصل الدراسي الرابع:

ت	الرمز	المقرر	الوحدات	الساعات
1	GS 250	Mathematics IV	3	3
2	GS 252	Statistics & Probabilities	3	3
3	GS 254	Signals and Systems	3	3
4	GS 256	Computer Programming II	3	3
5	GS 257	Computer Programming II Lab	1	2
6	GS 258	Int. to Control Systems	3	3
7	GS 259	Int. to Control Systems Lab	1	2
8	GS 260	Measurements	3	3
9	GS 261	Measurements Lab	1	2
		المجموع	<b>21</b>	<b>24</b>

مجموع وحدات الفصول التمهيدية: 74 وحدة دراسية.



## مقررات الفصول التخصصية

## الفصل الدراسي الخامس:

ت	الرمز	المقرر الدراسي	الوحدات	الساعات
1	GS 300	Numerical Analysis	3	3
2	OGI 300	Fundamental of Thermodynamic & Heat Transfer	3	3
3	OGI 302	Instrumentation Engineering	3	3
4	OGI 303	Instrumentation Engineering lab	1	2
5	OGI 304	Machine Control	3	3
6	OGI 305	Machine Control Lab	1	2
7	OGI 306	Control System Engineering	3	3
8	OGI 307	Control System Engineering Lab	1	2
		المجموع	18	21

## الفصل الدراسي السادس:

ت	الرمز	المقرر الدراسي	الوحدات	الساعات
1	CM 350	Digital Signal Processing (DSP)	3	3
2	CM 351	DSP - Lab	1	2
3	OGI 350	Process Elements & Modeling	3	3
4	OGI 352	Applied Fluid Mechanics	3	3
5	OGI 356	Embedded System	3	3
6	OGI 357	Embedded System Lab	1	2
7	OGI 358	Power Electronics & Servomechanism Control	3	3
8	OGI 359	Power Devices & Servomechanism Control lab	1	2
		المجموع	18	21





## الفصل الدراسي السابع:

ت	الرمز	المقرر الدراسي	الوحدات	الساعات
1	GS 400	Technical Report Writing	2	2
2	OGI 410	Process Control Engineering I	3	3
3	OGI 411	Process Control Engineering I lab	1	2
4	OGI 402	Analytical Instrumentation	3	3
5	OGI 404	Intro. To Petroleum and Well Logging	3	3
6	OGI 406	Hydraulic & Pneumatic System	3	3
7	OGI 407	Hydraulic & Pneumatic System Lab	1	2
8	OGI 408	Programmable Logic Controllers	3	3
9	OGI 409	Programmable Logic Controllers lab	1	2
10	GP 499	Project Proposal	2	2
		المجموع	22	25

## الفصل الدراسي الثامن:

ت	الرمز	المقرر الدراسي	الوحدات	الساعات
1	OGI 450	Process Control Engineering II	3	3
3	OGI 452	Virtual Instrumentation	3	3
4	OGI 453	Virtual Instrumentation lab	1	2
5	OGI 454	Computer Control (SCADA)	3	3
6	OGI 455	Computer Control (SCADA) lab	1	2
7	OGI 458	Project Management And Quality	3	3
8	OGI 462	Environmental Science	1	1
9	GP 499	Project Implementation	2	3
		المجموع	17	20

مجموع وحدات التخرج: 149 وحدة دراسية

## المواد الاختيارية:

ت	الرمز	المقرر الدراسي	الوحدات	الساعات
1	OGI 470	Fiber Optic Instrumentation	3	3
2	OGI 471	Fiber Optic Instrumentation lab	1	2
3	OGI 460	Process Safety	3	3
4				
5				

## المناهج الدراسية

(( أولاً: مناهج الفصول التمهيديّة ))

**Semester: 1****GS100 Mathematics I**

*Calculus*: Real numbers [intervals and inequalities], Functions, Limits, Continuity, Theorems on differentiation, Derivatives of elementary functions: algebraic, trigonometric exponential, logarithmic and hyperbolic, Derivatives of inverse functions: trigonometric and hyperbolic, Implicit differentiation, Parametric and Logarithmic differentiation, Maximum and minimum values of functions, *Analytical geometry*: Two and three dimensional coordinate systems: Cartesian, Polar, Cylindrical and Spherical, *Algebra*: Polynomials, remainder and factor theorem, Complex numbers, argued diagram, Cartesian and Polar forms, Operations with complex numbers, De Moivre's theorem and exponential forms.

**GS102 Physics I**

International system of units (SI); Fundamental SI units, derived units, derived units with special names. Vectors and Scalars; Vector addition (polygon, triangle and analysis methods). Rectilinear motion; average and instantaneous velocity and acceleration, freely falling bodies. Circular motion; centripetal force, projectile. Newton laws of motion. Work; work done by constant and variable force. Energy; potential and kinetic energy, elastic potential energy and conservation of energy. Geometrical Optics; nature of light, reflection and refraction, formation of images by reflection and refraction. Interference and diffraction. Sound; waves, Simple Harmonic Motion and its equations. Wave classification (Electromagnetic and mechanical). Wave equation. Wave speed (speed of a longitudinal and transverse waves). Vibrations of thread and air columns.

**GS104 English I**

Correct use of tenses; Use of Numbers & decimals: Introduction to measurement units; Use of descriptive nouns; Simple descriptions of shapes, figures and expressions of values; Describing angles and lines and some other geometrical shapes; Reading formulae; Introduction to fractions, equations, mathematical values and related expressions; Descriptions of basic spatial relationships of objects; Basic expressions of motion in various

directions; Definition of sentence and its parts and kinds; Sentence and its different types; noun and its forms; changing the voice of English sentences.

### GS106 Electrical Circuit I

Concept of current and voltage, Resistance, Conductance, ohm's law, power, Efficiency, Energy, Kirchhoff's laws, series and parallel connections, voltage and current sources, circuit analysis using branch-current, mesh and nodal methods, Bridge networks, Delta/Star conversion, Network theorems (superposition, Thevenin's, Norton's and maximum power transfer). Capacitors, capacitance, transients in capacitive circuits. Magnetic circuits, magnetic field, Flux density, permeability, Inductors, RC and RL dc circuits. Alternating current (AC) circuits, Instantaneous, peak, Mean and Effective values, series and parallel AC circuits, Phasor diagram, power in AC circuits, Series and parallel resonant circuits.

## Semester: 2

### GS150 Mathematics II

*Calculus: Integration:* Indefinite and Definite integrals, Area under a curve, Area between two curves, Integration Techniques: Integration by substitutions, Trigonometric techniques of integration, Integration by parts, Integration by partial fractions. *Partial differentiation:* Partial derivatives, Derivatives of functions of several variables, the chain, rule Euler's theorem for homogeneous functions, Total differentiation, and exact differentials. *Ordinary differential equations:* First order differential Equations: with Variables separable, Homogeneous functions, Exact differentials, Integrating factors, and Linear & reducible to linear first order equations. *Algebra:* Determinants, Properties of determinants, solutions of systems of simultaneous algebraic equation using determinants, Matrices, operations with matrices, sequences and series and convergence tests, Taylor and Maclurin's formula.

### GS152 Physics II

Static electricity charge; Classification of charges, interaction of charges; Coulomb's law. Electric field; field intensity, field direction, field mapping. Gauss Law; concept of electric flux and area vector and applications (field of an infinite plane sheet of charge and field just outside a charged conductor). Electric potential and potential difference. Capacitors; types of a capacitors (parallel plate, circular and cylindrical capacitors), connection of a capacitors (in-parallel and in-series). Dielectric; concept and influence of the dielectric on the capacity, charging and discharging of a capacitor Magnetism: Magnetic induction, force experience by the charge, Lorentz force, lines of induction, magnetic flux. Biot- Savart law. Magnetic field

produced; by a narrow circular coil and by an infinitely long straight conductor. Ampere's law. Hal effect.

### GS154 English II

Properties of materials and their comparison by using modifiers, Color and surface attributes, Statements of general truths and facts, Giving direct and indirect Instructions, Adjectives and degrees, Description of a process by using words of sequence, active and passive statements, Correct pronunciation of confusing words, Vocabulary development: Antonyms, Synonyms and Prefixes.

### GS156 Electrical Circuit II

Mesh and nodal analysis in AC circuits, networks theorems in AC circuits. Transformers, Mutual inductance, Iron-core transformer, power and Equivalent circuit, Air-core transformer and its equivalent circuits. Poly-phase systems, 3-ph generator, phaser diagram, Y and  $\Delta$  connected generator phase sequence, Two-port networks ( $Z$  and  $Y$ - parameters for  $T$  and  $\Pi$  networks), LC filters and RLC filters, Transient in simple RC and RL circuit , Transient in RLC circuits and their responses, Application of unit- step forcing function, Natural and forced responses.

### GS158 Electronic Circuit I

The P-N junction, biasing of P-N junctions; Zener diodes, Tunnel diodes, photodiodes, Light Emitting Diodes, Laser Diodes, Diode circuits and applications:-Clipping circuits, comparators, rectifiers. Introduction to Bipolar Junction Transistors, Construction and biasing, Common Emitter, Common Base and Common Collector configurations, Small signal amplifiers, hybrid parameters, small signal equivalent circuit of BJT and its simplification, Large signal amplifiers, classification of amplifiers (A, B, AB, C), efficiency, AF power amplifiers, Push-pull amplifier. Construction of Field Effect Transistors (JFET & MOSFET), the basic amplifier, small signal equivalent circuit of FET.

### GS160 Engineering Drawing

Drawing instruments, types of lines, letters and figures, geometrical construction, dimensioning, projections, principles of first angle and third angle projection applications, sectioning, section of views and hatching.

**Semester: 3****GS200 Mathematics III**

Ordinary differential equations: Linear dependence, Homogeneous and Non-Homogeneous linear differential equations with constant coefficients, Undetermined coefficients, Homogeneous and Non-Homogeneous Equidimensional equations, variation of parameters, Systems of linear differential equations. Laplace transforms: Definition and existence of Laplace transform, Translation theorem:(S-shifting, t- shifting), Unit step function, Differentiation and Integration of transforms, Transforms of derivatives and integrals, Convolution, Inverse transforms, Applications to linear differential equations with constant coefficients. Fourier analysis: Periodic functions, Trigonometric series, Fourier series of period  $2\pi$ , Fourier series of any period, Half-Range expansions, Complex Fourier series, Fourier integrals, Fourier transforms

**GS202 English III**

Expressing contrast and similarity by using conjunctions, Making Statements of Cause and Reason, Expressing Probable and Hypothetical Results, Describing Procedure, Observations, Deduction and Conclusion for a carried out experiment, Comparative use of Adjectives, Use of prepositions and Adverbs, Making Active and Passive Statements, Vocabulary Development: Antonyms, Synonyms, Prefixes and Suffixes.

**GS204 Digital Electronics**

Binary systems, binary coded decimal (BCD), octal, hexadecimal, addition, subtraction, multiplication and division, conversions between other binary systems, boolean algebra, karnaugh maps, logic gates, inhibit and enable operations, De Morgan's theorem, flip flops, shift registers; series-in-parallel-out (SIPO), serial-in-serial-out (SISO), parallel-in-serial-out (PISO), parallel-in-parallel-out (PIPO), counters; ring counter, ripple counter (asynchronous), up-down counter, divide by N counter, synchronous counters.

**GS206 Electronic Circuit II**

Frequency response of amplifiers, feedback in amplifier circuits, classification of amplifiers: voltage and current amplifiers, feedback concept; negative feedback amplifiers, analysis of

feedback configurations, principles of oscillators, Wein bridge oscillators, crystal oscillators, sinusoidal oscillators, phase-shift oscillators, multivibrators (using transistor circuits). Operational amplifiers, differential amplifiers, transfer characteristics of differential amplifiers, frequency response of op amp's: Basic applications of op amps, summing amplifiers, differentiator and integrator circuits, oscillators, comparators.

### **GS208 Computer Programming I**

Introduction to computers, hardware and software organization, files, problem solving, algorithms design and flowcharts, Introducing programming concepts and techniques, simple data types, expressions, identifiers, variables, literals, operators (arithmetic, relational, logical, bitwise), decision making and repetition statements, arrays, strings, functions. (Using C/C++ language syntax).

### **GS210 Workshop Technology**

Identification of the various types of diodes and their applications – Testing the diode when connected and not connected in a circuit – Identification of various types of transistors and their applications – Testing of transistor when connected and not connected in a circuit – Using data sheet to find the equivalent components – Soldering and testing some simple electronic circuits – Transformers and their troubleshooting – Proper use of electrical and mechanical tools in the work shop – Methods of soldering and desoldering – Fabrication of printed circuit boards of some electronic circuits – Safety measure and rules in electrical workshop.

## **Semester: 4**

### **GS250 Mathematics IV**

Power Series solutions of linear differential equations: Solutions about ordinary points, Solutions about singular points, Bessel's equation, Legendre's equation. Vectors and the geometry of space: Vectors in plane, Vectors in space, Dot and cross products, lines and planes in space: Multiple integrals: Double integrals, Surface integrals, Triple integrals. Vector calculus: Vector functions, derivative of Vector functions , motion in space, Gradient and Directional derivatives, vector fields, Divergence and Curl, Line integrals, conservative vector fields, Green theorem, Divergence theorem, Stokes` theorem, Applications of vector calculus, Partial differential equations: Separable Partial differential equations, Heat equation, wave equation, Laplac`s equation. Special function: Gamma function, Beta function

### **GS252 Statistics & Probabilities**



Rudimentary concepts of set theory; Fundamental principles of techniques of counting, factorial notations, permutations, ordered samples, binomial coefficients and theorem combinations; Sample space, axioms of probability, finite probability and infinite sample spaces; Conditional probability and its multiplication theorem, Random variables, distribution and function of a random variables, covariance and finite stochastic random process, independence, probability density function "pdf"; joint pdf, approximation to Binominal distribution, central limit theorem, Correlation and regression, Autocorrelation correlation function "ACF" , Cross ACF.

### GS254 Signals & Systems

Introduction to signals and systems, classification of signals and systems, time-domain analysis of continuous time systems, step and impulse response of continuous systems, Fourier series representation of signals (Trigonometric and Exponential), Fourier Transform, properties of Fourier transform, Convolution, cross correlation and autocorrelation, Frequency transfer function. Discrete time signals and systems, sampling of signals, examples of discrete time signals, Time-domain analysis of discrete time systems, discrete time impulse response, convolution sum. Introduction to the Z transform.

### GS256 Computer Programming II

Overview of structured programming, arrays, strings, functions including recursion, arrays and functions, sorting and searching techniques, references and pointers, structures, error-handling, file operations, overview of classes and objects.

### GS258 Introduction to Control Systems

Introduction to control engineering and control engineering practice, mathematical models of physical systems, review of Laplace transforms, transfer function and block diagrams of control systems, state variable models, characteristics of closed loop systems, performance of control systems, stability of linear systems.

### GS260 Measurements

Concepts and Principles, Measurements and error analysis, data and signal recording, mechanical pointers DC and AC current measurements, sensing and energy conversion elements, signal conditioning elements, magnifiers Transducer Fundamentals, Displacement transducer and motion sensor, strain gage, accelerometers, Gyros and attitude sensors, force transducer, Torque, flow meters, pressure, sound measuring microphones, vacuum sensors, optical detector, Humidity and moisture sensors, thermometers, liquid and level sensor.

**((ثانياً: مناهج الفصول التخصصية))****Semester: 5****GS300 Numerical Analysis**

Error analysis: rounding of numbers, classification and sources of errors, absolute and relative error, arithmetic operations with errors. Evaluation of functions: Taylor series and calculation of functions. Evaluation of a polynomial, the convergent series. Solution of non-linear algebraic equations. Iterative methods, Bisection method, Newton's method, Halley's method. Approximate solutions of systems of non-linear equations using Newton's method. Solving systems of linear algebraic equations: Gauss elimination method, Gauss-Jordan's method, Gauss-Siedel method. Interpolation and polynomial approximation: General interpolation formulae, Lagrange's interpolation, Newton's divided, forward and backward difference interpolation formulas. Curve fitting: The method of least squares. Introduction to numerical integration.

**OGI 300 Fundamental of Thermodynamic & Heat Transfer**

Introduction and Basic Concepts of Thermodynamic- System and control volume: Properties of the system- State and Equilibrium – the steady – Flow Process. Properties of pure substances - Energy Analysis of control system: Energy Balance- Specific Heat, Enthalpy internal Energy changes. (First Law of thermodynamic). Fundamentals of Heat Transfer: Introduction of heat transfer: Conduction, Convection and Radiation- Steady State one – dimensional Heat conduction.

**OGI 302 Instrumentation Engineering**

Principles of sensors, temperature sensors & transducer, flow sensors: Calculations: Bore of Orifice Plate, Venturi tube, Nozzel. Transducer, level sensors, transducer, pressure sensors , transducer weight sensors , transducer force sensors ,transducer, humidity sensors transducer. Basic standard of loop signals (4 to 20 mA) coupled.

Introduction to Signal conditioning : transmission, rectifiers, transformers, filters, current to voltage converters, voltage to current converts, current to pressure converters, voltage to frequency converters, voltage follower, amplifiers, magnetic, photo. Electronic interfacing,

**OGI 303 Instrumentation Engineering lab**

1. Studying of thermocouple and RTD characteristics.
2. Studying of temperature transducer using operation amplifier.
3. Studying of photo flow transducer.
4. Studying of Ultrasonic level transducer.
5. Studying of photo level transducer.
6. Studying of pressure transducer using LVDT.
7. Studying of weight transducer using strain gages.
8. Studying of soil humidity transducer.
9. Electrical circuits of (4-20mA) process coupled system.
10. Principles of transmission & conditioning of control signals of control signals.
11. Using the application of rectifiers & transforms in loop signals.
12. Studying of voltage to current converts' circuits.
13. Studying of current to voltage converter' circuits
14. Studying of voltage follows circuits
15. Studying of voltage to frequency converters.
16. Studying of magnetic, photo, and electronic interfacing.
17. Using of ON/OFF controller (temperature).
18. Using of LCD display units.

### OGI 304 Machine control

Introduction to control components: types and application of switches, types and applications of contactors, types and uses of electromechanical relays, solid state relays, principles and operation of DC/AC machines, DC Motors control and starters , AC motors : single phases there phase starters and control, tachometers fundamentals and applications, special purpose of motors, electromechanical valves, solenoid actuators, electromechanical pumps. Industrial P, PI, PID Controllers.

### OGI 305 Machine control Lab

1. Studying of switches types and applications
2. Studying of physical characteristics of contactors
3. Studying electromechanical relays and its applications.
4. Studying of solid state relays.
5. Studying of DC motors types
6. Studying of Ac motors and their types
7. Studying of stepper motors
8. Studying of electromechanical valves characteristics.
9. Studying of operation and application of solenoid actuators.

### OGI 306 Control System Engineering

Introduction to control system: System orders and types, system inputs and responses, block diagrams, open loop and close loop configurations, time response & frequency response Routh criteria, Proportional Integral Derivative, Root locus analysis and design, Bode plot lag & lead analysis and design, compensation of system response. (PI,PD,PID).

### OGI 307 Control System Engineering Lab

1. Effect of location of poles on stability
2. Routh - criterion
3. Design specification in time domain
4. Root locus
5. Design of PI controller .
6. Design of PD controller.
7. Design of PID controller.
8. Design of PID controller.
9. Design of Phase Lead/Lag compensator.
10. Bode plot .
11. Transient Response via gain adjustment

## Semester: 6

### GS350 Digital Signal Processing

Review of discrete systems and signals, Z-transform and its properties, inverse Z-transform, realization of discrete time systems, direct, cascade, parallel and Ladder realizations, Fourier analysis for discrete time systems, discrete Fourier series, discrete Fourier transform (DFT), properties of DFT, linear and periodic convolution, Fast Fourier transform FFT, selected discrete orthogonal transform, discrete Walsh-Hadamard and Haar transforms, discrete cosine transform. Digital filter design, FIR filter design, IIR filter design.

### OGI 350 Process Elements & Modeling

Introduction of process elements, process characteristics, classification of variable physical laws of elements, development of mathematical models, basic structure of tanks, series tanks, coupled tanks, floating tanks, boilers, heat exchangers types, distillation columns, reactors, furnaces, and piping types and structures.

### OGI 352 Applied Fluid Mechanics

Properties of Fluid: introduces the symbols and unites involved and discussed the Kind of calculations required in the study of fluid mechanics, Viscosity as the properties of fluid that offers resistance to the relative motion of fluid molecules. Pressure measurement relationship between pressure elevation, manometer. Force on submerged plane surface: several cases to

calculate the forces exerted on plane. Buoyancy and stability of bodies. Fluid flow and Bernoulli's equation: Continuity Equation . Fluid Flow rate. Application of Bernoulli equation. General Energy Equation. Forces due to fluid in motion. Remolds number. Laminar flow and turbulent flow. Energy loss: due to friction. Series & Parallel Pipe line system: Classification and Branches system. Flow measurement: Flow meter, Variable Head meter ,vortex flow meter.

### **OGI 356 Embedded Systems**

Introduction to an embedded systems and microcontrollers, processor in the system, other hardware units, software embedded into a system embedded system on-chip, microcontroller architecture (8051/8052), devices and drivers, timers and counting devices, serial communication I/O buses, device drivers, parallel port devices drivers in a system, serial port device in a system, interrupt servicing (Handling) mechanism, memory selection for an embedded system, software and programming concept, assembly language and C language.

### **OGI 357 Embedded Systems lab**

To Write a an assembly language programs for basic instructions  
 To Write an assembly language programme to generate PWM.  
 To study assembly programming for general purpose parallel input /output ports  
 To study implementation & interfacing of display devices like LCD, LED Bar graph & seven segment display with Microcontroller 8052.  
 To study implementation & interfacing of different motors like stepper, DC & servo motors.  
 To write an assembly language program for temperature, pressure, level, and flow measurement.  
 To study programming and Transmission & reception of data through serial port.  
 To study programming of data conversion DAC, and ADC.  
 To Study programmable interrupt controller.  
 To write an assembly program to study 4x4 keypad

### **OGI 358 Power Devices & Servomechanism Control**

Characteristics of the power MOSFET, silicon controlled rectifier (SCR) DC characteristics, the in junction transistor, SCR circuits with resistive and complex loads, characteristics of the TRIAC, power drivers (H-Bridge, ULN2xxx, L297x), speed measurement methods, armature control & field control of machines, phase angle control of machines, feedback control of mechanics, stepper motor characteristics and application, servomotor characteristics, pulse width modulation, pulse width modulation control of machines.

### **OGI 359 Power devices & Servomechanism Control Lab**

Study of characteristics of SCR, MOSFET & IGBT  
 Study of gate firing circuits of SCR  
 To study of the in junction transistor using PSpice.  
 To study SCR circuits with resistive and complex loads  
 To study of characteristics of the TRIAC.  
 To study of power drivers (H-Bridge, ULN2xxx, L297x)  
 Studying of Speed measurement methods

Studying armature control & field control of machines.  
Studying phase angle control of machines.  
Studying of feedback control of mechanics.  
Studying Of pulse width modulation control of machines.

### Semester: 7

#### OGI 354 Process Control Engineering I

Fundamental of process control. Piping instrumentation and drawing (P&ID), realization control, process graphical symbols, Process design criteria. Advanced control techniques: Cascade system, ratio control, feed forward control, smith predictor, internal mode control, multivariable control system, tuning of multivariable, analysis of complex systems.

#### OGI 355 Process Control Engineering I LAB

- Solenoid Valves Control ` Use of Limit Sensor
- Pump Applications
- Pressure Sensor Applications
- Temperature Sensor Applications 24
- Ultrasonic Sensor Applications 26
- PID Application 28
- Flowmeter Application 30
- Temperature Sensor Application with Temperature Control Device 32
- PID Application with Temperature Control Device 33
- Flowmeter Specifications 34
- Solenoid Valve Specifications
- Solid State Relay Specifications 48
- Ultrasonic Sensor Specifications 60
- Capacitive Sensor Specifications 63
- Power Supply Specifications 64
- Pressure Sensor Specifications

#### OGI402 Analytical Instrumentation

PH connectivity, sampling systems, ion selective electrodes , conductivity meters, pH meter, dissolved oxygen analyzer , sodium analyzer , silica analyzer , moisture measurement, gas analyzer, dust and smoke measurement, thermal conductivity type , thermal analyzer, industrial analyzers, principles of chromatography, types and applications of chromatography, pressure liquid chromatography , detectors, spectral photometers, spectral methods of analysis, applications of spectral photometers, introduction of nuclear magnetic detector, NMR spectrometers , NMR applications. GAS AND LIQUID CHRO



**OGI 404 Introduction to petroleum and well logging**

Basic Reservoir Rock Properties : Porosity , Permeability, Saturation, and Capillary Pressure  
 – Drilling Fluids – Well Logging : Devices Measurement – Normal Devices – Focused Tools  
 – Induction Tools : Measurement – Calculation of Water Saturation – Sonic Logs : Interpretation, Theory of Propagation, Type of Sonic Measurements – Generation of the signals – signal Path

**OGI 406 Hydraulic and Pneumatic Systems**

Introduction, global fluid power scenario, basic system of hydraulics(major advantages and disadvantages), principles of hydraulics fluid power, hydraulic symbols, hydraulic oils ,fluid properties and filter, characteristics & functions of hydraulic oils, ISO viscosity grades, classification(mineral based), fire resistant& biodegradable oils, contaminations, filter rating, location of filter, hydraulic pumps & motors, classification of hydraulic pumps(gear, radial piston, and axial piston pumps), hydraulic motor,hydraulic valves, hydraulic actuators(linear and rotary actuators, hydrostatic transmission), hydraulic system, accessories(reservoirs, accumulators, heating & cooling devices, pipes fittings, hoses), design of hydraulic circuits, introduction to , air compressor and pipeline layout,pneumatic, cylinders and motors,pneumatic valves, pneumatic circuit.

**OGI 407 Hydraulic and Pneumatic Systems Lab**

1. To control speed of Hydraulic cylinder through Throttle valve, and control of Hydraulic cylinder through the flow control valve in Bypass.
2. To study flow control valve in Meter-in & Meter-out circuit.
3. To study Electro Hydraulic circuit –Speed and Pressure control of double acting cylinder
4. T study Electro Hydraulic circuit—Sequential operation of double acting cylinder through Limit switches.
5. To control double acting cylinder through 5/2 solenoid operated D.C. valve.
6. To control Double acting pneumatic cylinder through 5/2 D.C. Valve
7. To control Double acting pneumatic cylinder by 3/2 push button, and Shuttle valves
8. To understand use of Logic element ‘OR’ gate and ‘AND’ gate, and to understand use of Quick Exhaust & Flow control valve.
9. To illustrate the use of Time delay valve with ‘OR’ gate and ‘AND’ gate, and pneumatic circuit involving two cylinders.

**OGI 408 Programmable Logic Controllers**

programmable logic controller basics, definition of PLC, overview of PLC systems, Input/output modules, power supplies and isolators, fundamentals of logic (AND, OR, NOT,



EX-OR).programming of PLC, Relay logic, Ladder logic, functional blocks, requirement of communication networks for PLC, connecting PLC to computer, interlocks and alarms,PLC wiring, principles of wiring, wiring diagram, addressing, wiring of electro-mechanical and electronic components.

### **OGI 409 Programmable Logic Controllers lab**

1. To study Ladder logic programming of an industrial PLC using simulator, such as SEIMENS/MITSUBISI simulation.
2. To study step by step sequence in a PLC
3. To write a programme for control of Watching machine,.
4. To write a Programme for Car Parking.
5. To write a programme & interface a traffic light using PLC.
6. To write a programme & interface elevator control using PLC
7. To write a programme & interface simulated hardware unit of Tank level, flow, and pressure control using PLC.
8. To write a programme and control a conveyer belt using PLC
9. To write a programme& interface & control direction and speed of a DC & stepper motors using PLC.
10. To write a programme and interface control of temperature and humidity systems using analog outputs of a PLC.

**Semester: 8**

### **OGI400 Process Control Engineering II**

Definitions, controller adaptation, scheduled adaptive control, model reference adaptive control, self tuning adaptive control, implicit and explicit self tuners, process parameter estimation, order determination, process models, predictive models, minimum variance self tuning regulators, pole assignment self tuning regulators, auto tuning, open loop tuning, closed loop tuning, gain scheduling, application of gain scheduling to ship steering

### **OGI452 Virtual Instrumentation**

Introduction to Labview programing, VIS and sub-VIS, loops & charts, arrays, clusters, graphs, case & sequence structures, formula modes, local and global variable, string & file input. graphical programming in data flow, comparison with conventional programming, data acquisition basics, analog to digital conversion, digital to analog conversion, digital input\output, counters, timers, timing, interrupts, GPIB/IEEE 488 concepts, and embedded system buses - PCI, EISA, CPCI, and USB & VXI, networking basics for office & industrial application VISA & IVI, image acquisition & processing, motion control, temperature data acquisition system, motion control employing stepper motor.

**OGI453 Virtual Instrumentation lab**

1. Study of components, and interface of Labview developments software.
2. Writing programs to implement the condition controls, loops, and timing loop.
3. Studying of arrays, clusters, and inter-conversion of arrays and clusters.
4. Studying of wave form charts, resetting plot, wave form graph.
5. Studying of state machine, events structures.
6. Studying of file formats.
7. Studying of digital interfacing using DAQ and Labview.
8. Studying of analog interfacing using DAQ and Labview.
9. Interfacing instruments with serials such as RS232, GPIS, and RS485.
10. Mini project using DAQ with Labview

**OGI 454 Computer Control**

Overview from classic control to automatic control and DCS, SCADA definition, need of SCADA system, distributed control systems (DCS), general definition and SCADA components, hardware architecture, software architecture, protocol detail, discrete control and analog control, application & benefits, PLCs Vs RTUs, RTU block diagram, , MTU communication interface, future trends, internet based SCADA display system, components of control systems in SCADA, industrial networks, IP addresses, subnetting, DAQ calculation

**OGI455 SCADA & DCS Control Systems Lab**

1. Wincc v7.3 software installation and network configuration.
2. PLC interfaced with SCADA & status read/command transfer operation.
3. Interfacing of lamp and button with PLC for ON/OFF operation with SCADA software for monitoring and control.
4. Interfacing of PLC to a wincc system through Ethernet.
5. Parameter reading of PLC in SCADA.
6. Alarm annunciation using SCADA.
7. Reporting & trending in SCADA system.
8. Tank level control by using SCADA.
9. Temperature monitoring by using SCADA.
10. pressure control of Machine by using SCADA.
11. conveyor belt control by using SCADA

### OGI 458 Project Management and Quality Standards

Foundations of project management, project life cycle, project environment, project selection, project proposal, project scope, work breakdown structure.

#### Project Monitoring, Control and Costing:

Critical path method, program evaluation & review technique, planning and scheduling of activity networks, assumptions in PERT modeling, time-cost trade-offs, estimation of project costs, monitoring project progress, project appraisal and selection, recent trends in project management, introduction to project management software.

#### Quality Systems:

Introduction to ISO, TQM, quality systems standards, quality functions & functions-various definitions such as quality function, quality measurement, quality costs, quality in production, design, marketing, quality conduit, SQC, quality assurance, total quality control, TQM introduction, history, principles, quality policy, quality system, quality management, TQM system & models, essentials of TQM, ISO 9000 quality management system, ISO 9000 elements, applications and benefits, zero defect, implementation registration & certification for ISO 9000, Case studies on TQM.

### OGI 460 Environmental Science

Introduction of environment, scope, objectives and importance of environment, concept of an ecosystem, types (terrestrial and aquatic ecosystems), introduction to biodiversity, value of biodiversity, consumptive use, productive use, social, ethical, aesthetic and option values, threats to biodiversity, pollution and waste management, air and water pollution, classification of pollutants and their effects, control measures of air pollution, waste water treatment, solid waste management, municipal waste, hazardous waste, bio medical waste, process of waste management, current environmental issues, environmental ethics, issues and possible solutions, population explosion, climatic change, ozone layer depletion, global warming, sustainable development definition, objectives and environmental dimensions of sustainable development, environmental audit for sustainable development, environmental protection.