Approved Experiential Essay Topics

General Education

Essay topics should be selected based on personal or professional experience and the needs of the student program. Students should contact an academic advisor to determine program needs.

Possible Course Duplication - This identifies possible course duplication between the essay topic and other coursework. The essay descriptions listed below could duplicate the courses indicated and/or any other coursework required or completed. Please contact your AC or plac@phoenix.edu to verify there is no duplication with your chosen topic before writing an essay.

Possible Supporting Documentation - This section identifies possible or recommended supporting documentation for the chosen topic. This is to assist students in choosing appropriate documentation. It is not all inclusive. If you are unable to provide the possible supporting documentation identified please contact PLA customer service to discuss other options for appropriate documentation.

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### Lower Division Topics

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<td>Science/ Technology</td>
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#### Course Description

Theory, characteristics and applications of semiconductor devices. The following subtopics are to be addressed:

- **Subtopic 1:** thin film device design concepts
- **Subtopic 2:** integrated circuit design concepts
- **Subtopic 3:** solid state devices
- **Subtopic 4:** metallic oxide semiconductors
- **Subtopic 5:** gallium arsenic devices
- **Subtopic 6:** controlled rectifiers, etc.

#### Possible Course Duplication

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<tr>
<td>The measurement of human and environmental characteristics. The following subtopics are to be addressed:</td>
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<td>Subtopic 2: temperature and atmospheric pressure</td>
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<td>Subtopic 3: humidity</td>
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<td>Subtopic 4: gas-presence</td>
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<td>Subtopic 5: radiation</td>
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<td>Subtopic 6: cardiac responses</td>
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<tr>
<td>Modern Engineering Mechanical Drawing practices and standards. The following subtopics are to be addressed:</td>
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<td>Subtopic 2: exploded views and assembly spatial visualization</td>
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<td>Subtopic 3: orthographic projection</td>
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<td>Subtopic 4: other techniques of descriptive geometry</td>
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<td>Subtopic 5: computer aided drawing</td>
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<td>Subtopic 6: computer aided design and manufacturing</td>
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**Course Description**

An examination of the inherent characteristics and functions of passive components in direct current and alternating current circuits. Utilization of resistance and reactance concepts. The following subtopics are to be addressed:

- **Subtopic 1:** basic components – capacitors, resistors, inductors, etc.
- **Subtopic 2:** Ohm’s Law
- **Subtopic 3:** Kirchoff’s Laws
- **Subtopic 4:** Thevenin’s and Norton’s Theorems
- **Subtopic 5:** The Supperposition Theorem
- **Subtopic 6:** practical examples of resonance, impedance matching and filters

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**Course Description**

Theory of operation of small signal amplifiers and of Class A, B, and C power amplifiers. The following subtopics are to be addressed:

- **Subtopic 1:** equivalent circuits and mathematical methods of circuit analysis
- **Subtopic 2:** transistor curves and graphical methods of circuit analysis
- **Subtopic 3:** inherent characteristics and practical applications of common-emitter, common-base and common-collector amplifiers
- **Subtopic 4:** frequency response
- **Subtopic 5:** bandwidth in audio, intermediate frequency and radio frequency amplifiers
- **Subtopic 6:** feedback in audio, intermediate frequency and radio frequency amplifiers

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### Semiconductor Digital Electronics

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**Course Description**

Digital Circuit Design. The following subtopics are to be addressed:

- **Subtopic 1:** Boolean algebra
- **Subtopic 2:** Analyze Computer bus principles, transmission lines
- **Subtopic 3:** Digital number systems
- **Subtopic 4:** Decimal-binary conversion
- **Subtopic 5:** Binary Logic Gates: e.g., AND, OR, INVERTER, NAND, NOR, TTL, etc.
- **Subtopic 6:** Theory and application of digital circuits; e.g., flip-flops, counters, shift registers, arithmetic circuits, memories, etc.

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### Upper Division Topics

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**Course Description**

Theory and application of aerodynamics to atmospheric flight vehicles and to interplanetary space flight vehicles. The following subtopics are to be addressed:

- **Subtopic 1:** supersonic flight theory in mach 2+ environments
- **Subtopic 2:** gravitational principles and orbital atmospheres
- **Subtopic 3:** unique terrestrial-solar-planetary phenomena; e.g., Van Allen belts, solar winds, geosynchronous orbits, etc
- **Subtopic 4:** the effect of the above on flight vehicle design
- **Subtopic 5:** safety considerations
- **Subtopic 6:** human factors considerations

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**Course Description**
Principles of electromagnetic wave radiation and reflection. The following subtopics are to be addressed:

- **Subtopic 1:** dipoles
- **Subtopic 2:** reflectors
- **Subtopic 3:** wave guides: including the theory and design of apertures
- **Subtopic 4:** mechanical and electronic scanning
- **Subtopic 5:** antenna pattern calculation and measurement
- **Subtopic 6:** applications in radio, radar, television and navigation systems

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**Course Description**
The inference processes used for reasoning using symbolic knowledge. The following subtopics are to be addressed:

- **Subtopic 1:** knowledge representation
- **Subtopic 2:** natural language comprehension
- **Subtopic 3:** game playing
- **Subtopic 4:** rule based systems
- **Subtopic 5:** robotics
- **Subtopic 6:** selection of hardware and software for AI applications

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**Course Description**

General applications in electromagnetic communication. The following subtopics are to be addressed:

- **Subtopic 1:** Maxwell’s equations in transmission lines and Wave Guides
- **Subtopic 2:** Maxwell’s equations as they apply to fiber optics
- **Subtopic 3:** Maxwell’s equations as applied to propagation in space
- **Subtopic 4:** impedance matching and power losses
- **Subtopic 5:** microwave components and systems
- **Subtopic 6:** measuring devices and techniques

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**Course Description**

Applications of the laws governing fluids and gases in hydraulic and pneumatic devices used in industrial, aerospace and naval systems. The following subtopics are to be addressed:

- **Subtopic 1:** pumps
- **Subtopic 2:** accumulators
- **Subtopic 3:** valves
- **Subtopic 4:** static, kinematic, and dynamic considerations important to the utilization of fluids and gases
- **Subtopic 5:** instrumentation and data reduction techniques
- **Subtopic 6:** environmental, space, weight, and material considerations

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<td>Applications of Lasers</td>
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**Course Description**
Laser theory, design and applications. The following subtopics are to be addressed:

- **Subtopic 1:** theory of lasers
- **Subtopic 2:** design considerations
- **Subtopic 3:** stimulated emission and amplification, including coherence
- **Subtopic 4:** regeneration and feedback
- **Subtopic 5:** reliability and safety consideration
- **Subtopic 6:** selection criteria for engineering, manufacturing, commercial and medical applications

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**Course Description**
Practical applications of analysis tools. The following subtopics are to be addressed:

- **Subtopic 1:** use of Fourier Series in analyzing waveforms
- **Subtopic 2:** use of the LaPlace Transform to determine transient responses
- **Subtopic 3:** theory and purpose of circuit simplification as a tool for analysis
- **Subtopic 4:** circuit analysis through the use of equivalent circuits
- **Subtopic 5:** Thevenin’s and Norton’s Theorems
- **Subtopic 6:** Kirchoff’s Voltage and Current Laws

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**Course Description**

Mathematical methods of approximation. The following subtopics are to be addressed:

- **Subtopic 1:** time domains
- **Subtopic 2:** frequency domains
- **Subtopic 3:** the theory of band pass filters
- **Subtopic 4:** passive filters
- **Subtopic 5:** active filters
- **Subtopic 6:** optimization techniques

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**Course Description**

Theory, design, and applications of nuclear energy systems. The following subtopics are to be addressed:

- **Subtopic 1:** radioisotope heat sources
- **Subtopic 2:** fission chain and fusion reactors
- **Subtopic 3:** nuclear reactor criticality, safety and control
- **Subtopic 4:** instrumentation methods
- **Subtopic 5:** nuclear fuel cycle, heat removal and waste disposal, including comparative costs
- **Subtopic 6:** Federal regulation and licensing of nuclear power generating plants

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<td>Applications of Thermodynamics</td>
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### Course Description
Applications of the laws and concepts of thermodynamics in conductive, convective, and radiative heat transfer systems. The following subtopics are to be addressed:

- **Subtopic 1**: heat exchanging systems; e.g., heat pumps, air conditioners and refrigerators
- **Subtopic 2**: propulsion systems; e.g., piston, gas turbine, ramjet, turbojet and rocket engines
- **Subtopic 3**: solar heat collection system; e.g., water and space heaters
- **Subtopic 4**: homeostatic equilibrium and stability in dynamic systems
- **Subtopic 5**: computer aided data collection and analysis techniques
- **Subtopic 6**: measurement techniques

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<td>Automatic Control Systems</td>
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### Course Description
Theory and applications of feedback control systems. The following subtopics are to be addressed:

- **Subtopic 1**: characteristics of components for electronic and mechanical systems
- **Subtopic 2**: principles of design
- **Subtopic 3**: transient analysis
- **Subtopic 4**: random signal techniques
- **Subtopic 5**: stabilization techniques by modifying the transfer function
- **Subtopic 6**: viscous-output and error-rate damping

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**Course Description**
The symbolic representation of knowledge for computer use, and the symbolic inference processes used for reasoning with the knowledge. Concepts and methods for problem solving, hypothesis formation, knowledge representation, knowledge acquisition, perceptual behavior and programming tools such as LISP and PROLOG. Commercial, industrial and military applications such as pattern recognition, theorem proving, game playing, natural language comprehension, cognitive simulation, rule-based systems and robotics. Selection of hardware and software for AI systems. The following subtopics are to be addressed:

- **Subtopic 1:** artificial Intelligence as a concept; i.e., a discussion of the “philosophical justification” of AI as a possibility
- **Subtopic 2:** perceptual behavior and programming tools: e.g., LISP and PROLOG
- **Subtopic 3:** methods for problem solving: e.g., hypothesis formation, knowledge representation, knowledge acquisition, etc
- **Subtopic 4:** examples of commercial, industrial and military applications
- **Subtopic 5:** selection of Hardware and Software
- **Subtopic 6:** rule based systems including a discussion of pattern recognition, cognitive simulation and Game Theory

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<td>Business Management Information Systems</td>
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**Course Description**
The student must demonstrate knowledge gained from experience working in either a Management Information Systems group or an End User group. The essay should focus on principles and concepts for producing information to be used in the decision making process. The following subtopics are to be addressed:

- **Subtopic 1:** hardware considerations
- **Subtopic 2:** software considerations
- **Subtopic 3:** communications, networks and the internet
- **Subtopic 4:** decision support systems
- **Subtopic 5:** organization support systems
- **Subtopic 6:** ethical considerations in an information society

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<td><strong>Compiler Construction</strong></td>
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**Course Description**

Design and implementation of compilers. The following subtopics are to be addressed:

- **Subtopic 1:** lexical analysis
- **Subtopic 2:** parsers
- **Subtopic 3:** code generation
- **Subtopic 4:** optimization
- **Subtopic 5:** error recovery
- **Subtopic 6:** translator writing systems

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**Course Description**

The application of the methods of computer science to problems in management decision making. The following subtopics are to be addressed:

- **Subtopic 1:** decision trees
- **Subtopic 2:** payoff and Opportunity Loss Tables
- **Subtopic 3:** analysis of risk and time preferences
- **Subtopic 4:** encoding of information and preferences
- **Subtopic 5:** methods of simulation, optimization and alternative evaluation
- **Subtopic 6:** selection of hardware and software

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**Course Description**

The application of computers for input, manipulation and display of graphical information. The following subtopics are to be addressed:

- **Subtopic 1**: function of the Graphical User Interface (GUI)
- **Subtopic 2**: human engineering aspects (Human Factors considerations) (this should include a discussion of research on the dangers of long time exposure to Cathode Ray Tube emissions)
- **Subtopic 3**: principles and types of display hardware
- **Subtopic 4**: graphical input methods
- **Subtopic 5**: hardware and software selection
- **Subtopic 6**: screen design and evaluation

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<tr>
<th>Course Title</th>
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<tbody>
<tr>
<td><strong>Computer Networks</strong></td>
<td>3 UD</td>
<td>Science/Technology</td>
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</table>

**Course Description**

This course includes all the methods and hardware used for interconnecting computers. The following subtopics are to be addressed:

- **Subtopic 1**: network functions
- **Subtopic 2**: network structures and components
- **Subtopic 3**: interconnection of Networks
- **Subtopic 4**: protocols – purpose and methods; include session protocols (end to end communication), data link protocols (bit oriented, character oriented, multi-access, error checking, etc.)
- **Subtopic 5**: switching techniques such as circuit switching, and packet switching, Asynchronous Transfer Mode (ATM).
- **Subtopic 6**: synchronous Optical Networks (SONET)

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<tbody>
<tr>
<td>Data Communication Systems</td>
<td>3 UD</td>
<td>Science/ Technology</td>
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</table>

**Course Description**

Theory and applications of telecommunications networks. The following subtopics are to be addressed:

- **Subtopic 1:** analog theory vs. digital theory
- **Subtopic 2:** voice digitalization and encoding – PAM and PCM
- **Subtopic 3:** characteristics of hardware components, software structures and transmission media
- **Subtopic 4:** bits, bytes and baud rates
- **Subtopic 5:** channel bandwidth and capacity
- **Subtopic 6:** transmission rates; explanation of OS-0, OS-1, etc.

**Possible Course Duplication**

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<tbody>
<tr>
<td>Database Systems</td>
<td>3 UD</td>
<td>Science/ Technology</td>
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</table>

**Course Description**

Design and evaluation of database management systems. The following subtopics are to be addressed:

*Note* This topic duplicates coursework in the BSB/IS required course of study.

- **Subtopic 1:** tree, network and relational models
- **Subtopic 2:** query Languages
- **Subtopic 3:** secondary storage devices
- **Subtopic 4:** access methods between Users and Database Management Systems (DBMS’s)
- **Subtopic 5:** evaluation of performance
- **Subtopic 6:** management issues

**Possible Course Duplication**

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### Development and Application of Management Information Systems

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<tr>
<td>Development and Application of Management Information Systems</td>
<td>3 UD</td>
<td>Science/ Technology</td>
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</table>

**Course Description**

The functions and evolution of MIS as a management function, including its effect on the End User. The following subtopics are to be addressed:

- **Subtopic 1:** functions of MIS, include a discussion of MIS as it impacts the End User
- **Subtopic 2:** "systems" point of view in the development process, including a discussion of life cycles
- **Subtopic 3:** system architectures
- **Subtopic 4:** data and storage structures
- **Subtopic 5:** discussion of operating systems and the philosophy used
- **Subtopic 6:** hardware and software characteristics

**Possible Course Duplication**

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### Digital System Design and Application

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<tbody>
<tr>
<td>Digital System Design and Application</td>
<td>3 UD</td>
<td>Science/ Technology</td>
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</tbody>
</table>

**Course Description**

Theory and applications of digital building blocks in computer systems. The following subtopics are to be addressed:

- **Subtopic 1:** control theory and methods
- **Subtopic 2:** control systems
- **Subtopic 3:** interfacing considerations
- **Subtopic 4:** peripheral equipment
- **Subtopic 5:** operational theory
- **Subtopic 6:** selection criteria

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<tr>
<td>Electric Power Distribution</td>
<td>3 UD</td>
<td>Science/ Technology</td>
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</table>

Course Description
Modern Power Distribution Systems. The following subtopics are to be addressed:

- **Subtopic 1:** power distribution theory
- **Subtopic 2:** modern techniques of power distribution
- **Subtopic 3:** configurations and transmission lines
- **Subtopic 4:** components; e.g., transformers, resistors, load coils, capacitors, etc.
- **Subtopic 5:** analysis of brownouts and system degradation
- **Subtopic 6:** computer control and fault analysis

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<td>Electric Power Plants</td>
<td>3 UD</td>
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Course Description
Current and future methods for the generation of power. The following subtopics are to be addressed:

- **Subtopic 1:** characteristics of fossil fuels – pros and cons
- **Subtopic 2:** characteristics of nuclear energy – pros and cons
- **Subtopic 3:** economics and technical considerations; include computer modeling
- **Subtopic 4:** plant operational theory, cost, life, efficiency, etc.
- **Subtopic 5:** energy conversion
- **Subtopic 6:** pollution control

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<td><strong>Electrical Communication Systems</strong></td>
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<td>Science/ Technology</td>
</tr>
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</table>

**Course Description**

Theory and organization of modern systems. The following subtopics are to be addressed:

- **Subtopic 1:** characteristics of state of the art components
- **Subtopic 2:** technological trends
- **Subtopic 3:** theory and organization of radio, radar, navigation, television and telephone systems
- **Subtopic 4:** wireless transmission systems; cell phones, wireless computers
- **Subtopic 5:** the internet
- **Subtopic 6:** potential future application impact on lifestyles

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<td><strong>Electrical Engineering Laboratory</strong></td>
<td>3 UD</td>
<td>Science/ Technology</td>
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**Course Description**

A development-oriented laboratory experience with inclusion of the following aspects of a multi-circuit radio, television, radar, navigation, control, or computer system. The following subtopics are to be addressed:

- **Subtopic 1:** specifications
- **Subtopic 2:** design
- **Subtopic 3:** costs
- **Subtopic 4:** economics
- **Subtopic 5:** test
- **Subtopic 6:** evaluation

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<td>Electronic Instrumentation</td>
<td>3 UD</td>
<td>Science/ Technology</td>
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**Course Description**

The measurement of human and environmental characteristics. The following subtopics are to be addressed:

- **Subtopic 1:** theory of operation of instruments (specify for each)
- **Subtopic 2:** temperature and atmospheric pressure
- **Subtopic 3:** humidity
- **Subtopic 4:** gas-presence
- **Subtopic 5:** radiation
- **Subtopic 6:** cardiac responses

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<td>Introduction to Computer Operating Systems</td>
<td>3 UD</td>
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</table>

**Course Description**

The function and impact of the operating system in computers. The following subtopics are to be addressed:

*Note* This topic duplicates coursework in the BSB/IS required course of study.

- **Subtopic 1:** function and purpose of the operating system
- **Subtopic 2:** design and implementation of operating systems in large computers
- **Subtopic 3:** design and implementation of operating systems in small computers
- **Subtopic 4:** multiprogramming: processes and scheduling, synchronization and communication
- **Subtopic 5:** multitasking
- **Subtopic 6:** memory management

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<td><strong>Introduction to Principles of Artificial Intelligence</strong></td>
<td>3 UD</td>
<td>Science/ Technology</td>
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</table>

**Course Description**
The symbolic representation of knowledge for computer use. The following subtopics are to be addressed:

**Subtopic 1:** concepts and methods of problem solving
**Subtopic 2:** hypothesis formation
**Subtopic 3:** knowledge acquisition
**Subtopic 4:** cognitive stimulation
**Subtopic 5:** pattern recognition; applications to commercial, industrial and military situations
**Subtopic 6:** perpetual behavior and programming tools; e.g., LISP and PR

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<td><strong>Manufacturing Engineering</strong></td>
<td>3 UD</td>
<td>Science/ Technology</td>
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</table>

**Course Description**
Design, implementation and evaluation of manufacturing processes and techniques. The following subtopics are to be addressed:

**Subtopic 1:** properties of materials; e.g., mechanical, optical, electrical, magnetic, and microstructure
**Subtopic 2:** design of gauges, dies, jigs, fixtures and the tools required in manufacturing processes
**Subtopic 3:** analysis of tool and process costs
**Subtopic 4:** considerations of tool-human compatibility and life expectancy
**Subtopic 5:** methods of specifying and controlling critical surfaces and tolerances
**Subtopic 6:** human factors considerations

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<td>Microcomputer System Design</td>
<td>3 UD</td>
<td>Science/ Technology</td>
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</table>

**Course Description**
The theoretical and practical principles of design for specific application. The following subtopics are to be addressed:

- **Subtopic 1:** evaluation of building blocks
- **Subtopic 2:** hardware and software tradeoffs; e.g., cost, speed, size, etc.,
- **Subtopic 3:** interaction of hardware and software and the impact of tradeoffs on design
- **Subtopic 4:** inherent characteristics of microcomputer system communications
- **Subtopic 5:** multi-user considerations
- **Subtopic 6:** human factor considerations; screen design, user friendly aspects, etc.

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<td>Noise in Electrical Communications</td>
<td>3 UD</td>
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**Course Description**
Theory and applications of Systems. The following subtopics are to be addressed:

- **Subtopic 1:** AM vs. FM systems
- **Subtopic 2:** PCM systems
- **Subtopic 3:** signal enhancement in the presence of noise
- **Subtopic 4:** matched filters
- **Subtopic 5:** correlation detection
- **Subtopic 6:** phase-locked loops

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<td>Nuclear Power Systems Environmental Analysis</td>
<td>3 UD</td>
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**Course Description**

Identification of the problems arising from the interactions between the nuclear power plant and its environment. The following subtopics are to be addressed:

- Subtopic 1: plant siting considerations including emissions and thermal effects
- Subtopic 2: waste disposal
- Subtopic 3: population removal
- Subtopic 4: environmental impacts
- Subtopic 5: economic feasibility considerations
- Subtopic 6: educational methods for public image improvement

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<tr>
<td>Operating Systems</td>
<td>3 UD</td>
<td>Science/ Technology</td>
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</table>

**Course Description**

Operating system functions, design and implementation. Multiprogramming: processes and scheduling. Concurrent programming: mutual exclusion, synchronization and communication. Memory management: static relocation, virtual memory, segmentation, paging and load control. I/O and file systems: file structures, naming, and disk management. Job management and protection. The following subtopics are to be addressed:

- Subtopic 1: A brief discussion of computer hardware; component function
- Subtopic 2: Operating system functions, design and implementation;
- Subtopic 3: I/O and file systems: file structures, naming and disk management
- Subtopic 4: Multiprogramming & concurrent programming
- Subtopic 5: Hardware and Memory management
- Subtopic 6: Job management and protection; include a serious discussion of security aspects

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<tr>
<td>Propagation of Electromagnetic Waves in Space</td>
<td>3 UD</td>
<td>Science/ Technology</td>
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</table>

**Course Description**

Theory and application of electromagnetic wave propagation. The following subtopics are to be addressed:

- **Subtopic 1:** radiation
- **Subtopic 2:** reflection
- **Subtopic 3:** absorption
- **Subtopic 4:** scattering
- **Subtopic 5:** all of the above as a function of frequency and transmission medium
- **Subtopic 6:** ground, ionospheric and tropospheric waves

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<td>Semiconductor Special Circuits</td>
<td>3 UD</td>
<td>Science/ Technology</td>
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</table>

**Course Description**

Theory and applications of special circuits. The following subtopics are to be addressed:

- **Subtopic 1:** operational amplifiers
- **Subtopic 2:** wave-form generators
- **Subtopic 3:** oscillators
- **Subtopic 4:** multivibrators
- **Subtopic 5:** modulators and demodulators
- **Subtopic 6:** analog-to-digital and digital-to-analog converters

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<td>Solar Energy Systems</td>
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### Course Description

Operation and comparative analysis of Solar Energy and Solar Energy Systems. The following subtopics are to be addressed:

- **Subtopic 1:** solar collectors and solar cells
- **Subtopic 2:** energy storage components
- **Subtopic 3:** design configurations
- **Subtopic 4:** cost effectiveness of Solar Energy Systems versus Conventional Water and Space Heaters
- **Subtopic 5:** selection criteria for materials used in solar energy components
- **Subtopic 6:** technical efficiency and cost improvement

#### Possible Course Duplication

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<td>Structural Engineering</td>
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### Course Description

Application of the principles of mechanics to the structural design and analysis of a mechanical or an aerospace component. The following subtopics are to be addressed:

- **Subtopic 1:** mechanics
- **Subtopic 2:** strength and microstructure of materials
- **Subtopic 3:** kinematics of stress, fracture, fatigue and creep
- **Subtopic 4:** electrical, magnetic, optical, chemical, thermal, and thermoelectric properties
- **Subtopic 5:** relationships between the internal behavior and structure of solids
- **Subtopic 6:** experimental techniques and mathematical tools

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<td>Systems Analysis, Design and Implementation</td>
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**Course Description**
A study of the concept of systems and the system approach. The following subtopics are to be addressed:

*Note* This topic duplicates coursework in the BSB/IS required course of study.

- **Subtopic 1:** general systems theory: The meaning of “systems” and the “systems approach”
- **Subtopic 2:** application analysis
- **Subtopic 3:** systems engineering methods
- **Subtopic 4:** design and implementation of computer systems
- **Subtopic 5:** methods of structured programming and analysis
- **Subtopic 6:** processes

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<td>Systems Programming</td>
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**Course Description**
Programming as an intellectual discipline. The following subtopics are to be addressed:

- **Subtopic 1:** principles of programming
- **Subtopic 2:** systematic design of programs
- **Subtopic 3:** verification and testing of programs
- **Subtopic 4:** functions and characteristics of assemblers and compilers
- **Subtopic 5:** data structures
- **Subtopic 6:** operating systems

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