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 introduces 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.

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 a statistical analysis software.

EETE 4130	Microwave Engineering	3 Credit Hours
Prerequisites:	**EETE 3190, EETE 3211**	
Goal	To enable the students to acquire knowledge in Microwave techniques, devices, components and their applications.	

Objectives

This course should enable the students to:

1. Analyze and characterize microwave transmission lines and waveguides.
2. Understand about the functions and uses of microwave components and devices
3. Gain the knowledge about microwave integrated circuits and microstrip lines.
4. Know about the different applications of microwaves in real life.

Outcomes

After satisfactory completion of the course a student should be able to:

1. Understand microwave transmission line analysis techniques.
2. Understand the concept of impedance matching circuits and design them.
3. Analyze various waveguide structures for propagation.
4. Know about the different microwave components and characterize them.
5. Understand the principle of operation of microwave transistors.
6. Describe about the construction and functions of microwave diodes.
7. Explain various types of microwave tubes for amplification and oscillation.
8. Know about the structures and features of microwave strip lines.
9. Explain about the microwave integrated circuits.
10. Know and use microwave measurement equipments.
11. Describe a useful practical application involving microwaves.

EETE 4140	LINEAR INTEGRATED CIRCUITS	3 Credit Hours
Prerequisite	**EETE 3102**	
Goal	To discuss and understand the concepts of integrated circuits, their functioning and applications in the telecommunications field.	

Objectives	**Outcomes**
This course should enable the student to understand : 1. The basic manufacturing process of linear integrated circuits 2. applications of Opamp 3. Various applications of linear ICs in telecom field 4. Special function ICs used in telecom area.	A student who completes the course should be able to: 1. Manufacturing process of IC 2. Linear and non linear circuits using opamp like inverting, non inverting, differentiator, integrator instrumentation amplifier, precision rectifier etc. 3. PLL, AM , PM and FSK modulator and demodulator , frequency synthesizer etc. 4. Sample and hold circuits, A/D and D/A converter 5. Voltage regulator switched capacitor filter, tuned and power amplifier, video amplifier, opto coupler etc.

BAEB 3114	Management Information System	3 Credit Hours
Prerequisites:	None	
Goal	To equip students with knowledge and skills of using computer-based information systems in business management activities	

Objectives	Outcomes
The course will enable students to understand the role of technology and systems related to challenges for business professionals. They will know all the processes of information systems and business.	The students should be able to: 1. Define information systems 2. Describe the relationships between technology and business activities. 3. Recognize the models and frameworks of Information System 4. Define concepts of basic decision- making and basic communication and describe the roles of different types of information systems in communication and decision-making. 5. Identify different ways of increasing efficiency and effectiveness of internal operations (e.g. empowerment, structuring…etc.) 6. Work individually and in a team 7. Work with highest codes of ethics 8. Communicate effectively in English 9. Utilize the available information sources

EETE 4299	B.Tech. Project I	3 Credit Hours
Prerequisites:	**EETE 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 electronics and communication 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 second semester of the Bachelor of Technology program. It involves the instrumentation of the proposed design or solution in Higher Diploma Project.

EETE 4231	Antennas & Propagation	3 Credit Hours
Prerequisites:	EETE 4130	
Goal	To introduce the principal radio antennas and the nature of the propagation of radio waves.	

Objectives

The course should enable the student to:

1. discuss the sources of noise in radio systems
2. explain the principles behind signal-to-noise degradation in a radio system
3. describe the parameters which characterize the operation of an antenna
4. illustrate the operation of a dipole antenna and an array of dipole antennas by their application to systems such as broadcasting and airport aids.

Outcomes

The students should be able to:

1. Recognize and represent monochromatic uniform and non-uniform plane EM waves in phasor notation, and use refractive index to relate wave properties in material media (isotropic) to wave properties in free space (a).
2. Recognize orthogonal polarized wave pairs, synthesize arbitrarily polarized waves and perform Poynting flux calculations in terms of linear and circular orthogonal pair components (a).
3. Perform 1- and 2-D spatial Fourier transforms of scalar functions defined on planar surfaces, and recognize the Fourier spectrum of tangential field components or surface currents as the amplitude spectrum of propagating and evanescent waves in the half-space bounded by the surface (a).
4. Calculate the far-field radiation due to a localized source on a surface in terms of the angular spectrum function of the source (a).
5. Perform near field calculations using the Fresnel diffraction formula, and examine the transition from near to far-field in the case of localized source distributions (a).
6. Describe the operation of radio imaging systems (radio camera) in terms of fields detected on a reception plane, and design reception systems to meet specified resolution requirements and source configurations (a,b,c).
7. Understand transmission properties (directivity, gain pattern, solid angle) of short line antennas and antenna arrays, and design 1- and 2-D antenna arrays to meet specified directivity and pointing requirements (a,c).
8. Understand the sampling (reception) properties of antennas and the relationship between antenna gain and effective antenna area, and re-interpret array design issues from the viewpoint

of reception (a,c).

9. Construct the power budget equations for communication and remote sensing systems (Friis transmission formula, hard- and soft-target radar equations), and design systems (choice of average transmitted power, transmission and reception antenna gains, bandwidth and pulse length) to meet specified SNR and resolution goals under operation constraints (e.g., link or target distance, target backscatter cross-section, sky temperature) (a,c).
10. Calculate radar backscatter cross-section for simple targets (free electron, planar reflector) (a,b).
11. Do ray tracing and phase path calculations in plane and spherical stratified inhomogeneous geometries (a).
12. Understand the standard tropospheric refractive index model and its implications for tropospheric refraction including curvature (spherical Earth) effects (a).
13. Calculate space-gain factor for tropospheric space wave links, and design link parameters (antenna heights, gains) to meet specified constraints (a,c).
14. Derive the refractive index for collisionless plasma and recognize propagation and evanescence conditions in ionospheric plasma in terms of plasma and radiowave frequencies (a).
15. Calculate phase and group velocities from specified dispersion relations and/or refractive index formulae, and perform group path calculations in homogeneous dispersive media (a).
16. Understand the average morphology and causes of formation of the ionosphere (a,j).
17. Perform ionospheric ray tracing calculations, and local ionosphere description in terms of ionograms, and determine ionospheric sky-wave link parameters such as virtual reflection height, ground distance, skip zone, and maximum usable frequency (a,c).
18. Understand the effect of free electron collisions in the D-region ionosphere on the propagation of radio waves in different frequency bands (in particular MF and HF) (a, j).
19. Derive refractive indices for normal modes of propagation in a collisionless but magnetized plasma neglecting the heavy ion effects (for parallel and

	perpendicular propagation), and perform phase and group velocity as well as phase and group path calculations associated with the normal modes (a). 20. Identify the conditions when quasi-longitudinal approximation is applicable and perform Faraday rotation computations, and design simple remote sensing experiments exploiting the Faraday rotation phenomenon (a, c). 21. Design simple experiments exploiting group delay variations for whistler mode propagation (a,c). 22. Understand the scintillation effect of ionospheric plasma density irregularities on waves propagating through the ionosphere (the simplest weak scintillation/single screen description) (a,j). 23. Understand atmospheric and ionospheric Doppler wind and electric field measurement techniques (a simplified multiple point-target description) (a, b, c).

EETE 4212	Telecommunications Networks	3 Credit Hours
Prerequisites:	EETE 3211	
Goal	To present the student with the basic concepts in Telecommunications Networks.	

Objectives

The course should enable the student to:

1. Appreciate and understand modern telecommunications topics.
2. Understand the telecommunications infrastructure.
3. Understand Switching of voice, data, and multimedia.
4. Understand the basic concepts of telephone network engineering and cell relay networking.
5. Demonstrate knowledge in the operations and management of large telecommunications networks.

Outcomes

The students should be able to:

1. Demonstrate knowledge of basic telephony.
2. Demonstrate knowledge of local access technologies.
3. Compare and contrast Residential Broadband technologies; Coax, Fiber, and xDSL.
4. Design and manage a Digital Transport network such as SDH.
5. Demonstrate knowledge of Traffic engineering.
6. Apply knowledge of switching, signaling and Intelligence Networks in the design and analysis of telecommunications networks.
7. Differentiate between Frame – & Cell – based Networks and their uses.
8. Demonstrate knowledge of IP Telephony.

EETE 4220	Digital Communications and Switching	3 Credit Hours
Prerequisites:	EETE 3211	
Goal	To enable the students to understand and analyze the techniques involved in the modern digital communication systems and also understand the modern telephone switching techniques	

Objectives

This course should enable the student to:

1. understand the processes involved in the data transmission and digital transmission of analog signals
2. understand about the error detection and correction techniques in the digtal communication
3. understand the concepts involved in the measurement of information and source coding and channel coding
4. analyze and design the electronic switching systems for communication

Outcomes

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

1. describe the various elements of a Digital Communication systems
2. explain the general constraints and limitations in the design of communication systems
3. understand the problems and the techniques involved in the baseband data transmission – ISI, Pulse Shaping, Eye diagram
4. analyze the modern digital modulation techniques such as QAM, MSK
5. know the concepts in measure of information, entropy
6. describe the source coding techniques based on information
7. understand the channel encoding - error detection and correction
8. explain about the electronic space division switching
9. explain about the time division switching
10. understand about the traffic engineering – Erlang's formula, Traffic Load, GoS
11. describe the modern local access techniques – xDSL, WLL

EETE 4300	RADAR SYSTEMS	3 Credit Hours
Prerequisite	**EETE 4130**	
Goal	To explore the concepts of Radar systems and their useful applications in various fields	

Objectives	**Outcomes**
This course should enable the student to : 1. Understand the fundamental concepts and terminology used in Radar systems. 2. Gain knowledge in range detection and velocity and Doppler measurements 3. Understand the radar detection in the presence of noise. 4. Analyze the different types of radar systems	A student who completes the course should be able to: 1. Understand and explain the principles of operation of radars 2. Understand the basic concepts and measurements, radar equation. 3. Explain the operation and tradeoffs for communication radar systems. 4. Distinguish between different types of radars such as CW and Frequency modulated radar, MTI and Pulse Doppler radar. 5. Describe Matched filter detection, Target effects on detection 6. Gain the knowledge about tracking radar, radar antennas and arrays.

EETE 4399	B. Tech. Project II	3 Credit Hours
Prerequisites:	**EETE 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 electronics and communication 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 .