EEPW 4180	NUMERICAL METHODS IN POWER SYSTEMS	3 Credit Hours

Prerequisites:	MATH 3120 EEPW 3252	Co requisites	EECP 4192

Goal	The course will make the student efficient in data power flow studies, Static load flow equations, Load flow solutions using Newton Raphson method and Gauss Seidel Methods

Objectives

This course should enable the student to:

1. Solve problem by using Newton Raphson Method in polar and rectangular coordinates.
2. Apprehend 3- phase symmetrical fault analysis and unsymmetrical fault analysis
3. Grasp elementary idea of steady state, Dynamic and transient stabilities
4. Produce simulation of swing equation using numerical methods

Outcomes

A student who satisfactorily complete the course should be able to:

1. Carry out calculations using Newton Raphson Method in polar and rectangular coordinates forms Use of flowcharts- Representation of PV buses-
2. Deal with Decoupled & Fast Decoupled methods
3. Perform 3-phase symmetrical fault analysis and unsymmetrical fault analysis (LG, LL, LLG faults using Z bus.
4. Study of dynamic and transient stabilities-swing equation-
5. Get familiar with the determination of steady state stability-determination of transient stability by equal area criterion
6. Get acquainted with Critical clearing angle calculation-methods of improving stability and auto reclosing circuit breakers.
7. Accomplish simulation of swing equation using numerical methods (step by step method, modified Euler methods)
8. Explain concept of multi machine stability-Representation of exciter & governor-Effect on stability.

PHIL 4100	Oman Civilization	3 Credit Hours
Prerequisites:	None	
Goal	To acquaint the student with Omani and Islamic civilization, their development and significance during different pre- and post-Islam eras, and with the Islamic judicial system.	

Objectives	Outcomes
The course should enable the student to: 1. Understand the geography of Oman 2. Be familiar with the significance of Omani civilization during pre- and post-Islam eras 3. Understand Islamic civilization, its development, and its supporting factors 4. Understand the Islamic judicial system during different post-Islam eras	The students should be able to: 1. Describe Oman's geography 2. Explain the effects of geography on Omani civilization 3. Investigate and describe the significance of Omani civilization during the pre-Islam era 4. Investigate and describe Oman's embracing of Islam 5. Investigate and describe the significance of Omani civilization during the caliphates, Ummait, and Abbasi eras 6. Describe the characteristics of Islamic civilization 7. Describe the development, and external and internal supporting factors for Islamic civilization 8. Describe the Islamic judicial system during the post-Islam eras

EECP 4192	Software Engineering and High Level Programming	3 Credit Hours
Prerequisites:	**EECP 1290**	
Goal	To introduce Software Engineering concepts in the context of learning advanced data structures and algorithms.	

Objectives

This course should enable the student to:

1. Understand the object-oriented programming paradigm.
2. Reuse mechanisms in object-oriented languages.
3. Specify requirements and use cases.
4. Analyze and design programs using object-oriented methodologies.
5. Design patterns.
6. Unify modeling language.

Outcomes

A student who satisfactory complete the course should be able to:

1. Explain the concepts central to developing reusable and reliable software, such as encapsulation, inheritance and polymorphism.
2. Utilize diagramming tools such as CRC cards and UML to document software designs.
3. Develop data flow diagrams and control flow charts.
4. Turn design documents into high-level language written in C++.
5. Demonstrate knowledge of arrays, lists, trees, and graphs as fundamental data structures.
6. Demonstrate knowledge of a number of searching, scanning and sorting algorithms.
7. Assess the runtime of these algorithms.
8. Realize these data structures and algorithms in object – oriented C++.
9. Demonstrate knowledge in software testing theory and practice.
10. Demonstrate knowledge about advances in the field of object-oriented software design.
11. Communicate with clients and problem domain experts.
12. Produce formal requirement specifications.
13. Design object-oriented solutions using unified modeling language.
14. Devise incremental/iterative implementation and testing strategies.
15. Organize and contribute to team programming projects.

EEPW 4153	Transient Stability of Power System	3 Credit Hours
Prerequisites:	EEPW 3252	
Goal	To provide the student with the concepts, techniques and application of transient stability of power system.	

Objectives

The course should enable the student to:

1. Understand the multifaceted aspects of transient stability from physics description and formulation of the problem.
2. Know the methods of transient stability.
3. Understand the concepts extended equal-area criterion.

Outcomes

The students should be able to:

1. Differentiate between different forms of power system stability like (steady state, transient and voltage).
2. Derive rotor dynamic and swing equations and the power angle equations.
3. Model generators, transmission line, transformer and induction motor as a dynamic load in order to study the transient stability of power systems.
4. Use equal area criterion to analyze transient stability in one-machine infinite-bus, two-finite-machine bus systems.
5. Analyze transient stability by numerical methods.
6. State different energy function methods.
7. Analyze the stability of one and multi machine stability systems using energy function.
8. Use extended area criterion to analyze power system stability.

MATH 4130	Probability & Statistics	3 Credit Hours
Prerequisites:	MATH 3120	
Goal	To provide the student with the basic knowledge of probability and statistics, along with practical applications to physical and engineering problems.	

Objectives

This course should enable the student to:

1. Understand the essential laws and principles governing the topics of probability and statistics.
2. Grasp the basic concepts and ideas involved in probability and statistics.
3. Conceive how to apply statistical methods and probability theory in practical situations.
4. Possess the mathematical skills to link probabilistic and statistical concepts in dealing with a technical problem.

Outcomes

A student who satisfactory complete the course should be able to:

1. Demonstrate knowledge of the role of statistics in engineering applications.
2. Determine the descriptive measures (mean, median, variance…etc.) of random variables and collected data.
3. Accurately estimate population characteristics from small sample groups.
4. Evaluate sample data to determine if process interventions are truly effective or to compare various system options before making final decisions.
5. Recognize types of data and describe the data using tabular, graphical, and numerical representation.
6. Utilize the predictive power of probability distributions to project process performance in advance.
7. Graphically represent discrete and continuous random variables with probability distribution function according to their use in random processes.
8. Integrate knowledge of normal, Binomial exponential, Poisson, and Weibull distribution in a coherent and meaningful manner to engineering processes.
9. Demonstrate knowledge of the fundamental concepts of reliability and its formulae.
10. Apply reliability concepts through Exponential and Weibull distributions for lifetime expectation of engineering products.
11. Solve regression and correlation problems.
12. Apply numerical analysis to the solution of linear equations, non-linear equations, and LAPLACE'S equation.
13. Utilize statistical analysis software.

EEPW 4259	High voltage Engineering	3 Credit Hours
Prerequisites:	EEPW 3150	
Goal	To provide the students with a knowledge of high voltage techniques and over voltage phenomena in electrical power transmission systems.	

Objectives

This course should enable the student to:

1. Know the methods of generation of high DC and AC voltages and controlling methods.
2. Understand the breakdown phenomena in gaseous, liquid and solid media.
3. Know different ways of high voltage measurements and testing.
4. Understand the concept of over voltage and principles of insulating coordination.

Outcomes

A student who satisfactory complete the course should be able to:

1. Explain different methods or generation of high AC and DC voltages.
2. Discuss ways to control impulse in generators.
3. Describe the nature and causes for different types of electrical, thermal and electromechanical breakdowns in solids liquids and gases and apply the related theories to practical situations.
4. Carry out different measurements and testing experiments like: dc resistivity measurements, dielectric constant and loss factor measurements, partial discharge measurements, testing of insulators and bushings, testing of cables, transformers, circuit breakers and surge diverters and radio interference measurements.
5. Explain different types of surges and methods used to protect the power systems against them.
6. State the principles of insulation coordination on high voltage and extra high voltage power system and explain how they are applied in practical situation.

EEPW 4254	Switchgear and Protection	3 Credit Hours
Prerequisites:	EEPW 3150	
Goal	To provide the student with the theoretical principles and current state of the art of switchgear and protection Engineering.	

Objectives

This course should enable the student to:

1. Understand the concepts of circuit interruption and protection.
2. Understand the concepts of circuit breaker as a kind of protection.
3. Understand the concepts of analogue protection.
4. Understand the concepts of digital protection.

Outcomes

A student who satisfactory complete the course should be able to:

1. Describe the basic structure of protection scheme and main criteria for detecting faults.
2. Differentiate between different types of circuit breaker like air, oil, air blast, vacuum, SF6 and high voltage DC circuit breaker.
3. Select a circuit breaker suitable for a given condition.
4. Apply different methods of testing the circuit breaker.
5. Explain different types analogue protection schemes like overcurrent protection, Distance protection, detecting line fault protection, multiwinding and auto-transformers protections, busbar protection, breaker backup protection, generator protection and HV three phase motor protection.
6. Describe the digital protection and control system structure including the logic structure of a simple protection devices, logic structure for determining the operating characteristic of distance relay and logic structure for transformer differential protection device.

EECP 3171	**Microprocessor Systems and Interfacing**	**3 Credit Hours**
Prerequisites:	**EETE 2270**	
Goal	To provide students with an understanding of microprocessor-based systems and their use in instrumentation/control/communications/ and computing systems.	

Objectives	Outcomes
The course should enable the student to: 1. Investigate microprocessor-based systems, 2. Produce software for microprocessor-based system, 3. Interface microprocessor-based system.	The students should be able to: 1. Compare types of micro-processor-based systems, 2. Investigate three typical applications of microprocessor-based systems, 3. Design software to a given specification using a structured design techniques, 4. Write programs to implement designs using appropriate computer language, 5. Test software to ensure it meets the given specifications, 6. Interface external devices to a microprocessor-based system using a programmable parallel interface device, 7. Interface external devices to microprocessor-based system using programmable serial interface device, 8. Design and build a simple non-programmable parallel port, 9. Interface external devices to a microprocessor-based system using the parallel port.

EEPW 4299	B. Tech. Project I	3 Credit Hours
Prerequisites:	**EEPW 3399**	
Goal	To expose each student to the situation where he/she works individually or on a team in a project in the field of electrical power engineering	

Objectives	Outcomes
This course should enable the student to: 1. Integrate the various areas of knowledge he/she gained through the program. 2. Consolidate personal confidence in working independently or on a team and improve his /her spirit of performance.	The students should be able to: 1. Apply the knowledge he/she gained through the program into an integrated project. 2. Demonstrate communication effectiveness through oral presentations and written reports. 3. Present the results of work in a seminar and submit a properly written and edited final report. 4. Manage his /her time to achieve a time constrained target. 5. Solve engineering problems.

Introduction

This project is carried out by the student during the second semester of the bachelor of technology program. It involves the instrumentation of the proposed design or solution in higher diploma project.

EEPW 4256	Power Stations	3 Credit Hours
Prerequisites:	EEPW 3252	
Goal	To acquaint the students with different power stations and criterion for selection of units.	

Objectives

This course should enable the student to:

1. Understand the concept of load curves.
2. Know different types of power stations.
3. Know different types of power substations.
4. Understand the concepts of energy tariff.

Outcomes

A student who satisfactory complete the course should be able to:

1. Analyses the load curves and find the diversity factor, demand factor, load factor, capacity factor and plant factor from it.
2. Differentiate between different power stations like thermal power station, nuclear power station and hydraulic plant.
3. Recognize the following terms in thermal power station like hate rate, incremental heat rate, efficiency, capacity scheduling, and load division between units within a plant.
4. Specify basic operation and various types of hydraulic plant.
5. Compare between the nuclear power stations and conventional plant in terms of basic component, chain reactions, reactor types and shielding.
6. Define the coordination of the thermal, hydro, energy limited and nuclear plan operation.
7. Describe different types and characteristics of Energy tariff.
8. Apply energy tariff in Sultanate of Oman.

EEPW 4399	B. Tech. Project II	3 Credit Hours
Prerequisites:	**EEPW 4299**	
Goal	To expose each student to the situation where he/she works individually or on a team in a project in the field of electrical power engineering	

Objectives	Outcomes
The course should enable the student to: 1. Integrate the various areas of knowledge he/she gained through the program 2. Consolidate personal confidence in working independently or an a team and improve his/her spirit of performance	The students should be able to: 1. Apply the knowledge he/she gained through the program into an integrated project 2. Demonstrate communication effectiveness through oral presentations and written reports 3. Present the results of work in a seminar and submit a properly written and edited final report 4. Manage his/her time to achieve a time-constrained target 5. Solve engineering problems

Introduction

This project is carried out by the student during the summer term of the Bachelor of Technology program. It involves the instrumentation of the proposed design or solution in B. Tech. Project I.

EEPW 4355	Power System Operation and Reliability	3 Credit Hours
Prerequisites:	EEPW 3252	
Goal	To provide the student with the concepts, techniques and application of Power system operation and reliability.	

Objectives	Outcomes
This course should enable the student to: 1. Understand and explore a number of engineering matters involved in operating, controlling of power generating and transmission systems. 2. Understand the application of reliability concepts in enhancing power system security.	A student who satisfactory complete the course should be able to: 1. Apply the unit commitment constraints including thermal unit constraints, hydro constraints and must run and fuel constraints. 2. Apply different unit commitment solution methods like priority-list methods and dynamic-programming solution methods. 3. Identify the factors which affect power system security. 4. Apply contingency analysis like network sensitivity methods and AC load flow methods. 5. Differentiate between different generations control like supplementary control action, tie-line control and automatic generation control. 6. Explain the reliability concepts like general reliability functions, exponential distribution, mean time to failure, series-parallel systems and Markov's process. 7. Use different generation reliabilities evaluations like LOLP and LOEP.