Students' Handbook

Computer Engineering

Faculty of Engineering, Akpakip Oro University (AOU)

Academic year: [to be inserted]

Draft for Faculty approval

1. Welcome

Welcome to the Department of Computer Engineering. This handbook explains the Computer Engineering programme: what you will study, how you will be assessed, and where to get help. Read it alongside the university's academic regulations, which take precedence where they differ.

2. About the Programme

The programme trains engineers who design the hardware, software and networks that make computing systems work. Years 1 and 2 build the foundations in mathematics, digital design, programming and algorithms. Years 3 to 5 add the pathway specialisation, culminating in an integrated design project and defence.

Graduate profile

- Design digital hardware, embedded systems and software.
- Design, configure and secure computer networks and distributed services.
- Apply algorithms, data management and software engineering practice.
- Assess security, reliability and quality in computing systems.
- Work ethically and communicate effectively in teams.

Career pathways

Graduates may work with technology companies, telecommunications operators, embedded product manufacturers, banks and enterprises with network and data infrastructure, and research organisations. Graduates who register with COREN may practise as professional engineers in Nigeria. Postgraduate study is also an option.

Professional registration

Registration with the Council for the Regulation of Engineering in Nigeria (COREN) requires an accredited qualification and professional experience. Keep your SIWES records and project reports, as they support your later registration.

3. Programme Structure

The tables list every course, its units, the semester in which it is taken, and its track. Codes and units are provisional until confirmed in the approved CCMAS schedule.

Track: 'Core' is taken by all students. 'ES' marks Embedded Systems option courses; 'SN' marks Software and Networks option courses.

Year 1: Engineering Foundations

Semester 1 (First semester)

Code	Course	Units	Track
CPE 101	Mathematics I	3	Core
CPE 102	Discrete Mathematics	3	Core
CPE 103	Introduction to Computing	2	Core
CPE 104	Programming I	3	Core
CPE 105	Communication in English	2	Core
CPE 106	Introductory Engineering	2	Core
CPE 107	Engineering Laboratory Practicals	1	Core
CPE 108	Introduction to Computer Engineering	2	Core
	Semester total	**18**	

Semester 2 (Second semester)

Code	Course	Units	Track
CPE 109	Mathematics II	3	Core
CPE 110	Physics for Electronics	3	Core
CPE 111	Programming II	3	Core
CPE 112	Computer Hardware Fundamentals	2	Core
CPE 113	Nigerian Peoples and Cultures	2	Core
CPE 114	Engineering Workshop and Safety	2	Core
CPE 115	Electrical Principles	3	Core
CPE 116	Computing Laboratory I	1	Core
	Semester total	**19**	

Year 2: Core Engineering

Semester 3 (First semester)

Code	Course	Units	Track
CPE 201	Data Structures and Algorithms	3	Core
CPE 202	Digital Logic Design	3	Core
CPE 203	Electronic Devices I	3	Core
CPE 204	Computer Organisation and Architecture	3	Core
CPE 205	Object-Oriented Programming	3	Core
CPE 206	Engineering Mathematics	3	Core
CPE 207	Probability and Statistics	2	Core
CPE 208	Circuit Theory I	3	Core
	Semester total	**23**	

Semester 4 (Second semester)

Code	Course	Units	Track
CPE 209	Operating Systems	3	Core
CPE 210	Digital Electronics	3	Core
CPE 211	Microprocessors	3	Core
CPE 212	Database Systems	3	Core
CPE 213	Software Engineering I	3	Core
CPE 214	Signals and Systems	3	Core
CPE 215	Computing Laboratory II	2	Core
CPE 216	Numerical Methods	2	Core
	Semester total	**22**	

Year 3: Specialist Foundations

Semester 5 (First semester)

Code	Course	Units	Track
CPE 301	Embedded Systems Design	3	ES
CPE 302	Computer Networks I	3	Core
CPE 303	Real-Time Systems	3	ES

Code	Course	Units	Track
CPE 304	Software Engineering II	3	Core
CPE 305	Microcontroller Interfacing	3	ES
CPE 306	Algorithms and Complexity	3	Core
CPE 307	Computer Architecture II	3	Core
CPE 308	Engineering Statistics and Research Methods	2	Core
	Semester total	**23**	

Semester 6 (Second semester)

Code	Course	Units	Track
CPE 309	Computer Networks II	3	SN
CPE 310	Embedded Linux and Device Drivers	3	ES
CPE 311	Network Programming	3	SN
CPE 312	Compiler Design	3	Core
CPE 313	Mobile Application Development	3	SN
CPE 314	Sensors and Actuators Interfacing	2	ES
CPE 315	Computing Laboratory III	2	Core
CPE 316	Engineering Economics	2	Core
	Semester total	**21**	

Year 4: Advanced Design and Industrial Practice

Semester 7 (First semester)

Code	Course	Units	Track
CPE 401	Internet of Things	3	ES
CPE 402	Wireless Sensor Networks	3	ES
CPE 403	Network Security	3	SN
CPE 404	Distributed Systems	3	SN
CPE 405	Machine Learning Fundamentals	3	Core
CPE 406	Hardware-Software Co-design	3	ES
CPE 407	Cloud Computing	2	SN
CPE 408	Research Project I	2	Core
	Semester total	**22**	

Semester 8 (Second semester)

Code	Course	Units	Track
CPE 409	Embedded Systems Security	2	ES
CPE 410	Network Design and Administration	3	SN
CPE 411	Industrial Embedded Systems	3	ES
CPE 412	Cybersecurity Operations	3	SN
CPE 413	Artificial Intelligence	3	Core
CPE 414	Digital Systems Verification	2	Core
CPE 415	Systems Design Standards	2	Core
CPE 416	Industrial Training (SIWES)	3	Core
	Semester total	**21**	

Year 5: Specialisation, Integration and Professional Readiness

Semester 9 (First semester)

Code	Course	Units	Track
CPE 501	Advanced Embedded Systems	3	ES
CPE 502	Advanced Network Systems	3	SN
CPE 503	Edge Computing and Embedded AI	2	ES
CPE 504	DevOps and Software Delivery	2	SN
CPE 505	Research Project II	3	Core
CPE 506	Engineering Project Management	2	Core
CPE 507	Technical Elective I	2	Core
CPE 508	Intellectual Property and IT Law	2	Core
	Semester total	**19**	

Semester 10 (Second semester)

Code	Course	Units	Track
CPE 509	Integrated Computing Systems Design	3	Core
CPE 510	Embedded Product Development	2	ES
CPE 511	Enterprise Network Deployment	2	SN
CPE 512	Engineering Professional Practice and Ethics	2	Core
CPE 513	Quality Assurance and Testing	2	Core
CPE 514	Risk and Safety in Computing Systems	2	Core
CPE 515	Final-Year Design Project and Defence	4	Core
CPE 516	Technical Elective II	2	Core
	Semester total	**19**	

4. Course Specifications

Each entry gives the course description, learning outcomes, topics, assessment and recommended texts. Your lecturer issues the week-by-week scheme for each course.

Year 1: Engineering Foundations

CPE 101 Mathematics I

Units: 3 | Year 1, Semester 1 (First semester)

Description. Algebra, calculus and logic foundations for computing.

Learning outcomes:

- Solve algebraic and trigonometric problems
- Apply differentiation and integration

Course topics:

1. Functions
2. Differentiation
3. Integration
4. Mathematical reasoning

Assessment: CA 30 / Exam 70

Recommended texts: Stroud and Booth (latest edition)

CPE 102 Discrete Mathematics

Units: 3 | Year 1, Semester 1 (First semester)

Description. Sets, logic, graphs and combinatorics for computing.

Learning outcomes:

- Apply logical reasoning
- Solve counting and graph problems

Course topics:

1. Logic
2. Sets and relations
3. Graphs
4. Combinatorics

Assessment: CA 30 / Exam 70

Recommended texts: Rosen, Discrete Mathematics and Its Applications (latest edition)

CPE 103 Introduction to Computing

Units: 2 | Year 1, Semester 1 (First semester)

Description. Computer fundamentals and productivity tools.

Learning outcomes:

- Use common computing tools
- Explain computer system components

Course topics:

1. Hardware
2. Operating systems
3. Productivity tools
4. Data management

Assessment: CA 60 / Exam 40

Recommended texts: Shelly and Vermaat (latest edition)

CPE 104 Programming I

Units: 3 | Year 1, Semester 1 (First semester)

Description. Introduction to programming and problem solving.

Learning outcomes:

- Write simple programs
- Apply control structures and functions

Course topics:

1. Variables
2. Control structures
3. Functions
4. Debugging

Assessment: CA 40 / Exam 60

Recommended texts: Deitel and Deitel, C How to Program (latest edition)

CPE 105 Communication in English

Units: 2 | Year 1, Semester 1 (First semester)

Description. Academic and technical writing and presentation.

Learning outcomes:

- Write clear technical reports
- Deliver structured presentations

Course topics:

1. Academic writing
2. Technical reports
3. Presentations
4. Listening

Assessment: CA 60 / Exam 40

Recommended texts: Swales and Feak (latest edition)

CPE 106 Introductory Engineering

Units: 2 | Year 1, Semester 1 (First semester)

Description. Overview of engineering disciplines, problem solving and ethics.

Learning outcomes:

- Describe engineering disciplines
- Apply a structured problem-solving method

Course topics:

1. Disciplines and roles
2. Units
3. Problem solving
4. Professional ethics

Assessment: CA 50 / Exam 50

Recommended texts: Dym and Little (latest edition)

CPE 107 Engineering Laboratory Practicals

Units: 1 | Year 1, Semester 1 (First semester)

Description. Introductory measurement and laboratory safety.

Learning outcomes:

- Record and analyse measurement data
- Apply laboratory safety procedures

Course topics:

1. Units and measurement
2. Error analysis
3. Data presentation
4. Laboratory safety

Assessment: Lab reports 100

Recommended texts: Institutional laboratory manual

CPE 108 Introduction to Computer Engineering

Units: 2 | Year 1, Semester 1 (First semester)

Description. Scope of computer engineering across hardware, software and networks.

Learning outcomes:

- Describe computer engineering subdisciplines
- Discuss computing careers

Course topics:

1. Subdisciplines
2. Hardware
3. Software and networks
4. Careers

Assessment: CA 40 / Exam 60

Recommended texts: Departmental reading list, to be confirmed

CPE 109 Mathematics II

Units: 3 | Year 1, Semester 2 (Second semester)

Description. Linear algebra, probability foundations and series.

Learning outcomes:

- Solve linear systems
- Apply matrix methods

Course topics:

1. Matrices
2. Vector spaces
3. Series
4. Probability basics

Assessment: CA 30 / Exam 70

Recommended texts: Stroud and Booth (latest edition)

CPE 110 Physics for Electronics

Units: 3 | Year 1, Semester 2 (Second semester)

Description. Electricity, magnetism and semiconductors for electronic systems.

Learning outcomes:

- Analyse electric circuits and fields
- Explain semiconductor basics

Course topics:

1. Electricity
2. Magnetism
3. Semiconductors
4. Electronic materials

Assessment: CA 30 / Exam 70

Recommended texts: Halliday, Resnick and Walker (latest edition)

CPE 111 Programming II

Units: 3 | Year 1, Semester 2 (Second semester)

Description. Object and procedural programming with data handling.

Learning outcomes:

- Write modular programs
- Apply arrays, pointers and files

Course topics:

1. Modular design
2. Arrays
3. Pointers
4. File handling

Assessment: CA 40 / Exam 60

Recommended texts: Deitel and Deitel (latest edition)

CPE 112 Computer Hardware Fundamentals

Units: 2 | Year 1, Semester 2 (Second semester)

Description. Components, assembly and maintenance of computer hardware.

Learning outcomes:

- Describe hardware components
- Diagnose basic hardware faults

Course topics:

1. Components
2. Assembly
3. Storage
4. Diagnostics

Assessment: CA 40 / Exam 60

Recommended texts: Mueller, Upgrading and Repairing PCs (latest edition)

CPE 113 Nigerian Peoples and Cultures

Units: 2 | Year 1, Semester 2 (Second semester)

Description. Nigerian history, cultures and national development, or applicable general studies as prescribed.

Learning outcomes:

- Describe Nigerian cultural diversity
- Discuss national development issues

Course topics:

1. Nigerian history
2. Cultural diversity
3. Governance
4. Contemporary issues

Assessment: CA 40 / Exam 60

Recommended texts: Departmental reading list, to be confirmed

CPE 114 Engineering Workshop and Safety

Units: 2 | Year 1, Semester 2 (Second semester)

Description. Workshop practice, electrical safety and tools.

Learning outcomes:

- Use common tools safely
- Apply electrical safety standards

Course topics:

1. Workshop safety
2. Hand tools
3. Electrical safety
4. Practice

Assessment: Practical 70 / Exam 30

Recommended texts: Institutional workshop manual

CPE 115 Electrical Principles

Units: 3 | Year 1, Semester 2 (Second semester)

Description. Basic DC and AC circuit analysis.

Learning outcomes:

- Analyse resistive DC circuits
- Apply basic AC circuit concepts

Course topics:

1. DC circuits
2. Network theorems
3. AC fundamentals
4. Power

Assessment: CA 30 / Exam 70

Recommended texts: Hughes (latest edition)

CPE 116 Computing Laboratory I

Units: 1 | Year 1, Semester 2 (Second semester)

Description. Practical programming and hardware exercises.

Learning outcomes:

- Carry out programming exercises
- Write laboratory reports

Course topics:

1. Programming tasks
2. Hardware exercises
3. Testing
4. Reporting

Assessment: Lab reports 100

Recommended texts: Institutional laboratory manual

Year 2: Core Engineering

CPE 201 Data Structures and Algorithms

Units: 3 | Year 2, Semester 3 (First semester)

Description. Core data structures and algorithm design.

Learning outcomes:

- Implement core data structures
- Analyse algorithm efficiency

Course topics:

1. Arrays and lists
2. Trees
3. Graphs
4. Sorting and searching

Assessment: CA 30 / Exam 70

Recommended texts: Cormen et al., Introduction to Algorithms (latest edition)

CPE 202 Digital Logic Design

Units: 3 | Year 2, Semester 3 (First semester)

Description. Boolean algebra and combinational and sequential logic.

Learning outcomes:

- Simplify Boolean functions
- Design combinational and sequential circuits

Course topics:

1. Boolean algebra
2. Combinational logic
3. Flip-flops
4. Counters

Assessment: CA 40 / Exam 60

Recommended texts: Mano and Ciletti (latest edition)

CPE 203 Electronic Devices I

Units: 3 | Year 2, Semester 3 (First semester)

Description. Semiconductor devices and diode circuits.

Learning outcomes:

- Explain semiconductor behaviour
- Analyse diode circuits

Course topics:

1. Semiconductor physics
2. PN junction
3. Diode circuits
4. Rectifiers

Assessment: CA 30 / Exam 70

Recommended texts: Boylestad and Nashelsky (latest edition)

CPE 204 Computer Organisation and Architecture

Units: 3 | Year 2, Semester 3 (First semester)

Description. Processor design, memory hierarchy and instruction sets.

Learning outcomes:

- Describe processor organisation
- Analyse memory hierarchy

Course topics:

1. Instruction sets
2. Datapath
3. Pipelining
4. Memory hierarchy

Assessment: CA 30 / Exam 70

Recommended texts: Patterson and Hennessy, Computer Organization and Design (latest edition)

CPE 205 Object-Oriented Programming

Units: 3 | Year 2, Semester 3 (First semester)

Description. Classes, inheritance and design patterns.

Learning outcomes:

- Design object-oriented programs
- Apply design patterns

Course topics:

1. Classes
2. Inheritance
3. Polymorphism
4. Design patterns

Assessment: CA 40 / Exam 60

Recommended texts: Deitel and Deitel (latest edition)

CPE 206 Engineering Mathematics

Units: 3 | Year 2, Semester 3 (First semester)

Description. Calculus of several variables and transforms.

Learning outcomes:

- Apply Laplace transforms
- Solve engineering differential problems

Course topics:

1. Partial derivatives
2. Integration
3. Laplace transforms
4. Fourier series

Assessment: CA 30 / Exam 70

Recommended texts: Kreyszig (latest edition)

CPE 207 Probability and Statistics

Units: 2 | Year 2, Semester 3 (First semester)

Description. Probability and statistics for engineering and computing.

Learning outcomes:

- Apply probability models
- Perform statistical inference

Course topics:

1. Probability
2. Distributions
3. Estimation
4. Hypothesis testing

Assessment: CA 40 / Exam 60

Recommended texts: Montgomery and Runger (latest edition)

CPE 208 Circuit Theory I

Units: 3 | Year 2, Semester 3 (First semester)

Description. Network analysis of linear circuits.

Learning outcomes:

- Apply nodal and mesh analysis
- Use network theorems

Course topics:

1. Nodal analysis
2. Mesh analysis
3. Network theorems
4. Transients

Assessment: CA 30 / Exam 70

Recommended texts: Nilsson and Riedel (latest edition)

CPE 209 Operating Systems

Units: 3 | Year 2, Semester 4 (Second semester)

Description. Process management, memory and file systems.

Learning outcomes:

- Explain process and memory management
- Analyse file system design

Course topics:

1. Processes
2. Scheduling
3. Memory management
4. File systems

Assessment: CA 30 / Exam 70

Recommended texts: Silberschatz et al., Operating System Concepts (latest edition)

CPE 210 Digital Electronics

Units: 3 | Year 2, Semester 4 (Second semester)

Description. Logic families, memory and digital interfacing.

Learning outcomes:

- Compare logic families
- Design memory and interfaces

Course topics:

1. Logic families
2. Memory
3. Interfacing
4. Timing

Assessment: CA 40 / Exam 60

Recommended texts: Floyd (latest edition)

CPE 211 Microprocessors

Units: 3 | Year 2, Semester 4 (Second semester)

Description. Microprocessor architecture and assembly programming.

Learning outcomes:

- Write assembly programs
- Interface memory and peripherals

Course topics:

1. Architecture
2. Assembly programming
3. Interrupts
4. Peripherals

Assessment: CA 40 / Exam 60

Recommended texts: Brey, The Intel Microprocessors (latest edition)

CPE 212 Database Systems

Units: 3 | Year 2, Semester 4 (Second semester)

Description. Relational design, SQL and transaction processing.

Learning outcomes:

- Design normalised databases
- Write SQL queries

Course topics:

1. Relational model
2. Normalisation
3. SQL
4. Transactions

Assessment: CA 40 / Exam 60

Recommended texts: Elmasri and Navathe, Fundamentals of Database Systems (latest edition)

CPE 213 Software Engineering I

Units: 3 | Year 2, Semester 4 (Second semester)

Description. Software development lifecycle and requirements.

Learning outcomes:

- Gather requirements
- Plan and document software projects

Course topics:

1. Lifecycle
2. Requirements
3. Design
4. Documentation

Assessment: CA 40 / Exam 60

Recommended texts: Sommerville, Software Engineering (latest edition)

CPE 214 Signals and Systems

Units: 3 | Year 2, Semester 4 (Second semester)

Description. Continuous and discrete signals and systems.

Learning outcomes:

- Classify signals and systems
- Apply Fourier analysis

Course topics:

1. Signal classification
2. LTI systems
3. Convolution
4. Fourier analysis

Assessment: CA 30 / Exam 70

Recommended texts: Oppenheim and Willsky (latest edition)

CPE 215 Computing Laboratory II

Units: 2 | Year 2, Semester 4 (Second semester)

Description. Operating systems, digital and database experiments.

Learning outcomes:

- Carry out system experiments
- Write laboratory reports

Course topics:

1. System tasks
2. Digital experiments
3. Database tasks
4. Reporting

Assessment: Lab reports 100

Recommended texts: Institutional laboratory manual

CPE 216 Numerical Methods

Units: 2 | Year 2, Semester 4 (Second semester)

Description. Numerical methods for computing and engineering.

Learning outcomes:

- Apply numerical root finding and interpolation
- Solve numerical integration problems

Course topics:

1. Root finding
2. Interpolation
3. Integration
4. Error analysis

Assessment: CA 40 / Exam 60

Recommended texts: Chapra (latest edition)

Year 3: Specialist Foundations

CPE 301 Embedded Systems Design

Units: 3 | Year 3, Semester 5 (First semester)

Description. Design of embedded systems and firmware.

Learning outcomes:

- Design embedded systems
- Write firmware for constrained devices

Course topics:

1. Embedded architecture
2. Firmware
3. Power constraints
4. Testing

Assessment: CA 40 / Exam 60

Recommended texts: Wolf, Computers as Components (latest edition)

CPE 302 Computer Networks I

Units: 3 | Year 3, Semester 5 (First semester)

Description. Network architecture and protocols.

Learning outcomes:

- Describe layered network models
- Analyse TCP/IP protocols

Course topics:

1. OSI and TCP/IP
2. Addressing
3. Routing
4. Transport protocols

Assessment: CA 30 / Exam 70

Recommended texts: Kurose and Ross, Computer Networking (latest edition)

CPE 303 Real-Time Systems

Units: 3 | Year 3, Semester 5 (First semester)

Description. Real-time scheduling and operating systems.

Learning outcomes:

- Analyse real-time schedulability
- Design real-time tasks

Course topics:

1. Scheduling
2. Real-time OS
3. Deadlines
4. Synchronisation

Assessment: CA 30 / Exam 70

Recommended texts: Liu, Real-Time Systems (latest edition)

CPE 304 Software Engineering II

Units: 3 | Year 3, Semester 5 (First semester)

Description. Software design, testing and maintenance.

Learning outcomes:

- Design software architectures
- Apply testing methods

Course topics:

1. Architecture
2. Design patterns
3. Testing
4. Maintenance

Assessment: CA 40 / Exam 60

Recommended texts: Sommerville (latest edition)

CPE 305 Microcontroller Interfacing

Units: 3 | Year 3, Semester 5 (First semester)

Description. Interfacing microcontrollers with peripherals.

Learning outcomes:

- Interface sensors and actuators
- Program interrupts and timers

Course topics:

1. GPIO
2. ADC
3. Timers
4. Interrupts

Assessment: CA 40 / Exam 60

Recommended texts: Predko (latest edition)

CPE 306 Algorithms and Complexity

Units: 3 | Year 3, Semester 5 (First semester)

Description. Advanced algorithms and complexity classes.

Learning outcomes:

- Design divide and conquer and dynamic programming algorithms
- Analyse complexity

Course topics:

1. Divide and conquer
2. Dynamic programming
3. Greedy methods
4. Complexity classes

Assessment: CA 30 / Exam 70

Recommended texts: Cormen et al. (latest edition)

CPE 307 Computer Architecture II

Units: 3 | Year 3, Semester 5 (First semester)

Description. Advanced processor and parallel architectures.

Learning outcomes:

- Analyse pipelines and hazards
- Evaluate parallel architectures

Course topics:

1. Pipelines
2. Hazards
3. Caches
4. Parallelism

Assessment: CA 30 / Exam 70

Recommended texts: Hennessy and Patterson (latest edition)

CPE 308 Engineering Statistics and Research Methods

Units: 2 | Year 3, Semester 5 (First semester)

Description. Statistics and research design for computing.

Learning outcomes:

- Apply descriptive and inferential statistics
- Design simple experiments

Course topics:

1. Descriptive statistics
2. Probability
3. Hypothesis testing
4. Research design

Assessment: CA 40 / Exam 60

Recommended texts: Montgomery and Runger (latest edition)

CPE 309 Computer Networks II

Units: 3 | Year 3, Semester 6 (Second semester)

Description. Advanced routing, switching and network management.

Learning outcomes:

- Configure routing protocols
- Analyse network performance

Course topics:

1. Routing protocols
2. Switching
3. Network management
4. Performance

Assessment: CA 30 / Exam 70

Recommended texts: Kurose and Ross (latest edition)

CPE 310 Embedded Linux and Device Drivers

Units: 3 | Year 3, Semester 6 (Second semester)

Description. Embedded Linux systems and device driver development.

Learning outcomes:

- Build embedded Linux images
- Write simple device drivers

Course topics:

1. Embedded Linux
2. Build systems
3. Device drivers
4. Kernel modules

Assessment: CA 40 / Exam 60

Recommended texts: Departmental reading list, to be confirmed

CPE 311 Network Programming

Units: 3 | Year 3, Semester 6 (Second semester)

Description. Socket programming and network applications.

Learning outcomes:

- Write client-server applications
- Apply network security basics

Course topics:

1. Sockets
2. Client-server
3. Protocols
4. Application security

Assessment: CA 40 / Exam 60

Recommended texts: Stevens et al., UNIX Network Programming (latest edition)

CPE 312 Compiler Design

Units: 3 | Year 3, Semester 6 (Second semester)

Description. Lexical analysis, parsing and code generation.

Learning outcomes:

- Design lexical analysers and parsers
- Explain code generation

Course topics:

1. Lexical analysis
2. Parsing
3. Semantics
4. Code generation

Assessment: CA 30 / Exam 70

Recommended texts: Aho et al., Compilers (latest edition)

CPE 313 Mobile Application Development

Units: 3 | Year 3, Semester 6 (Second semester)

Description. Design and development of mobile applications.

Learning outcomes:

- Develop mobile applications
- Test and deploy mobile apps

Course topics:

1. User interfaces
2. Data storage
3. Networking
4. Deployment

Assessment: CA 40 / Exam 60

Recommended texts: Departmental reading list, to be confirmed

CPE 314 Sensors and Actuators Interfacing

Units: 2 | Year 3, Semester 6 (Second semester)

Description. Interfacing sensors and actuators to computing systems.

Learning outcomes:

- Interface common sensors
- Drive actuators safely

Course topics:

1. Sensors
2. Actuators
3. Signal conditioning
4. Driver circuits

Assessment: CA 40 / Exam 60

Recommended texts: Departmental reading list, to be confirmed

CPE 315 Computing Laboratory III

Units: 2 | Year 3, Semester 6 (Second semester)

Description. Embedded, networking and software lab exercises.

Learning outcomes:

- Carry out embedded and network experiments
- Write laboratory reports

Course topics:

1. Embedded tasks
2. Network tasks
3. Software tasks
4. Reporting

Assessment: Lab reports 100

Recommended texts: Institutional laboratory manual

CPE 316 Engineering Economics

Units: 2 | Year 3, Semester 6 (Second semester)

Description. Economic evaluation of computing projects.

Learning outcomes:

- Evaluate project cash flows
- Compare investment options

Course topics:

1. Time value of money
2. Cash flow
3. Depreciation
4. Appraisal

Assessment: CA 40 / Exam 60

Recommended texts: Blank and Tarquin (latest edition)

Year 4: Advanced Design and Industrial Practice

CPE 401 Internet of Things

Units: 3 | Year 4, Semester 7 (First semester)

Description. IoT architectures, devices and cloud integration.

Learning outcomes:

- Design IoT architectures
- Integrate devices with cloud services

Course topics:

1. IoT architecture
2. Protocols
3. Cloud integration
4. Edge devices

Assessment: CA 30 / Exam 70

Recommended texts: Departmental reading list, to be confirmed

CPE 402 Wireless Sensor Networks

Units: 3 | Year 4, Semester 7 (First semester)

Description. Design of wireless sensor networks.

Learning outcomes:

- Design wireless sensor networks
- Analyse energy efficiency

Course topics:

1. Radio links
2. Routing
3. Energy efficiency
4. Deployment

Assessment: CA 30 / Exam 70

Recommended texts: Departmental reading list, to be confirmed

CPE 403 Network Security

Units: 3 | Year 4, Semester 7 (First semester)

Description. Cryptography, network security and defence.

Learning outcomes:

- Apply cryptographic methods
- Design network security controls

Course topics:

1. Cryptography
2. Firewalls
3. Intrusion detection
4. Protocol security

Assessment: CA 30 / Exam 70

Recommended texts: Stallings, Cryptography and Network Security (latest edition)

CPE 404 Distributed Systems

Units: 3 | Year 4, Semester 7 (First semester)

Description. Distributed architectures, consistency and fault tolerance.

Learning outcomes:

- Design distributed services
- Analyse consistency and fault tolerance

Course topics:

1. Architectures
2. Consistency
3. Fault tolerance
4. Communication

Assessment: CA 30 / Exam 70

Recommended texts: Coulouris et al., Distributed Systems (latest edition)

CPE 405 Machine Learning Fundamentals

Units: 3 | Year 4, Semester 7 (First semester)

Description. Core machine learning methods.

Learning outcomes:

- Apply supervised learning methods
- Evaluate model performance

Course topics:

1. Supervised learning
2. Unsupervised learning
3. Evaluation
4. Practice

Assessment: CA 30 / Exam 70

Recommended texts: Goodfellow, Bengio and Courville (latest edition)

CPE 406 Hardware-Software Co-design

Units: 3 | Year 4, Semester 7 (First semester)

Description. Partitioning and co-design of hardware and software.

Learning outcomes:

- Partition systems between hardware and software
- Evaluate design trade-offs

Course topics:

1. Partitioning
2. FPGA basics
3. Co-simulation
4. Trade-offs

Assessment: CA 40 / Exam 60

Recommended texts: Departmental reading list, to be confirmed

CPE 407 Cloud Computing

Units: 2 | Year 4, Semester 7 (First semester)

Description. Cloud service models and deployment.

Learning outcomes:

- Describe cloud service models
- Deploy services in the cloud

Course topics:

1. Service models
2. Virtualisation
3. Deployment
4. Scaling

Assessment: CA 40 / Exam 60

Recommended texts: Departmental reading list, to be confirmed

CPE 408 Research Project I

Units: 2 | Year 4, Semester 7 (First semester)

Description. Literature review and proposal for the final-year project.

Learning outcomes:

- Conduct a literature review
- Write a research proposal

Course topics:

1. Literature search
2. Research questions
3. Methodology
4. Proposal writing

Assessment: Proposal 100

Recommended texts: Supervisor guidance and departmental guide

CPE 409 Embedded Systems Security

Units: 2 | Year 4, Semester 8 (Second semester)

Description. Security of embedded and IoT devices.

Learning outcomes:

- Assess embedded security threats
- Apply secure firmware practices

Course topics:

1. Threats
2. Secure boot
3. Firmware security
4. Hardening

Assessment: CA 40 / Exam 60

Recommended texts: Departmental reading list, to be confirmed

CPE 410 Network Design and Administration

Units: 3 | Year 4, Semester 8 (Second semester)

Description. Design and administration of enterprise networks.

Learning outcomes:

- Design enterprise networks
- Administer network services

Course topics:

1. Network design
2. Services
3. Administration
4. Monitoring

Assessment: CA 30 / Exam 70

Recommended texts: Departmental reading list, to be confirmed

CPE 411 Industrial Embedded Systems

Units: 3 | Year 4, Semester 8 (Second semester)

Description. Embedded systems for industrial and automotive applications.

Learning outcomes:

- Design industrial embedded systems
- Apply functional safety basics

Course topics:

1. Industrial embedded
2. Automotive networks
3. Functional safety
4. Testing

Assessment: CA 30 / Exam 70

Recommended texts: Departmental reading list, to be confirmed

CPE 412 Cybersecurity Operations

Units: 3 | Year 4, Semester 8 (Second semester)

Description. Monitoring, incident response and security operations.

Learning outcomes:

- Monitor security events
- Respond to security incidents

Course topics:

1. Monitoring
2. Incident response
3. Forensics basics
4. Policy

Assessment: CA 30 / Exam 70

Recommended texts: Departmental reading list, to be confirmed

CPE 413 Artificial Intelligence

Units: 3 | Year 4, Semester 8 (Second semester)

Description. Search, knowledge representation and intelligent agents.

Learning outcomes:

- Apply search methods
- Design simple intelligent agents

Course topics:

1. Search
2. Knowledge representation
3. Agents
4. Reasoning

Assessment: CA 30 / Exam 70

Recommended texts: Russell and Norvig (latest edition)

CPE 414 Digital Systems Verification

Units: 2 | Year 4, Semester 8 (Second semester)

Description. Verification of digital designs and systems.

Learning outcomes:

- Write verification testbenches
- Analyse coverage

Course topics:

1. Testbenches
2. Simulation
3. Coverage
4. Debugging

Assessment: CA 40 / Exam 60

Recommended texts: Departmental reading list, to be confirmed

CPE 415 Systems Design Standards

Units: 2 | Year 4, Semester 8 (Second semester)

Description. Standards and documentation for computing systems.

Learning outcomes:

- Apply design standards
- Produce system documentation

Course topics:

1. Standards
2. Documentation
3. Quality
4. Review

Assessment: CA 40 / Exam 60

Recommended texts: Departmental reading list, to be confirmed

CPE 416 Industrial Training (SIWES)

Units: 3 | Year 4, Semester 8 (Second semester)

Description. Supervised industrial attachment in a relevant organisation.

Learning outcomes:

- Apply engineering knowledge in practice
- Keep a professional logbook

Course topics:

1. Workplace induction
2. Practical tasks
3. Reporting
4. Professional conduct

Assessment: Logbook 40 / Report 40 / Assessor 20

Recommended texts: SIWES guidelines issued by the Industrial Training Fund and AOU

Year 5: Specialisation, Integration and Professional Readiness

CPE 501 Advanced Embedded Systems

Units: 3 | Year 5, Semester 9 (First semester)

Description. Advanced embedded platforms and system design.

Learning outcomes:

- Design advanced embedded platforms
- Optimise embedded performance

Course topics:

1. Platforms
2. Optimisation
3. Power management
4. Verification

Assessment: CA 30 / Exam 70

Recommended texts: Departmental reading list, to be confirmed

CPE 502 Advanced Network Systems

Units: 3 | Year 5, Semester 9 (First semester)

Description. Software-defined and high-performance networks.

Learning outcomes:

- Design software-defined networks
- Analyse network performance

Course topics:

1. SDN
2. Virtualisation
3. Performance
4. Traffic engineering

Assessment: CA 30 / Exam 70

Recommended texts: Departmental reading list, to be confirmed

CPE 503 Edge Computing and Embedded AI

Units: 2 | Year 5, Semester 9 (First semester)

Description. Running machine learning models on edge devices.

Learning outcomes:

- Deploy models on edge devices
- Evaluate latency and energy

Course topics:

1. Edge architecture
2. Model compression
3. Deployment
4. Evaluation

Assessment: CA 40 / Exam 60

Recommended texts: Departmental reading list, to be confirmed

CPE 504 DevOps and Software Delivery

Units: 2 | Year 5, Semester 9 (First semester)

Description. Continuous integration, delivery and operations.

Learning outcomes:

- Build continuous delivery pipelines
- Monitor deployed services

Course topics:

1. CI/CD
2. Containers
3. Infrastructure as code
4. Monitoring

Assessment: CA 40 / Exam 60

Recommended texts: Departmental reading list, to be confirmed

CPE 505 Research Project II

Units: 3 | Year 5, Semester 9 (First semester)

Description. Execution, analysis and reporting of the final-year project.

Learning outcomes:

- Execute a research project
- Report findings professionally

Course topics:

1. Data collection
2. Analysis
3. Writing
4. Oral presentation

Assessment: Project 100

Recommended texts: Supervisor guidance and departmental guide

CPE 506 Engineering Project Management

Units: 2 | Year 5, Semester 9 (First semester)

Description. Planning, scheduling and control of engineering projects.

Learning outcomes:

- Plan and schedule projects
- Manage cost and risk

Course topics:

1. Planning
2. Scheduling
3. Cost control
4. Risk

Assessment: CA 40 / Exam 60

Recommended texts: Departmental reading list, to be confirmed

CPE 507 Technical Elective I

Units: 2 | Year 5, Semester 9 (First semester)

Description. Elective from the approved computing list.

Learning outcomes:

- Apply specialist knowledge in the chosen area
- Evaluate case studies

Course topics:

1. Selected topic
2. Case studies
3. Applications
4. Review

Assessment: CA 40 / Exam 60

Recommended texts: As specified for the chosen elective

CPE 508 Intellectual Property and IT Law

Units: 2 | Year 5, Semester 9 (First semester)

Description. Intellectual property, data protection and computing law.

Learning outcomes:

- Explain intellectual property rights
- Apply data protection principles

Course topics:

1. Intellectual property
2. Licensing
3. Data protection
4. Computing law

Assessment: CA 50 / Exam 50

Recommended texts: Departmental reading list, to be confirmed

CPE 509 Integrated Computing Systems Design

Units: 3 | Year 5, Semester 10 (Second semester)

Description. Capstone design of an integrated hardware and software system.

Learning outcomes:

- Integrate hardware and software subsystems
- Produce a coordinated design

Course topics:

1. System integration
2. Design documentation
3. Testing
4. Review

Assessment: Design project 100

Recommended texts: Departmental design brief

CPE 510 Embedded Product Development

Units: 2 | Year 5, Semester 10 (Second semester)

Description. Development of embedded products from concept to production.

Learning outcomes:

- Plan embedded product development
- Validate product requirements

Course topics:

1. Concept
2. Prototyping
3. Validation
4. Production

Assessment: CA 40 / Exam 60

Recommended texts: Departmental reading list, to be confirmed

CPE 511 Enterprise Network Deployment

Units: 2 | Year 5, Semester 10 (Second semester)

Description. Planning and deployment of enterprise networks.

Learning outcomes:

- Plan network deployment
- Document network configuration

Course topics:

1. Deployment planning
2. Configuration
3. Testing
4. Documentation

Assessment: CA 40 / Exam 60

Recommended texts: Departmental reading list, to be confirmed

CPE 512 Engineering Professional Practice and Ethics

Units: 2 | Year 5, Semester 10 (Second semester)

Description. Professional conduct, registration and computing ethics.

Learning outcomes:

- Apply professional ethics
- Describe registration and legal responsibilities

Course topics:

1. Ethics
2. Professional bodies
3. Registration
4. Computing law

Assessment: CA 50 / Exam 50

Recommended texts: Departmental reading list, to be confirmed

CPE 513 Quality Assurance and Testing

Units: 2 | Year 5, Semester 10 (Second semester)

Description. Software and hardware quality assurance and testing.

Learning outcomes:

- Design test plans
- Apply quality assurance methods

Course topics:

1. Test plans
2. Test automation
3. Quality metrics
4. Reviews

Assessment: CA 40 / Exam 60

Recommended texts: Departmental reading list, to be confirmed

CPE 514 Risk and Safety in Computing Systems

Units: 2 | Year 5, Semester 10 (Second semester)

Description. Risk and safety analysis for computing systems.

Learning outcomes:

- Conduct risk assessments
- Assess safety of computing systems

Course topics:

1. Hazard analysis
2. Risk assessment
3. Safety cases
4. Reliability

Assessment: CA 40 / Exam 60

Recommended texts: Departmental reading list, to be confirmed

CPE 515 Final-Year Design Project and Defence

Units: 4 | Year 5, Semester 10 (Second semester)

Description. Culminating integrated design project with defence.

Learning outcomes:

- Produce a complete design project
- Defend design decisions orally

Course topics:

1. Design development
2. Documentation
3. Presentation
4. Defence

Assessment: Project 60 / Defence 40

Recommended texts: Departmental project guide

CPE 516 Technical Elective II

Units: 2 | Year 5, Semester 10 (Second semester)

Description. Second elective from the approved computing list.

Learning outcomes:

- Apply specialist knowledge in the chosen area
- Evaluate case studies

Course topics:

1. Selected topic
2. Case studies
3. Applications
4. Review

Assessment: CA 40 / Exam 60

Recommended texts: As specified for the chosen elective

5. Industrial Training (SIWES)

- SIWES is taken in Year 4, Semester 8, for 3 units.
- Keep a daily or weekly logbook that records tasks, supervision and what you learned.
- Obtain the placement letter and supervisor details before you start.
- Your final report and assessor's evaluation are part of your assessment.
- Follow the Industrial Training Fund and AOU SIWES guidelines throughout.

6. Assessment and Academic Regulations

Assessment follows the university's approved academic regulations, which govern grading, attendance, progression, carry-over and classification. This summary does not replace those regulations.

- Continuous assessment (CA) is set by course. Examinations form the remainder unless a course states otherwise.
- Practical and laboratory courses are assessed on reports, practical work and, where stated, a viva.
- Design projects and the final-year defence are assessed by a panel using published rubrics.
- Report any missed assessment through the department as soon as possible, with supporting evidence.
- Grading and classification are as set out in the regulations: [insert AOU grading table].

7. Student Support and Conduct

- **Academic advising:** each student is assigned an adviser. Meet your adviser at least once a semester.
- **Academic integrity:** plagiarism, falsified data and unauthorised collaboration are serious offences.
- **Respect and inclusion:** treat staff, colleagues and communities with dignity; report harassment through the appropriate channel.
- **Wellbeing:** seek help early from your adviser or the university welfare services.

8. Laboratory, Workshop and Field Safety

- Wear the prescribed personal protective equipment (PPE) in laboratories, workshops and on sites.
- Follow the instructions of the technician and lecturer. Never operate equipment you have not been trained to use.
- Report every accident, near miss and damaged equipment immediately.
- Network and security exercises are carried out only on authorised, isolated equipment and networks.
- Handle lithium batteries and power supplies carefully; never short-circuit a supply.
- Use electrostatic discharge precautions when handling boards and integrated circuits.

9. Contacts

Role	Name	Contact
Head of Department	[to be inserted]	[to be inserted]
Programme coordinator	[to be inserted]	[to be inserted]
Level advisers	[to be inserted]	[to be inserted]
SIWES coordinator	[to be inserted]	[to be inserted]
Laboratory technical officer	[to be inserted]	[to be inserted]