# ACADEMIC
# CATALOG
## 2025/2026

ASHESI

# Table of Contents


1 ACADEMIC PROGRAMS, DEGREES, AND DEGREE REQUIREMENTS ..... 2

1.1 Mission & Vision Statements ..... 2
1.2 Academic Message ..... 2
1.3 Ashesi University Academic and Social Honour Codes ..... 2
1.4 Undergraduate Degrees Offered ..... 2
1.4.1 Bachelor of Science (BSc.) ..... 2
1.4.2 Graduate Degrees ..... 2
1.5 Bachelor's Degree Requirements ..... 3
1.6 Graduation Honours ..... 4
1.7 Overview of Courses Offered in Ashesi's Undergraduate Degree Programs ..... 5
1.7.1 Overview of Courses Offered in the Undergraduate programs of the Department of Business Administration ..... 5
1.7.2 Overview of Courses Offered in the Undergraduate programs of the Department of Economics ..... 6
1.7.3 Overview of Courses Offered in the Undergraduate programs of the Department of Computer Science and Information Systems 7
1.7.4 Overview of Courses Offered in the Undergraduate programs in the Department of Engineering ..... 8

2 4-YEAR CURRICULUM ..... 10

2.1 Law with Public Policy Program: 4-Year Curriculum ..... 10
2.2 Business Administration, Economics, Management Information Systems, Computer Science Programs: 4-Year Curriculum ..... 12
2.3 Computer Engineering, Electrical and Electronic Engineering, Mechanical Engineering, Mechatronics, and Biological Engineering Programs: 4-Year Curriculum ..... 14
2.4 Humanities and Social Sciences: 4-Year Curriculum ..... 15

3 PROGRESSION PLANS ..... 16

4 PLANS OF STUDY PER YEAR, SEMESTER, AND PROGRAM ..... 17

4.1 Plan of Study: Law with Public Policy ..... 17
4.2 Plan of Study: Business Administration ..... 17
4.3 Plan of Study: Economics ..... 18
4.4 Plan of Study: Computer Science ..... 18
4.5 Plan of Study: Management Information Systems ..... 19
4.6 Plan of Study: Computer Engineering ..... 19
4.7 Plan of Study: Electrical & Electronic Engineering ..... 20
4.8 Plan of Study: Mechanical Engineering ..... 20
4.9 Plan of Study: Mechatronic Engineering ..... 21
4.10 Plan of Study: Biological Engineering ..... 21

5 DESCRIPTIONS OF COURSES AND PREREQUISITES ..... 22

5.1 Business Administration ..... 22
5.1.1 BUSA 100 Principles of Economics ..... 22
5.1.2 BUSA 132 Organizational Behaviour ..... 22
5.1.3 BUSA 161/A Foundation of Design & Entrepreneurship I ..... 23
5.1.4 BUSA 162 Foundation of Design & Entrepreneurship II ..... 23
5.1.5 BUSA 210 Financial Accounting ..... 24
5.1.6 BUSA 220 Introduction to Finance ..... 24
5.1.7 BUSA 224 Finance for non-Finance Managers ..... 24
5.1.8 BUSA 304 Operations Management ..... 25
5.1.9 BUSA 311 Managerial Accounting ..... 25
5.1.10 BUSA 321 Investments ..... 26
5.1.11 BUSA 341 Marketing ..... 26

5.1.12 BUSA 350 International Trade & Policy ..... 27
5.1.13 BUSA 400A_B Thesis 1 & 2 ..... 27
5.1.14 BUSA 401_A Entrepreneurship 1 ..... 27
5.1.15 BUSA 401_B Entrepreneurship 2 ..... 28
5.1.16 BUSA 402 Business Law ..... 28
5.1.17 BUSA 405 Competitive Strategy ..... 29
5.1.18 BUSA 410 Applied Project ..... 29
5.1.19 BUSA 422 Corporate Finance ..... 30
5.1.20 BUSA 423 International Finance ..... 30
5.1.21 BUSA 430 Human Resource Management ..... 30
5.1.22 BUSA 431 Real Estate Development ..... 31
5.1.23 BUSA 442 Strategic Brand Management ..... 31
5.1.24 BUSA 444 Supply Chain Management ..... 32
5.1.25 BUSA 451 Development Economics ..... 32
5.1.26 ECON 101 Micro-Economics ..... 33
5.1.27 ECON 102 Macro-Economics ..... 33
5.1.28 ECON 452 Econometrics ..... 33
5.1.29 ECON 455 Managerial Economics ..... 34
5.1.30 ENGR 413 Project Management & Professional Practice ..... 34
5.1.31 BUSA 424 Venture Capital Investment ..... 35
5.1.32 BUSA 432 Organization Development ..... 35
5.1.33 BUSA 441 Service Marketing ..... 35
5.1.34 BUSA 471 Social Enterprise ..... 36
5.1.35 BUSA 458 Data Analytics for Business ..... 36
5.1.36 BUSA 462 New Product Development ..... 37
5.1.37 BUSA 446 Integrated Marketing Communications ..... 37
5.1.38 BUSA 403 Company and Commercial Law ..... 38
5.1.39 BUSA 446 Anti-Money Laundering ..... 38
5.1.40 BUSA 446 Service Marketing ..... 39
**5.2 Economics ..... 39**
5.2.1 ECON 201 Principles Of Microeconomics ..... 39
5.2.2 ECON 202 Principles of Macroeconomics ..... 39
5.2.3 ECON 211 The Economy of Ghana ..... 40
5.2.4 ECON 221 Statistics with Probability ..... 40
5.2.5 ECON 231 Mathematics for Economists ..... 41
5.2.6 ECON 241 Introduction To Environmental Economics ..... 41
5.2.7 ECON 301 Intermediate Microeconomic Theory I ..... 41
5.2.8 ECON 302 Intermediate Microeconomic Theory II ..... 42
5.2.9 ECON 303 Intermediate Macroeconomic Theory I ..... 42
5.2.10 ECON 304 Intermediate Macroeconomic Theory II ..... 42
5.2.11 ECON 321 Econometrics I ..... 43
5.2.12 ECON 401 Advanced Microeconomic Theory ..... 43
5.2.13 ECON 402 Advanced Macroeconomic Theory ..... 43
5.2.14 ECON 422 Econometrics II ..... 44
5.2.15 ECON 451 Development Economics ..... 44
5.2.16 BUSA 400 A & B- Undergraduate Thesis I & II ..... 44
5.2.17 BUSA 401 A Entrepreneurship I ..... 45
5.2.18 BUSA 401 B Entrepreneurship II ..... 45
5.2.19 BUSA 410 A & B- Applied Project I & II ..... 45
5.2.20 ECON 461 Labour Economics ..... 46
5.2.21 ECON 471 Monetary Economics ..... 46
5.2.22 ECON 441/ BUSA 350: International Trade and Policy ..... 46
5.2.23 ECON 453 Behavioural Economics ..... 47
5.2.24 ECON 431 Health Economics ..... 47
5.2.25 ECON 454 Africa and the Oil Industry ..... 47
**5.3 Computer Science and Information Systems ..... 48**
5.3.1 CS111: Introduction to Computing and Information Systems ..... 48
5.3.2 CS212: Computer Programming for Computer Science ..... 48
5.3.3 CS213: Object-Oriented Programming ..... 48
5.3.4 CS221 Discrete Structures and Theory ..... 48
5.3.5 CS222 Data Structures & Algorithms ..... 49
5.3.6 CS313 Intermediate Computer Programming ..... 49
5.3.7 CS 314 Human Computer Interaction ..... 49
5.3.8 CS323: Database Systems ..... 50
5.3.9 CS331 Computer Organization and Architecture ..... 50
5.3.10 CS341 Web Technologies ..... 50

5.3.11 CS353 Introduction to AI Robotics ..... 51
5.3.12 CS361: Introduction to Modelling and Simulation ..... 51
5.3.13 CS402: CSIS Research Seminar ..... 51
5.3.14 CS413: Concepts of Programming Languages ..... 52
5.3.15 CS415 Software Engineering ..... 52
5.3.16 CS424 Advanced Database Systems ..... 52
5.3.17 CS432 Networks & Data Communications ..... 52
5.3.18 CS 434: Parallel & Distributed Computing ..... 53
5.3.19 CS435 Operating Systems ..... 53
5.3.20 CS442 E-Commerce ..... 53
5.3.21 CS451: Computer Graphics ..... 53
5.3.22 CS452 Machine Learning ..... 54
5.3.23 CS 455 Applied Cryptography and Computer Security ..... 54
5.3.24 CS 456: Algorithm Design & Analysis ..... 54
5.3.25 CS458 Internet of Things ..... 54
5.3.26 CS459 Natural Language Processing ..... 55
5.3.27 CS461 Data Science ..... 55
5.3.28 IS333 IT Infrastructure and Systems Administration ..... 56
5.3.29 IS351: Systems Analysis and Design ..... 57
5.3.30 IS 362: IS Project Management ..... 57
5.3.31 IS371: Technology & Ethics ..... 57
5.3.32 IS451 Information and Systems Security ..... 57
**5.4 Mathematics Track ..... 58**
5.4.1 MATH101 College Algebra ..... 58
5.4.2 MATH121 Pre-calculus 1 ..... 58
5.4.3 MATH122 Pre-calculus 2 ..... 58
5.4.4 MATH141 Calculus 1 ..... 58
5.4.5 MATH142 Calculus 2 ..... 58
5.4.6 MATH152 Statistics for Engineers ..... 59
5.4.7 MATH 161 Engineering Calculus ..... 59
5.4.8 MATH211 Multivariable Calculus & Linear Algebra ..... 59
5.4.9 MATH212 Linear Algebra ..... 59
5.4.10 MATH221 Statistics with Probability ..... 59
5.4.11 MATH233 Quantitative Methods ..... 60
5.4.12 MATH211 Multivariable Calculus & Linear Algebra ..... 60
5.4.13 MATH 251 Differential Equations & Numerical Methods ..... 60
**5.5 Engineering ..... 61**
5.5.1 Engineering Core ..... 61
5.5.1.1 ENGR 112 Introduction to Engineering ..... 61
5.5.1.2 CS 112 Computer Programming for Engineering ..... 61
5.5.1.3 ENGR 212 Instrumentation for Engineering* ..... 61
5.5.1.4 ENGR 300 Year 3 Group Project & Seminar* ..... 61
5.5.1.5 SC 221 Materials Science & Chemistry ..... 62
5.5.1.6 ENGR 311 System Dynamics ..... 62
5.5.1.7 ENGR 312 Control Systems ..... 62
5.5.1.8 ENGR 401 Senior Project & Seminar ..... 62
5.5.1.9 ENGR 413 Project Management and Professional Practice ..... 63
5.5.1.10 SC 113 Physics: Electromagnetism ..... 63
5.5.1.11 CS213 Object-Oriented Programming ..... 63
5.5.1.12 CS331 Computer Organization and Architecture ..... 63
5.5.1.13 CE 122 Applied Programming for Engineers* ..... 64
5.5.1.14 EE 222 Circuits and Electronics ..... 64
5.5.1.15 CE 322 Digital Systems Design ..... 64
5.5.1.16 CE 451 Embedded Systems ..... 64
5.5.2 Electrical Engineering Courses ..... 65
5.5.2.1 EE 242 Electrical Machines ..... 65
5.5.2.2 EE 342 Advanced Electrical Machines ..... 65
5.5.2.3 EE 421 Digital and Analog Signal Processing in Telecommunications ..... 65
5.5.2.4 ME 301 Mechanical Machine Design ..... 65
5.5.2.5 ME 311 Mechanics of Materials ..... 65
5.5.2.6 ME 212 Thermodynamics ..... 66
5.5.2.7 ME 422 Heat Transfer ..... 66
5.5.2.8 ME 431 Fluid Mechanics ..... 66
5.5.2.9 EE 453 Power Systems Analysis ..... 66
5.5.2.10 EE 454 Renewable Energy and Smart Power Grid ..... 67
5.5.2.11 ENGR 442 Mechatronics Systems Design ..... 67

5.5.2.12 EE 442 Power Electronics ..... 67
5.5.3 Mechanical Engineering Electives ..... 68
5.5.3.1 ME 432 Computational Fluid Dynamics ..... 68
5.5.3.2 ME 412 Advanced Thermodynamics ..... 68
5.5.3.3 ME 423 Refrigeration and Air-conditioning ..... 68
5.5.3.4 ME 402 Advanced Mechanical Machine Design ..... 68
5.5.3.5 ME 444 Advanced Manufacturing Processes ..... 69
5.5.3.6 ME 461 Composite Design and Fabrication ..... 69
5.5.3.7 ME 445 Machine Shop and Factory Design ..... 69
5.5.3.8 ME 433 Gas Dynamics and Jet Propulsion ..... 70
5.5.3.9 ME 443 Renewable and Non-renewable Energy Systems ..... 70
5.5.3.10 ME 453 Automotive Engineering ..... 70
5.5.3.11 ME 451 Aerospace Projects ..... 70
5.5.3.12 ENGR 444 Automation and Production Systems ..... 71
5.5.4 Computer and Electrical and Electronics Engineering Electives ..... 71
5.5.4.1 EE 421 Digital and Analog Signal Processing in Telecommunications ..... 71
5.5.4.2 CS 432 Networks & Data Communications ..... 71
5.5.4.3 EE 422 Advanced Communication Systems ..... 71
5.5.4.4 CE 458 Internet of Things ..... 72
5.5.4.5 CS 452 Machine Learning ..... 72
5.5.4.6 EE 421 Digital and Analog Signal Processing in Telecommunications ..... 72
5.5.4.7 CS 445 Applied Cryptography and Computer Security ..... 73
5.5.4.8 CE 452 Very Large-Scale Integration (VLSI) ..... 73
5.5.4.9 CE 432 Neural Networks ..... 73
5.5.4.10 CS 313 Intermediate Computer Programming ..... 73
5.5.4.11 CS 441 Mobile Application Development ..... 73
5.5.4.12 CS 461 Data Science ..... 74
5.5.5 Bioengineering Core ..... 74
5.5.5.1 BENG 181 Molecular and Cell Biology ..... 74
5.5.5.2 BENGR 281 General Chemistry ..... 74
5.5.5.3 BENGR 282 Anatomy and Physiology for Engineers ..... 74
5.5.5.4 BENGR 382 Biochemistry ..... 74
5.5.5.5 BENG 482 Transport Phenomena in Biological Systems ..... 74
5.5.5.6 BENGR 483 Biomaterials ..... 75
5.5.5.7 BENGR 484 Systems Biology ..... 75
5.5.5.8 BENGR 482 Cellular and Tissue Biomechanics ..... 75
5.5.5.9 BENGR 381 Modeling in Biomedical Engineering ..... 75
5.5.5.10 BENGR 485 Science Communication and Public Engagement ..... 75
5.5.5.11 BENGR 412 Synthetic Biological Engineering ..... 75
5.5.6 Bioengineering Electives ..... 75
5.5.6.1 BENGR 486 Biomimetic Design ..... 75
5.5.6.2 CS453 Robotics ..... 76
5.5.6.3 CS254 Introduction to Artificial Intelligence ..... 76
5.5.6.4 CS452 Machine Learning (CS Elective) ..... 76
5.5.6.5 EE421 Digital and Analog Signal Processing in Telecommunications ..... 76
5.5.6.6 BUSA 471 Social Enterprise ..... 76
5.5.6.7 BENG 487 Bioinformatics ..... 76
5.5.6.8 BENGR Neuroengineering ..... 77
5.5.6.9 ENGR 401 Senior Project & Seminar ..... 77
**5.6 Law and Public Policy Core ..... 77**
5.6.1 Law with Public Policy Core ..... 77
5.6.1.1 LLB112 Ghana Legal Systems & Methods ..... 77
5.6.1.2 LLB114 Legal Writing ..... 77
5.6.1.3 LLB150 Introduction to Public Policy ..... 77
5.6.1.4 LLB213 Constitutional Law I ..... 77
5.6.1.5 LLB214 Constitutional Law II ..... 78
5.6.1.6 LLB215 Contract Law I ..... 78
5.6.1.7 LLB216 Contract Law II ..... 78
5.6.1.8 LLB217 Torts ..... 78
5.6.1.9 LLB218 P0litics of Policymaking ..... 78
5.6.1.10 LLB250 Philosophical Foundations of Public Policy ..... 79
5.6.1.11 LLB255 Economic Analysis for Public Policy ..... 79
5.6.1.12 LLB321 Criminal Law I ..... 79
5.6.1.13 LLB322 Criminal Law II ..... 79
5.6.1.14 LLB323 Immovable Property I ..... 79
5.6.1.15 LLB324 Immovable Property Law II ..... 79

5.6.1.16 LLB325 Public International Law....80
5.6.1.17 LLB351 Designing Public Policy....80
5.6.1.18 LLB352 Implementing Public Policy....80
5.6.1.19 LLB401 Capstone 1 (Thesis)....80
5.6.1.20 LLB402 Capstone 2 (Applied Project)....80
5.6.1.21 LLB403 Public Policy Practicum....80
5.6.1.22 LLB425 Equity & Trusts....81
5.6.1.23 LLB426 Company Law....81
5.6.1.24 LLB427 Commercial Law....81
5.6.1.25 LLB428 Jurisprudence....81
5.6.1.26 LLB429 Legislative Writing....82
5.6.1.27 LLB430 Succession....82
5.6.1.28 LLB454 Evaluating Public Policy....82
5.6.2 Law with Public Policy Electives....82
5.6.2.1 LLB331 Gender and the Law....82
5.6.2.2 LLB332 Intellectual Property....82
5.6.2.3 LLB333 International Trade Law....83
5.6.2.4 LLB334 Law of Taxation....83
5.6.2.5 LLB335 Alternative Dispute Resolution....83
**5.7 Humanities and Social Sciences Core and Electives....83**
5.7.1.1 AS 111 Ashesi Success....83
5.7.1.2 ENGL 001 Writing, Public Speaking, and Multimedia Communications....84
5.7.1.3 FYE 001 How to Communicate Like a Leader (Optional)....84
5.7.1.4 FYE 002 English Bridge (Optional)....84
5.7.1.5 ENGL 112 Written and Oral Communication....84
5.7.1.6 ENGL 113 Text and Meaning....84
5.7.1.7 SOAN 325 Research Methods....85
5.7.2 Leadership Seminar Series....85
5.7.2.1 SOAN 111 Leadership Seminar 1....85
5.7.2.2 SOAN 211 Leadership Seminar 2....85
5.7.2.3 SOAN 311 Leadership Seminar 3....86
5.7.2.4 SOAN 411 Leadership Seminar 4....86
5.7.3 Africana/African Studies Elective Courses....87
5.7.3.1 ENGL 231 African Literature & Film....87
5.7.3.2 POLS 221 African Philosophical Thought....87
5.7.3.3 POLS 231 Africa in International Settings: Africa Beyond Aid....87
5.7.3.4 POLS 332 Governance in Africa....88
5.7.3.5 SOAN 225 Ghanaian Popular Culture....88
5.7.3.6 SOAN 233 African Music and the Contemporary Art Music Scene....89
5.7.3.7 SOAN 322 African Cultural Institutions....89
5.7.3.8 SOAN 227 Religion in Africa....90
5.7.3.9 SOAN 301 Introduction to Africana Studies: The Global Black Experience....90
5.7.3.10 POLS 322 China-Africa Relations....91
5.7.3.11 POLS 234 Comparative Politics: Politics in Africa....91
5.7.3.12 SOAN 239 African & Diasporan Choir....91
5.7.3.13 SOAN 302 Travel Seminar: Living Ghana's History, Culture, and Politics....91
5.7.3.14 SOAN240 Neo-Traditional African Dance Forms....92
5.7.3.15 SOAN237 Crafting Cultures: Exploring African History through Ceramics and Pottery....92
5.7.3.16 ENG232 African Folktales - How Stories Shape Us....92
5.7.3.17 SOAN 236 ESG: Corporate Ethics in Africa....92
5.7.3.18 POLS 222 Political Economy of Healthcare in Ghana....93
5.7.3.19 SOAN 238 Introduction to Sociocultural Anthropology....93
5.7.4 French Elective Courses....94
5.7.4.1 FRENC 111 Conversational French I....94
5.7.4.2 FRENC 123 Conversational French II....94
5.7.4.3 FRENC 213 Professional French (Global communication in French)....94
5.7.4.4 FRENC 318 Langue Francaise: La Culture En Plus....94

**6 PRE-ADMISSION PREPARATORY EXPERIENCE....96**

**7 EUROPEAN CREDIT TRANSFER AND ACCUMULATION SYSTEM (ECTS) PER DEPARTMENT....97**

**7.1 ECTS for Degree in Business Administration....97**
**7.2 ECTS for Degree in Engineering....97**

**7.3 ECTS for Degree in Computer Science and Information Systems ..... 97**

**8 COURSE CATALOGUE FOR MASTERS IN MECHATRONICS ENGINEERING PROGRAMS ..... 98**

**8.1 Sequence for 3-year Joint MAS and MSc. Mechatronics Engineering Programs ..... 98**
**8.2 MAS Curriculum (Year I) ..... 99**
8.2.1 Mathematical Tools I ..... 99
8.2.2 Mathematical Tools II ..... 99
8.2.3 Thermofluids ..... 99
8.2.4 Embedded Systems and Computer Programming ..... 99
8.2.5 Digital Electronics ..... 99
8.2.6 Material Engineering ..... 99
8.2.7 Signals and Systems ..... 99
8.2.8 Dynamics ..... 99
8.2.9 Statics and Solid Mechanics ..... 100
8.2.10 Computational Methods ..... 100
**8.3 Mechatronics [MSc] ..... 100**
8.3.1 Control Systems I ..... 100
8.3.2 Control Systems II and Optimal Control ..... 100
8.3.3 Introduction to Robotics and Mechatronics ..... 100
8.3.4 System Identification and Modelling ..... 100
8.3.5 Communication Networks and Internet of Things ..... 100
8.3.6 Data Analysis and Machine Learning ..... 100
**8.4 Engineering in Perspective [MSc] ..... 100**
8.4.1 Investment Appraisal and Cost-effectiveness Analysis ..... 100
8.4.2 Leading Teams ..... 101
8.4.3 Corporate Responsibility and Sustainability ..... 101
8.4.4 International Environmental Politics ..... 101
8.4.5 Introduction to Development Economics ..... 101
8.4.6 Sustainable Engineering ..... 101
**8.5 Energy Systems [MSc] ..... 101**
8.5.1 Renewable Energy Technologies ..... 101
8.5.2 Energy Systems and Mobility ..... 101
**8.6 Production [MSc] ..... 101**
8.6.1 Manufacturing Processes ..... 101
8.6.2 Process Engineering ..... 102
8.6.3 Product Development ..... 102
8.6.4 Reliability and Risk ..... 102
**8.7 Research Methods ..... 102**
**8.8 Thesis ..... 102**
**8.9 MSc Curriculum: Semester-by-semester structure/schedule of course ..... 103**
**8.10 Course Descriptions of Mechatronics Engineering Programs ..... 103**
8.10.1 MECH 581 Analysis and Design of Control Systems (2,2,3) ..... 103
8.10.2 MECH 582 Optimal Control (2,2,3) ..... 104
8.10.3 MECH 584 Robotics (1,2,2) ..... 104
8.10.4 MECH 586 Mechatronics (1,2,2) ..... 104
8.10.5 MECH 681 System Identification and Modelling (2,2,3) ..... 104
8.10.6 MECH 631 Advanced Communication Systems and Internet of Things (2,2,3) ..... 104
8.10.7 MECH 521 Data Analysis and Machine Learning (2,2,3) ..... 105
8.10.8 MECH 504 Finance and Public Policy for Engineers (2,0,2) ..... 105
8.10.9 MECH 501 Leading Teams (2,0,2) ..... 105
8.10.10 MECH 611 Sustainable Engineering (2,2,3) ..... 106
8.10.11 MECH 601 Development Economics (2,0,2) ..... 106
8.10.12 MECH 502 Reducing Societal and Environmental Footprint (2,0,2) ..... 106
8.10.13 MECH 503 Corporate Responsibility & Sustainability (2,0,2) ..... 106
8.10.14 MECH 531 Energy Systems (2,2,3) ..... 106
8.10.15 MECH 532 Energy Systems and Mobility (2,2,3) ..... 107
8.10.16 MECH 641 Manufacturing Processes (2,2,3) ..... 107
8.10.17 MECH 542 Process Engineering (2,2,3) ..... 107
8.10.18 MECH 613 Product Development (2,2,3) ..... 107
8.10.19 MECH 511 Reliability and Risk (2,2,3) ..... 107
**8.11 Two-year MPhil Mechatronics Engineering ..... 108**
**8.12 Two-year standalone MSc Mechatronics Engineering ..... 108**

**9 COURSE CATALOGUE FOR THE ASHESI MBA PROGRAM ..... 109**

**9.1 OVERVIEW OF THE ASHESI MBA PROGRAM ..... 109**
**9.2 COURSE DESCRIPTIONS OF THE ASHESI MBA PROGRAM ..... 109**
9.2.1 BLOCK 1 ..... 109
9.2.1.1 MBA571 Module 1: Leadership, Ethics & A Good Society ..... 109
9.2.1.2 MBA511 Financial Reporting and Control ..... 109
9.2.1.3 MBA541 Marketing Management ..... 110
9.2.1.4 MBA551 Managerial Economics ..... 110
9.2.1.5 MBA561 Process Innovation and Technology ..... 110
9.2.2 BLOCK 2 ..... 110
9.2.2.1 MBA 572 Module 2: Cultural Intelligence in Leadership ..... 110
9.2.2.2 MBA582 Business Analytics and Empirical Methods ..... 111
9.2.2.3 MBA534 Psychology of Work and Human Behavior ..... 111
9.2.2.4 MBA532 Managing People, Culture and Performance ..... 111
9.2.2.5 MBA512 Managerial Finance ..... 111
9.2.3 BLOCK 3 ..... 112
9.2.3.1 MBA673 Sustainable Leadership & Ethical Business ..... 112
9.2.3.2 MBA601 Cross-Border Business ..... 112
9.2.3.3 MBA601 Cross-Border Business ..... 112
9.2.3.4 MBA645 Resource Incentive and Market Failures ..... 112
9.2.3.5 MBA661 Supply Chain Strategies for African Markets ..... 112
9.2.3.6 MBA635 Business Communication and Negotiation ..... 112
9.2.4 BLOCK 4 ..... 113
9.2.4.1 MBA674 Completing the Circle – Leadership 360 ..... 113
9.2.4.2 MBA636 Competitive Strategy ..... 113
9.2.4.3 MBA648 New Venture Development ..... 113
9.2.5 MBA ELECTIVES ..... 113
9.2.5.1 Innovation for Business Sustainability ..... 113
9.2.5.2 MBA692 Entrepreneurial Leadership ..... 114
9.2.5.3 MBA642 Technology strategy ..... 114
9.2.5.4 MBA638 Decision Intelligence ..... 114
9.2.5.5 MBA614 Financial Technology ..... 114
9.2.5.6 MBA602 Global & Regional Immersion Program ..... 114
9.2.5.7 MBA600 Capstone ..... 114

**10 COURSE CATALOGUE FOR MSC. AND MPHIL IN INTELLIGENT COMPUTING PROGRAMS ..... 115**

**10.1 OVERVIEW OF THE MSC. AND MPHIL IN INTELLIGENT COMPUTING SYSTEMS PROGRAM ..... 115**
10.1.1 SUMMARY OF REQUIREMENTS FOR MSC. INTELLIGENT COMPUTING SYSTEMS PROGRAM ..... 115
10.1.2 CORE COURSES ..... 115
10.1.2.1 Seminars ..... 115
10.1.2.2 Software Engineering & Systems Group ..... 115
10.1.2.3 Artificial Intelligence Group ..... 116
10.1.2.4 Security Group ..... 116
Two courses from this group must be taken to meet the breadth requirement ..... 116
10.1.2.5 Integration requirement and practical training ..... 116
10.1.3 ELECTIVE COURSES ..... 116
10.1.3.1 Software Engineering & Systems Group ..... 116
10.1.3.2 Artificial Intelligence group ..... 117
10.1.3.3 Security Group ..... 117
10.1.4 PROGRESSION PLAN FOR MSC. INTELLIGENT COMPUTING SYSTEMS ..... 117
10.1.4.1 Progression Plan for Full-time Students ..... 117
10.1.4.2 Progression Plan for Part-time Students ..... 118
10.1.5 PROGRESSION PLAN FOR MPHIL INTELLIGENT COMPUTING SYSTEMS ..... 119
10.1.6 COURSE DESCRIPTIONS OF THE MSC. AND MPHIL IN INTELLIGENT COMPUTING SYSTEMS PROGRAMS ..... 119
10.1.6.1 ICS 510 Foundations of Intelligent Systems Seminar ..... 119
10.1.6.2 ICS 521 Leadership & Ethics Seminar ..... 120
10.1.6.3 ICS 522 Technology & Ethics Seminar ..... 120
10.1.6.4 ICS 523 Technology & Law Seminar ..... 120
10.1.6.5 ICS 524 Project Management Seminar ..... 120
10.1.6.6 ICS 525 Accessibility and Universal Design Seminar ..... 120
10.1.6.7 ICS 530 Software Engineering Essentials ..... 120
10.1.6.8 ICS 531 Advanced Programming ..... 120

10.1.6.9 ICS 532 Agile Software Engineering Methods ..... 121
10.1.6.10 ICS 533 Software Measurement & Testing ..... 121
10.1.6.11 ICS 534 Cloud Computing ..... 121
10.1.6.12 ICS 535 Embedded Systems ..... 121
10.1.6.13 ICS 536 Blockchain & Cryptocurrencies ..... 121
10.1.6.14 ICS 550 Artificial Intelligence Essentials ..... 121
10.1.6.15 ICS 551 Machine Learning Essentials ..... 121
10.1.6.16 ICS 552 Applied Data Science ..... 122
10.1.6.17 ICS 553 Deep Learning ..... 122
10.1.6.18 ICS 554 Advanced Natural Language Processing ..... 122
10.1.6.19 ICS 555 Computer Vision ..... 122
10.1.6.20 ICS 556 Autonomous Robotics ..... 122
10.1.6.21 ICS 557 Internet of Things ..... 122
10.1.6.22 ICS 570 Computer Security Essentials ..... 122
10.1.6.23 ICS 572 Software Security ..... 123
10.1.6.24 ICS 573 Cybersecurity ..... 123
10.1.6.25 ICS 574 Security Management ..... 123
10.1.6.26 ICS 575 Security Engineering ..... 123
10.1.6.27 ICS 576 Privacy Preserving Systems ..... 123
10.1.6.28 ICS 591 Building Secure Intelligent Systems ..... 123
10.1.6.29 ICS 592 Industry Practicum ..... 123

**11 APPENDIX A: PROGRESSION PLANS ..... 124**

**11.1 Law with Public Policy Program Progression Plan (Class of 2026, 2027 & Alumni) ..... 124**
**11.2 Business Administration Program Progression Plan (Class of 2024 & 2025) ..... 126**
**11.3 Business Administration Program Progression Plan - Jan 2022 (Class of 2026) ..... 127**
**11.4 Economics Program Progression Plan - Jan 2024 (Class of 2026 & 2027) ..... 128**
**11.5 Management Information Systems Program Progression Plan – Sept 2024 (Class of 2025 and later) ..... 129**
**11.6 Computer Science Program Progression Plan – Sept 2024 (Class of 2025 and later) ..... 130**
**11.7 Computer Engineering Program Progression Plan – Jan 2022 (Class of 2026) ..... 131**
**11.8 Electrical and Electronic Engineering Program Progression Plan - Jan 2022 (Class of 2026) ..... 132**
**11.9 Mechanical Engineering Program Progression Plan - Jan 2022 (Class of 2026) ..... 133**
**11.10 Mechatronics Program Progression Plan - Jan 2024 (Class of 2027) ..... 134**
**11.11 Bioengineering Program Progression Plan - Jan 2024 (Class of 2027) ..... 135**

# ASHESI UNIVERSITY 2025-2026 ACADEMIC CATALOG

# 1 Academic Programs, Degrees, And Degree Requirements

## 1.1 Mission & Vision Statements

The mission of Ashesi University is to educate a new generation of ethical, entrepreneurial leaders in Africa to cultivate within our students critical thinking skills, concern for others, and the courage it will take to transform a continent.

Our vision is an African renaissance driven by a new generation of ethical, entrepreneurial leaders. We aim to educate such leaders and to drive a movement in African higher education to scale up the education of such leaders.

## 1.2 Academic Message

An Ashesi student's academic purpose is striving for excellence in citizenship, leadership, and scholarship in their discipline to transform Africa.

## 1.3 Ashesi University Academic and Social Honour Codes

Academic Honour Code (2007): All members of each second-year class at Ashesi University vote on whether to pledge to abide by the Academic Honour Code. When a minimum of 66.7% of the class votes in favour of the pledge, the entire class is deemed committed to honouring the pledge, which simply states, "I will not cheat, and I will not allow my peers to cheat."

Social Honour Code (2018): Under the code, all members of the Ashesi community will now sign on to a new pledge of behaviour; the pledge reads, "As a member of the Ashesi Community, I will act with honesty, integrity, and respect for others, and will hold my peers accountable to abide by these principles and by the university's code of conduct."

## 1.4 Undergraduate Degrees Offered

### 1.4.1 Bachelor of Science (BSc.)

**Department of Business Administration**

- BSc. in Business Administration
- BSc. in Economics

**Department of Computer Science and Information Systems**

- BSc. in Computer Science
- BSc. in Management Information Systems

**Department of Engineering**

- BSc. in Computer Engineering
- BSc. in Electrical & Electronic Engineering
- BSc. in Mechanical Engineering
- BSc. in Mechatronics
- BSc. In Bioengineering

**Department of Law, Humanities, and Social Sciences**

- LLB Law with Public Policy

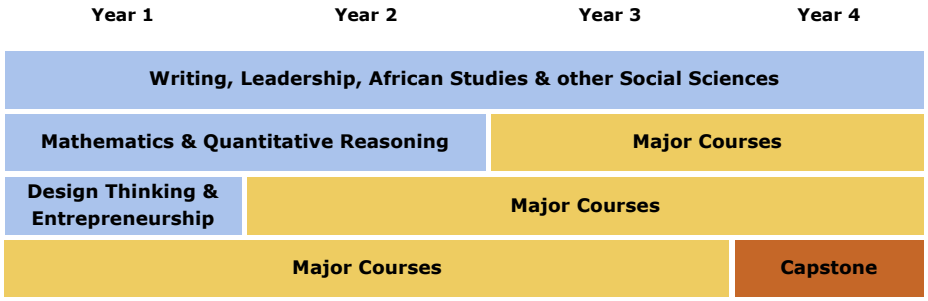
### 1.4.2 Graduate Degrees

- MSc. in Mechatronic Engineering
- MAS in Mechatronic Engineering
- MPhil. in Mechatronic Engineering
- MSc. in Intelligent Computing Systems
- MPhil. in Intelligent Computing Systems
- The Ashesi MBA (Master of Business Administration)

## 1.5 Bachelor's Degree Requirements

Ashesi University offers an academic program consisting of a minimum of 134 semester hours of credit (33.5 Ashesi units, each unit a minimum of 4 semester hours) for the bachelor's degree. The degree consists of a hybrid foundational liberal arts core, a professional core major, and elective courses.

*Table 1-1: Four-Year Curriculum*




Ashesi's academic calendar of 45 weeks a year is divided into three semesters, i.e., 15 weeks each. Students typically enrol for two successive semesters and take their third semester off as their Independent Activities Period (IAP). During the IAP students may engage in internships, retake failed courses, etc. Students take four Ashesi units per semester. An Ashesi unit is the equivalent of 4 hours a student has in contact with an instructor for instruction, discussion, or lab, or some combination of the three. Typically, a 15-week semester is 13 weeks of instruction made up of in-classroom instruction and a discussion or a lab. That is, in a 15-week semester, there are 3 hours of classroom-contact instruction each week for 13 weeks (3 hrs. X 13 weeks = 39 hours) and either a one-hour discussion or a 2–3-hour lab, i.e., additional contact hours of (1hr x 13 weeks) 13 discussion hours or (2- or 3-hours X 13 weeks) range of 26 to 39 hours of lab experience. Each semester is named after the starting month, i.e., the first semester begins in September and is the September Semester (formerly semester 1 or fall semester); the second semester begins in January and is the January Semester (formerly semester 2 or Spring semester); the third semester of the academic year begins in May and is the May Semester (formerly semester 3 or summer semester). Beginning September 2025 there will be two enrolments each academic year, one in September and the other in January, referred to as the Dual Intake.

In the European Credit Transfer and Accumulation System, ECTS (using 1 ECTS = 25 hours), each of our degree programs is approximately 240 ECTS. (See page 97)

To earn a baccalaureate degree and be eligible for graduation, students are required to fulfil the following minimal requirements.

- Successful completion of at least 33.5-Ashesi units, including all core and major requirements*
- A cumulative grade point average of 2.0 (C average) or higher
- Successful completion of the service-learning component**
- Successful completion of internship (required only for engineering students) ***
- Successful completion of writing across the curriculum course series (required pass for class of 2028 and subsequent classes) ****
- Fulfilment of all financial obligations to the University.

* Note that some Ashesi degree programs require more than 33.5 units, depending on a student's math track.

** The service-learning component exists as another dimension of our commitment to nurturing graduates who excel in citizenship. Service learning helps students develop a sense of citizenship by giving them an opportunity to become engaged with their surrounding community. Students must complete 40 hours of community service and fulfil this requirement in a variety of ways. The Outreach and Experiential Learning Programs office keeps a directory of non-profit organisations students can volunteer with.

*** All Ashesi students are encouraged to use the Independent Activities Period for internship opportunities at the end of their second and third years. To ensure some level of familiarity with the practising engineering profession, all Ashesi engineering students must either intern at an engineering firm or an engineering-related internship at a non-engineering firm, shadow a practising engineer, or engage in an engineering project for an external company.

**** Beginning with the Class of 2028, all Ashesi students should obtain a pass in the Writing Across the Curriculum Lab series as a graduation requirement.

## 1.6 Graduation Honours

Students with a cumulative GPA of 3.50 to 3.69 for all undergraduate work earn ***Cum Laude*** (honours). Those with a cumulative GPA of 3.70 to 3.84 for all undergraduate work earn ***Magna Cum Laude*** (high honours). Students with a cumulative GPA of 3.85 to 4.00 for all undergraduate work earn ***Summa Cum Laude*** (highest honours).

*Table 1-2: Cum Laude and Class Distinctions*

| Ashesi University Honours | GPA | Public University (University of Cape Coast Honours) | GPA |
|---|---|---|---|
| Summa Cum Laude (Highest Honours) | 3.85 - 4.00 | First Class | 3.60 - 4.00 |
| Magna Cum Laude (High Honours) | 3.70 - 3.84 | | |
| Cum Laude (Honours) | 3.50 - 3.69 | Second Class (Upper) | 2.95 – 3.59 |
| Bachelor's | 2.00 - 3.49 | Second Class (Lower) | 2.45 – 2.94 |
| | | Third Class | 2.00 – 2.44 |

## 1.7 Overview of Courses Offered in Ashesi's Undergraduate Degree Programs

### 1.7.1 Overview of Courses Offered in the Undergraduate programs of the Department of Business Administration

| | Business Administration |
|---|---|
| Liberal Arts & Sciences Core | |
| Humanities & Social Sciences | Written and Oral Comm. |
| Humanities & Social Sciences | Text and Meaning |
| Humanities & Social Sciences | Ashesi Success |
| Humanities & Social Sciences | Leadership 1* |
| Humanities & Social Sciences | Leadership 2* |
| Humanities & Social Sciences | Leadership 3* |
| Humanities & Social Sciences | Leadership 4 |
| Humanities & Social Sciences | Microeconomics |
| Humanities & Social Sciences | Macroeconomics |
| Ashesi Units | 6.5 Ashesi Units |
| Business | Found. of Design & Entrepreneurship I |
| Business | Found. of Design & Entrepreneurship II |
| Ashesi Units | 2 Ashesi Units |
| Mathematics | Pre-Calculus 1 / Calculus 1 |
| Mathematics | Pre-Calculus 2 / Calculus 2 |
| Mathematics | Applied Calculus (Pre-Calc track only) |
| Mathematics | Statistics |
| Mathematics | Quantitative Methods |
| Ashesi Units | 4 Ashesi Units (5 if Pre-Calculus track) |
| Computing | Intro to Computing & IS |
| Ashesi Units | 1 Ashesi Unit |
| Research / Project Prep | Research Methods |
| Ashesi Units | 1 Ashesi Unit |
| Research / Project Prep | 3 Non-Major Electives including at least 1 African studies |
| Ashesi Units | 3 Ashesi Units |
| Total Credits – Liberal Arts & Science Core | 17.5 Ashesi Units (18.5 if Pre-Calculus) |
| MAJOR | |
| Required Major Class | Introduction to Finance |
| Required Major Class | Financial Accounting |
| Required Major Class | Marketing |
| Required Major Class | Managerial Accounting |
| Required Major Class | Corporate Finance |
| Required Major Class | Organizational Behavior |
| Required Major Class | International Trade & Policy |
| Required Major Class | Operations Management |
| Required Major Class | Business Law |
| Required Major Class | Competitive Strategy |
| Required Major Class | Investments |
| Required Major Class | |
| Required Major Class | |
| Ashesi Units | 11 Ashesi Units |
| Major Electives | 3 BA Electives |
| Ashesi Units | 3 Ashesi Units |
| Capstone | Capstone 1 |
| Capstone | Capstone 2 |
| Ashesi Units | 2 Ashesi Units |
| Total Credits - Major | 16 Ashesi Units |
| **Total Credits - Overall** | **33.5 Ashesi Units (34.5 if Pre-Calc Track)** |

## 1.7.2 Overview of Courses Offered in the Undergraduate programs of the Department of Economics

| Economics | |
|---|---|
| Liberal Arts & Sciences Core | |
| Humanities & Social Sciences | Written and Oral Comm. |
| Humanities & Social Sciences | Text and Meaning |
| Humanities & Social Sciences | Ashesi Success |
| Humanities & Social Sciences | Leadership 1* |
| Humanities & Social Sciences | Leadership 2* |
| Humanities & Social Sciences | Leadership 3* |
| Humanities & Social Sciences | Leadership 4 |
| Humanities & Social Sciences | Principles of Microeconomics |
| Humanities & Social Sciences | Principles of Macroeconomics |
| Ashesi Units | 6.5 Ashesi Units |
| Business | Found. of Design & Entrepreneurship I |
| Business | Found. of Design & Entrepreneurship II |
| Ashesi Units | 2 Ashesi Units |
| Mathematics | Pre-Calculus 1 / Calculus 1 |
| Mathematics | Pre-Calculus 2 / Calculus 2 |
| Mathematics | Applied Calculus (Pre-Calc track only) |
| Mathematics | Statistics |
| Mathematics | |
| Ashesi Units | 3 Ashesi Units (4 if Pre-Calculus track) |
| Computing | Intro to Computing & IS |
| Ashesi Units | 1 Ashesi Unit |
| Research / Project Prep | Research Methods |
| Ashesi Units | 1 Ashesi Unit |
| Research / Project Prep | 3 Non-Major Electives including at least 1 African studies |
| Ashesi Units | 3 Ashesi Units |
| Total Credits – Liberal Arts & Science Core | 16.5 Ashesi Units (17.5 if Pre-Calculus) |
| MAJOR | |
| Required Major Class | Mathematics for Economists |
| Required Major Class | Introduction to Environmental Economics |
| Required Major Class | The Economy of Ghana |
| Required Major Class | Intermediate Microeconomic Theory I |
| Required Major Class | Intermediate Macroeconomic Theory I |
| Required Major Class | Development Economics |
| Required Major Class | Intermediate Microeconomic Theory II |
| Required Major Class | Intermediate Macroeconomic Theory II |
| Required Major Class | Econometrics I |
| Required Major Class | Business Law |
| Required Major Class | Advanced Microeconomic Theory |
| Required Major Class | Econometrics II |
| Required Major Class | Advanced Macroeconomic Theory |
| Ashesi Units | 13 Ashesi Units |
| Major Electives | 3 Economics Electives |
| Ashesi Units | 3 Ashesi Units |
| Capstone | Capstone 1 |
| Capstone | Capstone 2 |
| Ashesi Units | 2 Ashesi Units |
| Total Credits - Major | 18 Ashesi Units |
| **Total Credits - Overall** | **34.5 Ashesi Units (35.5 if Pre-Calc Track)** |

### 1.7.3 Overview of Courses Offered in the Undergraduate programs of the Department of Computer Science and Information Systems

| | Management Information Systems | Computer Science |
|---|---|---|
| **Liberal Arts & Sciences Core** | | |
| Humanities & Social Sciences | Written and Oral Comm. | Written and Oral Comm. |
| Humanities & Social Sciences | Text and Meaning | Text and Meaning |
| Humanities & Social Sciences | Ashesi Success | Ashesi Success |
| Humanities & Social Sciences | Leadership 1* | Leadership 1* |
| Humanities & Social Sciences | Leadership 2* | Leadership 2* |
| Humanities & Social Sciences | Leadership 3* | Leadership 3* |
| Humanities & Social Sciences | Leadership 4 | Leadership 4 |
| Humanities & Social Sciences | Principles of Economics | Principles of Economics |
| ***Ashesi Units*** | ***6.5 Ashesi Units*** | ***6.5 Ashesi Units*** |
| Business | Found. of Design & Entrepreneurship I | Found. of Design & Entrepreneurship I |
| Business | Found. of Design & Entrepreneurship II | Found. of Design & Entrepreneurship II |
| | | Finance for non-Finance Managers |
| ***Ashesi Units*** | ***2 Ashesi Units*** | ***3 Ashesi Units*** |
| Mathematics | Pre-Calculus 1 / Calculus 1 | Pre-Calculus 1 / Calculus 1 |
| Mathematics | Pre-Calculus 2 / Calculus 2 | Pre-Calculus 2 / Calculus 2 |
| Mathematics | Applied Calculus (Pre-Calc track only) | Applied Calculus (Pre-Calc track only) |
| Mathematics | Statistics | Statistics |
| Mathematics | Quantitative Methods or Linear Algebra | Linear Algebra |
| ***Ashesi Units*** | ***4 Ashesi Units (5 if Pre-Calculus track)*** | ***4 Ashesi Units (5 if Pre-Calculus track)*** |
| Computing | Intro to Computing & Information Systems | Intro to Computing & Information Systems |
| ***Ashesi Units*** | ***1 Ashesi Unit*** | ***1 Ashesi Unit*** |
| Research / Project Prep | Research Methods | Research Methods |
| ***Ashesi Units*** | ***1 Ashesi Unit*** | ***1 Ashesi Unit*** |
| Research / Project Prep | 2 Non-Major Electives including at least 1 African Studies and 1 free elective | 2 Non-Major Electives, including at least 1 African Studies |
| ***Ashesi Units*** | ***3 Ashesi Units*** | ***2 Ashesi Units*** |
| **Total Credits – Liberal Arts & Science Core** | **17.5 Ashesi Units (18.5 if Pre-Calculus)** | **17.5 Ashesi Units (18.5 if Pre-Calculus)** |
| **MAJOR** | | |
| Required Major Class | Finance for Non-Finance Managers | Computer Programming for CS |
| Required Major Class | Competitive Strategy | Object-Oriented Programming* |
| Required Major Class | Computer Programming for CS | Discrete Structures and Theory |
| Required Major Class | Object-Oriented Programming | Data Structures & Algorithms |
| Required Major Class | Discrete Structures & Theory | Database Systems |
| Required Major Class | Introduction to Artificial Intelligence | Intermediate Comp. Prog. |
| Required Major Class | Database Systems Administration | Introduction to Artificial Intelligence |
| Required Major Class | Web Technologies | Hardware and Systems Fundamentals * |
| Required Major Class | Systems Analysis & Design | Computer Org. & Arch. |
| Required Major Class | Information & Systems Security | Algorithm Design & Analysis |
| Required Major Class | E-Commerce | Software Engineering |
| | IT Infrastructure & Systems | Web Technologies |
| | IS Project Management | Introduction to Modelling and Simulation* |
| | | Networks & Data Comm. |
| | | Operating Systems |
| ***Ashesi Units*** | ***13 Ashesi Units*** | ***13.5 Ashesi Units*** |
| Major Electives | 2 MIS Electives | 2 CS Electives |
| ***Ashesi Units*** | ***2 Ashesi Units*** | ***2 Ashesi Units*** |
| Capstone | Capstone 1 (could be electives) | Capstone 1 (could be electives) |
| Capstone | Capstone 2 | Capstone 2 |
| ***Ashesi Units*** | ***2 Ashesi Units*** | ***2 Ashesi Units*** |
| **Total Credits - Major** | **17 Ashesi Units** | **17.5 Ashesi Units** |
| **Total Credits - Overall** | **34.5 Ashesi Units (35.5 if Pre-Calc Track)** | **35 Ashesi Units (36 if Pre-Calc Track)** |

## 1.7.4 Overview of Courses Offered in the Undergraduate programs in the Department of Engineering

| | Computer Engineering | Electrical and Electronic Engineering | Mechanical Engineering | Mechatronics Engineering | Biological Engineering |
|---|---|---|---|---|---|
| **Liberal Arts & Sciences Core** | | | | | |
| Humanities & Social Sciences | Written and Oral Comm. | Written and Oral Comm. | Written and Oral Comm. | Written and Oral Comm. | Written and Oral Comm. |
| Humanities & Social Sciences | Text and Meaning | Text and Meaning | Text and Meaning | Text and Meaning | Text and Meaning |
| Humanities & Social Sciences | Ashesi Success | Ashesi Success | Ashesi Success | Ashesi Success | Ashesi Success |
| Humanities & Social Sciences | Leadership 1* | Leadership 1* | Leadership 1* | Leadership 1* | Leadership 1* |
| Humanities & Social Sciences | Leadership 2* | Leadership 2* | Leadership 2* | Leadership 2* | Leadership 2* |
| Humanities & Social Sciences | Leadership 3* | Leadership 3* | Leadership 3* | Leadership 3* | Leadership 3* |
| Humanities & Social Sciences | Leadership 4 (for Engineers) | Leadership 4 (for Engineers) | Leadership 4 (for Engineers) | Leadership 4 (for Engineers) | Leadership 4 (for Engineers) |
| Humanities & Social Sciences | Principles of Economics | Principles of Economics | Principles of Economics | Principles of Economics | Principles of Economics |
| ***Ashesi Units*** | ***6.5 Ashesi Units*** | ***6.5 Ashesi Units*** | ***6.5 Ashesi Units*** | ***6.5 Ashesi Units*** | ***6.5 Ashesi Units*** |
| Business | Found. Of Design & Entre. I | Found. Of Design & Entre. I | Found. Of Design & Entre. I | Found. Of Design & Entre. I | Found. Of Design & Entre. I |
| Business | Found. Of Design & Entre. II | Found. Of Design & Entre. II | Found. Of Design & Entre. II | Found. Of Design & Entre. II | Found. Of Design & Entre. II |
| ***Ashesi Units*** | ***2 Ashesi Units*** | ***2 Ashesi Units*** | ***2 Ashesi Units*** | ***2 Ashesi Units*** | ***2 Ashesi Units*** |
| Mathematics | Calculus for Engineering / Calculus 1 | Calculus for Engineering / Calculus 1 | Calculus for Engineering / Calculus 1 | Calculus for Engineering / Calculus 1 | Calculus for Engineering / Calculus 1 |
| Mathematics | Calculus 2 (if Calculus 1) | Calculus 2 (if Calculus 1) | Calculus 2 (if Calculus 1) | Calculus 2 (if Calculus 1) | Calculus 2 (if Calculus 1) |
| Mathematics | Multivariable Calc. & Linear Algebra | Multivariable Calc. & Linear Algebra | Multivariable Calc. & Linear Algebra | Multivariable Calc. & Linear Algebra | Multivariable Calc. & Linear Algebra |
| Mathematics | Differential Equations & Numerical Methods | Differential Equations & Numerical Methods | Differential Equations & Numerical Methods | Differential Equations & Numerical Methods | Differential Equations & Numerical Methods |
| Mathematics | Statistics for Engineering | Statistics for Engineering | Statistics for Engineering | Statistics for Engineering | Statistics for Engineering |
| ***Ashesi Units*** | ***4 Ashesi Units (5 if Calculus 1 & 2 track)*** | ***4 Ashesi Units (5 if Calculus 1 & 2 track)*** | ***4 Ashesi Units (5 if Calculus 1 & 2 track)*** | ***4 Ashesi Units (5 if Calculus 1 & 2 track)*** | ***4 Ashesi Units (5 if Calculus 1 & 2 track)*** |
| Computing | Computer Programming for Engineering | Computer Programming for Engineering | Computer Programming for Engineering | Computer Programming for Engineering | Computer Programming for Engineering |
| ***Ashesi Units*** | ***1 Ashesi Unit*** | ***1 Ashesi Unit*** | ***1 Ashesi Unit*** | ***1 Ashesi Unit*** | ***1 Ashesi Unit*** |
| Science | Engineering Mechanics | Engineering Mechanics | Engineering Mechanics | Engineering Mechanics | Engineering Mechanics |
| Science | Electromagnetism | Electromagnetism | Electromagnetism | Electromagnetism | Electromagnetism |
| Science | Material Science & Chemistry | Material Science & Chemistry | Material Science & Chemistry | Material Science & Chemistry | Material Science & Chemistry |
| ***3 Ashesi Units*** | ***3 Ashesi Units*** | ***3 Ashesi Units*** | ***3 Ashesi Units*** | ***3 Ashesi Units*** | ***3 Ashesi Units*** |
| Research / Project Prep | 3rd Yr. Grp. Project & Seminar* | 3rd Yr. Grp. Project & Seminar* | 3rd Yr. Grp. Project & Seminar* | 3rd Yr. Grp. Project & Seminar* | 3rd Yr. Grp. Project & Seminar* |
| ***Ashesi Units*** | ***0.5 Ashesi Unit*** | ***0.5 Ashesi Unit*** | ***0.5 Ashesi Unit*** | ***0.5 Ashesi Unit*** | ***0.5 Ashesi Unit*** |
| Research / Project Prep | 2 Non-Major Electives including at least 1 African studies | 2 Non-Major Electives including at least 1 African studies | 2 Non-Major Electives including at least 1 African studies | 2 Non-Major Electives including at least 1 African studies | 2 Non-Major Electives including at least 1 African studies |
| ***Ashesi Units*** | ***2 Ashesi Units*** | ***2 Ashesi Units*** | ***2 Ashesi Units*** | ***2 Ashesi Units*** | ***2 Ashesi Units*** |
| **Total Credits – Liberal Arts & Science Core** | **18 Ashesi Units (19 if Calc 1&2 Track)** | **18 Ashesi Units (19 if Calc 1&2 Track)** | **18 Ashesi Units (19 if Calc 1&2 Track)** | **18 Ashesi Units (19 if Calc 1&2 Track)** | **18 Ashesi Units (19 if Calc 1&2 Track)** |
| **MAJOR** | | | | | |
| Required Major Class | Introduction to Engineering | Introduction to Engineering | Introduction to Engineering | Introduction to Engineering | Introduction to Engineering |
| Required Major Class | Instrumentation for Engineering* | Instrumentation for Engineering* | Instrumentation for Engineering* | Instrumentation for Engineering* | Instrumentation for Engineering* |
| Required Major Class | Applied Programming for Eng.* | Applied Programming for Eng.* | Applied Programming for Eng.* | Applied Programming for Eng.* | Applied Programming for Eng.* |

| | Computer Engineering | Electrical and Electronic Engineering | Mechanical Engineering | Mechatronics Engineering | Biological Engineering |
|---|---|---|---|---|---|
| Required Major Class | System Dynamics | System Dynamics | System Dynamics | System Dynamics | System Dynamics |
| Required Major Class | Control Systems | Control Systems | Control Systems | Control Systems | Control Systems |
| Required Major Class | Digital Systems Design | Digital Systems Design | Digital Systems Design | Digital Systems Design | Digital Systems Design |
| Required Major Class | Circuits & Electronics | Circuits & Electronics | Circuits & Electronics | Circuits & Electronics | Circuits & Electronics |
| Required Major Class | Project Mgmt. & Prof. Practice | Project Mgmt. & Prof. Practice | Project Mgmt. & Prof. Practice | Project Mgmt. & Prof. Practice | Project Mgmt. & Prof. Practice |
| Required Major Class | Embedded Systems | Embedded Systems | Mechanical machine Design | Electrical Machines | Molecular and Cell Biology |
| Required Major Class | Data Structures & Algorithms | Electrical Machines | Mechanics of Machines | Signals and Systems | General Chemistry |
| Required Major Class | Operating Systems | Signals and Systems | Electrical Machines | Mechanics of Materials | Anatomy and Physiology for Engineers |
| Required Major Class | Object Oriented Programming (Java) | Electrical Machines & Power Elect II | Thermodynamics | Robotics | Modelling in Biological Engineering |
| Required Major Class | Networks & Data Communications | CAD / CAM | CAD / CAM | Mechatronics | Biochemistry |
| Required Major Class | Communication Systems | Thermodynamics | Fluid Mechanics | CAD/CAM | Transport Phenomena in Biological Systems |
| Required Major Class | Computer Org. & Arch. | Communications Systems | Heat Transfer | Embedded Systems | Synthetic Biological Engineering |
| Required Major Class | | Power Engineering | Mechanics of Material | Mechanical Machine Design | Cellular and Tissue Biomechanics |
| Required Major Class | | | | Intro to AI | Biomaterials |
| | | | | | Systems Biology |
| | | | | | Science Communication and Public Engagement |
| ***Ashesi Units*** | ***14 Ashesi Units*** | ***15 Ashesi Units*** | ***15 Ashesi Units*** | ***16 Ashesi Units*** | ***17 Ashesi Units*** |
| Major Electives | 2 CE Electives | 2 EE Electives | 2 ME Electives | 2 Electives | 3 Electives |
| ***Ashesi Units*** | ***2 Ashesi Units*** | ***2 Ashesi Units*** | ***2 Ashesi Units*** | ***2 Ashesi Units*** | |
| Capstone | Capstone | Capstone | Capstone | Capstone | Capstone |
| ***Ashesi Units*** | ***2 Ashesi Units*** | ***2 Ashesi Units*** | ***2 Ashesi Units*** | ***2 Ashesi Units*** | |
| **Total Credits - Major** | **18 Ashesi Units** | **19 Ashesi Units** | **19 Ashesi Units** | **20 Ashesi Units** | **21 Ashesi Units** |
| **Total Credits - Overall** | **36 Ashesi Units (37 if Calc 1 & Calc 2 Track)** | **37 Ashesi Units (38 if Calc 1 & Calc 2 Track)** | **37 Ashesi Units (38 if Calc 1 & Calc 2 Track)** | **38 Ashesi Units (39 if Calc 1 & Calc 2 Track)** | **39 Ashesi Units (40 if Calc 1 & Calc 2 Track)** |

# 2 4-Year Curriculum

## 2.1 Law with Public Policy Program: 4-Year Curriculum

| Semester | Law with Public Policy |
|---|---|
| **Year 1** | |
| **September Semester** | MATH 101 College Algebra or MATH 141 Calculus 1 or MATH 121 Pre-calculus |
| | ENGL 112 Written and Oral Communication |
| | BUSA 161A Foundations of Design and Entrepreneurship I |
| | CS 111 Introduction to Computing and Information Systems |
| | AS 111 Ashesi Success |
| **January Semester** | SOAN 111 Leadership Seminar 1 |
| | ENGL 113 Text and Meaning |
| | BUSA 161B Foundations of Design and Entrepreneurship II |
| | LLB112 Ghana Legal System & Methods |
| | LLB114 Legal Writing |
| | LLB150 Introduction to Public Policy |
| **Year 2** | |
| **September Semester** | SOAN211 Leadership Seminar 2 |
| | LLB217 Torts |
| | LLB213 Constitutional Law I |
| | LLB215 Contract Law I |
| | LLB255 Economic Analysis for Public Policy |
| **January Semester** | SOAN 311 Leadership Seminar 3 |
| | LLB214 Constitutional Law II |
| | LLB216 Contract Law II |
| | Africana elective |
| | LLB218 Politics of Policymaking |
| | LLB250 Philosophical Foundations of Public Policy |
| **May Semester** | Internship (Public Policy) |
| **Year 3** | |
| **September Semester** | LLB321 Criminal Law I |
| | LLB323 Immovable Property Law I |
| | LLB351 Designing Public Policy |
| | Law / Non-Major Elective |
| | MATH221 Statistics with Probability |
| | LLB325: Public International Law |
| **January Semester** | LLB322 Criminal Law II |
| | LLB324 Immovable Property II |
| | Law / Non-major Elective |
| | SOAN411 Leadership Seminar 4 |
| | LLB352 Implementing Public Policy |
| **May Semester** | Internship (Law) |
| **Year 4** | |
| **September Semester** | LLB429 Legislative drafting |
| | LLB427 Commercial Law |
| | LLB425 Equity & Trusts |
| | Africana elective |
| | LLB401 Capstone (Thesis) |
| **January Semester** | LLB430 Succession |
| | LLB428 Jurisprudence |
| | LLB426 Company Law |
| | LLB454 Evaluating Public Policy |
| | LLB402 Capstone 2 (applied project) |

| Semester | Law with Public Policy | |
|---|---|---|
| | **Electives** | |
| | LLB334 Law of Taxation | |
| | LLB332 Intellectual Property | |
| | LLB331 Gender & the law | |
| | LLB333 International Trade Law | |
| | LLB335 Alternative Dispute Resolution | |

## 2.2 Business Administration, Economics, Management Information Systems, Computer Science Programs: 4-Year Curriculum

| Semester | Business Administration | Economics | Management Information Systems | Computer Science |
|---|---|---|---|---|
| **Year 1** | | | | |
| **September Semester** | Ashesi Success | | | |
| | Pre-Calculus I or Calculus I | | | |
| | Written and Oral Communication | | | |
| | Foundations of Design & Entrepreneurship 1 | | | |
| | Introduction to Computing and Information Systems | | | |
| | Leadership Seminar 1 (Class of 2024) | | | |
| **January Semester** | Text and Meaning | | | |
| | Precalculus II or Calculus II | | | |
| | Leadership Seminar 1* (Class of 2025) | | | |
| | Foundations of Design and Entrepreneurship II | | | |
| | Organizational Behaviour | Organizational Behaviour | Computer Programming for CS | Computer Programming for CS |
| **Year 2** | | | | |
| **September Semester** | Leadership Seminar 2* | Leadership Seminar 2* | Leadership Seminar 2* | Leadership Seminar 2* |
| | Statistics | Statistics | Statistics | Statistics |
| | Microeconomics | Microeconomics | Object-Oriented Programming | Object-Oriented Programming |
| | Financial Accounting | Financial Accounting | Discrete Structures & Theory | Discrete Structures & Theory |
| | Non-Major Elective[1] | Non-Major Elective[1] | Principles of Economics | Principles of Economics |
| **January Semester** | Leadership Seminar 3* | Leadership Seminar 3* | Leadership Seminar 3* | Leadership Seminar 3* |
| | Quantitative Methods | Quantitative Methods | Quantitative Methods | Linear Algebra |
| | Macroeconomics | Macroeconomics | Non-major Elective[1] or Data Structures[1] | Data Structures and Algorithm (Java) |
| | Marketing[1] | Multivariable Calculus & Linear Algebra | Introduction to Artificial Intelligence | Introduction to Artificial Intelligence |
| | Introduction to Finance | Introduction to Finance | | |
| **May Semester** | Applied Calculus (Pre-Calculus Students only) | | | |
| **Year 3** | | | | |
| **September Semester** | International Trade & Policy | International Trade & Policy | Web Technologies | Web Technologies |
| | Operations Management | The Economy of Ghana | Systems Analysis & Design | Algorithm Design and Analysis |
| | Investments | Intermediate Microeconomic Theory | Finance for non-Finance Managers | Intermediate Computer Programming (C++) |
| | | Intermediate Macroeconomic Theory | | Hardware and Systems Fundamentals* |
| | Leadership Seminar 4 or Elective† | Leadership Seminar 4 or Elective† | Leadership Seminar 4 or Elective† | Leadership Seminar 4 or Elective† |
| **January Semester** | Managerial Accounting | Mathematics for Economists | IS Project Management | Software Engineering |
| | Research Methods | Research Methods | IT Infrastructure | Computer Org & Architecture |
| | Elective† | Managerial Economics | Research Methods | Research Methods |

| Semester | Business Administration | Economics | Management Information Systems | Computer Science |
|---|---|---|---|---|
| | Business Law | Business Law | | Introduction to Modelling and Simulation* |
| | Leadership Seminar 4 or Elective† | Leadership Seminar 4 or Elective† | Leadership Seminar 4 or Elective† | Leadership Seminar 4 or Elective† |
| **Year 4** | | | | |
| **September Semester** | Corporate Finance | Development Economics | E-Commerce | Operating Systems |
| | Competitive Strategy | Econometrics | Information and Systems Security | Finance for non-Finance Managers |
| | Elective† | Elective† | Elective† | Elective† |
| | Capstone 1 (Entrepreneurship 1 / Thesis 1/ Extra major elective) | Capstone 1 (Entrepreneurship 1 / Thesis 1/ Extra major elective) | Capstone 1 (Undergraduate Thesis 1/ Entrepreneurship 1 / Extra major elective) | Capstone 1 (Undergraduate Thesis 1/ Entrepreneurship 1 / Extra major elective) |
| **January Semester** | Business Communications & Negotiations | Environmental Economics | Competitive Strategy | Networks & Data Communications |
| | Elective† | Elective† | Elective† | Elective† |
| | Elective† | Elective† | Elective† | Elective† |
| | Capstone 2 ((Entrepreneurship 2 / Thesis 2/ Extra major elective) | Capstone 2 ((Entrepreneurship 2 / Thesis 2/ Extra major elective) | Capstone 2 ((Entrepreneurship 2 / Thesis 2/ Extra major elective) | Capstone 2 ((Entrepreneurship 2 / Thesis 2/ Extra major elective) |

* Half-credit course

[1] Students who have started studying French and wish to continue will take *Beginning French 2* in Year 2 Sem 2 as a non-major elective (BA majors would need to postpone *Marketing* to the May Semester (Semester 3) or to the elective slot in Year 3 Sem 2). The study of French can continue in Year 3 by taking *Professional French 1* and *Professional French 2* as course overloads. Alternatively, students can free up space for French in Year 3 by taking May Semester (Semester 3) courses after Year 2.

† Students have flexibility in scheduling electives (major and non-major) in Years 3 and 4 but must ensure that they ultimately have the needed number of major electives (3 for BA, 2 for MIS & CS) and non-major electives (3, including at least 1 Africana).

[3] Law with Public Policy students must take 3 elective courses. 2 of those courses must be an Africana, and 1 of the remaining electives may be a major or non-major elective.

## 2.3 Computer Engineering, Electrical and Electronic Engineering, Mechanical Engineering, Mechatronics, and Biological Engineering Programs: 4-Year Curriculum

| Semester | Computer Engineering | Electrical and Electronic Engineering | Mechanical Engineering | Mechatronics | Biological Engineering |
|---|---|---|---|---|---|
| **Year 1** | | | | | |
| **September Semester** | Written and Oral Communication | | | | |
| | Calculus for Engineers | | | | |
| | Introduction to Engineering | | | | |
| | Ashesi Success + Leadership Seminar 1* | | | | |
| | Foundations Design & Entrepreneurship 1 | | | | |
| **January Semester** | Computer Programming for Engineering | | | | |
| | Multivariable Calculus & Linear Algebra | | | | |
| | Engineering Mechanics | | | | |
| | Foundations Design & Entrepreneurship 2 | | | | |
| | Leadership Seminar 2* | | | | |
| **Year 2** | | | | | |
| **September Semester** | Physics: Electromagnetism | Physics: Electromagnetism | Physics: Electromagnetism | Physics: Electromagnetism | Physics: Electromagnetism |
| | Discrete Mathematics | CAD/CAM | CAD/CAM | CAD/CAM | Molecular and Cell Biology |
| | Statistics for Engineering | Statistics for Engineering | Statistics for Engineering | Statistics for Engineering | Statistics for Engineering |
| | Data Structures and Algorithms (Java) | Thermodynamics | Thermodynamics | Mechanics of Materials | General Chemistry |
| | Leadership Seminar 3* | Leadership Seminar 3* | Leadership Seminar 3* | Leadership Seminar 3* | Leadership Seminar 3* |
| **January Semester** | Circuits and Electronics | Circuits and Electronics | Circuits and Electronics | Circuits and Electronics | Circuits and Electronics |
| | Materials Science & Chemistry | Materials Science & Chemistry | Materials Science & Chemistry | | Anatomy and Physiology for Engineers |
| | Differential Equations & Numerical Methods | Differential Equations & Numerical Methods | Differential Equations & Numerical Methods | Applied Programming for Engineers | Applied Programming for Engineers |
| | Applied Programming for Engineers | Applied Programming for Engineers | Applied Programming for Engineers | Differential Equations & Numerical Methods | Differential Equations & Numerical Methods |
| | Text and Meaning | Text and Meaning | Text and Meaning | Text and Meaning | Text and Meaning |
| **Year 3** | | | | | |
| **September Semester** | Computer Organization & Architecture | Electrical Machines | Electrical Machines | Electrical Machines | Modelling in Biological Engineering |
| | System Dynamics | System Dynamics | System Dynamics | System Dynamics | System Dynamics |
| | Signals & Systems | Signals & Systems | Mechanics of Materials | Signals and Systems | Biochemistry |
| | Leadership Seminar 4 for Engineers (Includes Year 3 Group Project) | Leadership Seminar 4 for Engineers (Includes Year 3 Group Project) | Leadership Seminar 4 for Engineers (Includes Year 3 Group Project) | Leadership Seminar 4 for Engineers (Includes Year 3 Group Project) | Leadership Seminar 4 for Eng. +Y3GP |
| | Instrumentation for Engineering* | Instrumentation for Engineering* | Instrumentation for Engineering* | Instrumentation for Engineering* | Instrumentation for Engineering* |
| **January Semester** | Control Systems | Control Systems | Control Systems | Control Systems | Transport Phenomena in Biological Systems |
| | Data Structures & Algorithms | Communication Systems | Manufacturing Processes | Robotics | Synthetic Biological Engineering |
| | Networks & Data Communications | Electrical Machines & Power Elect II | Mechanical Machine Design | Mechanical Machine Design | Cellular and Tissue Biomechanics |
| | Digital Systems Design | Digital Systems Design | Fluid Mechanics | Digital Systems Design | Biomaterials |
| | CE Elective | EE Elective | ME Elective | Intro to AI | BioE Electives |
| **Year 4** | | | | | |
| **September Semester** | Operating Systems | Power Engineering | Mechanics of Machines | Mechatronics | Systems Biology |
| | CE Elective | EE Elective | ME Elective | MT Elective (Machine learning) now elect | BioE Elective |
| | Principles of Economics | Principles of Economics | Principles of Economics | Principles of Economics | Principles of Economics |
| | Embedded Systems | Embedded Systems | Heat Transfer | Embedded Systems | Science communication and Public Engagement |
| | Elective | Elective | Elective | Mechanic of Machines / Elective | Non-Major Elective |
| **January Semester** | Project Management and Professional Practice | Project Management and Professional Practice | Project Management and Professional Practice | Project Management and Professional Practice | Project Mgmt and Professional Practice |
| | CE Elective | EE Elective | ME Elective | MT Elective | BioE Elective |
| | African Studies Elective | African Studies Elective | African Studies Elective | African Studies Elective | African Studies Elective |
| | Senior Project & Seminar | Senior Project & Seminar | Senior Project & Seminar | Senior Project & Seminar | Senior Project & Seminar |

EE Year 4: students wishing to do Networks should do Africana in Sem 1 and Networks in Sem II

CE: Year 4: if desiring to do a Sem II elective, consider doing Africana in Sem 1

## 2.4 Humanities and Social Sciences: 4-Year Curriculum

| Semester | |
|---|---|
| **Year 1** | |
| **September Semester** | ENGL 112 Written and Oral Communication |
| | SOAN 111 Leadership Seminar 1 |
| **January Semester** | SOAN 111 Leadership Seminar 1 |
| | ENGL 113 Text and Meaning |
| | AS 111 Ashesi Success |
| | SOAN 211 Leadership Seminar 2 |
| **May Semester** | ENGL 113 Text and Meaning |
| | SOAN 211 Leadership Seminar 2 |
| **Year 2** | |
| **September Semester** | SOAN211 Leadership Seminar 2 |
| | SOAN 311 Leadership Seminar 3 |
| | POLS 234 Comparative Politics: Politics in Africa |
| | POLS 332 Governance in Africa |
| | SOAN 225 Ghanaian Popular Culture |
| | SOAN240 Neo-Traditional African Dance Forms |
| | SOAN 301 Introduction to Africana Studies: The Global Black Experience |
| | FRENC 111 Conversational French I |
| | FRENC 213 Professional French (Global communication in French) |
| | ENGL 113 Text and Meaning |
| | SOAN 236 ESG: Corporate Ethics in Africa |
| **January Semester** | SOAN 311 Leadership Seminar 3 |
| | SOAN 227 Religion in Africa |
| | POLS 222 Political Economy of Healthcare in Ghana |
| | POLS 231 Africa in International Settings: Africa Beyond Aid |
| | POLS 221 African Philosophical Thought |
| | SOAN 233 African Music and the Contemporary Art Music Scene |
| | ENGL 113 Text and Meaning |
| **Year 3** | |
| **September Semester** | SOAN 411 Leadership Seminar IV for Engineers |
| | SOAN411 Leadership Seminar IV |
| | ENGL 231 African Literature & Film |
| | POLS 322 China-Africa Relations |
| | SOAN 322 African Cultural Institutions |
| | FRENC 111 Conversational French I |
| | FRENC 213 Professional French (Global communication in French) |
| **January Semester** | SOAN411 Leadership Seminar 4 |
| | CARINE |
| | SOAN 325 Research Methods |
| **Year 4** | |
| **September Semester** | FRENC 318 Langue Francaise: La Culture En Plus |
| | FRENC 213 Professional French (Global communication in French) |
| | SOAN 225 Ghanaian Popular Culture |
| | POLS 322 China-Africa Relations |
| | SOAN 322 African Cultural Institutions |
| **January Semester** | POLS 231 Africa in International Settings: Africa Beyond Aid |
| | POLS 222 Political Economy of Healthcare in Ghana |
| | SOAN 301 Introduction to Africana Studies: The Global Black Experience |

# 3 Progression Plans

COVID – 19 caused disruptions to the academic progression plan of the class of 2024, 2025 and 2026. The accreditation cycle of approval also resulted in some modifications to the academic progression of some programs. Appendix A reflects the slight modifications for the class of 2024, 2025, 2026, and 2027.

Refer to Appendix A for the Progression Plans.

# 4 PLANS OF STUDY PER YEAR, SEMESTER, AND PROGRAM

## 4.1 Plan of Study: Law with Public Policy

**ASHESI UNIVERSITY**
Department of Law and Public Policy

**LLB Law with Public Policy**

**Ashesi Courses**

| Freshman Undergraduate | Sophomore Undergraduate | Junior Undergraduate | Senior Undergraduate |
|---|---|---|---|
| **YEAR 1**<br>**SEMESTER 1 & 2** | **YEAR 2**<br>**SEMESTER 3 & 4** | **YEAR 3**<br>**SEMESTER 5 & 6** | **YEAR 4**<br>**SEMESTER 7 & 8** |
| **SEMESTER 1**<br>• College Algebra or Calculus 1 or MATH Pre-calculus (4 credits)<br>• Written and Oral Communication (4 credits)<br>• Foundations of Design and Entrepreneurship I (4 credits)<br>• Introduction to Computing and Information Systems (4 credits)<br>• Ashesi Success | **SEMESTER 3**<br>• Leadership Seminar 2 (2 credits)<br>• Torts (4 credits)<br>• Constitutional Law I (4 credits)<br>• Contract Law I (3 credits)<br>• Economic Analysis for Public Policy (4 credits) | **SEMESTER 5**<br>• Criminal Law I (4 credits)<br>• Immovable Property Law I (3 credits)<br>• Designing Public Policy (3 credits)<br>• Law / Non-Major Elective (3 credits)<br>• Statistics with Probability (4 credits)<br>• Public International Law (2 credits) | **SEMESTER 7**<br>• Legislative drafting (3 credits)<br>• Commercial Law (3 credits)<br>• Equity & Trusts (4 credits)<br>• Africana elective (4 credits)<br>• Capstone 1 (thesis) (4 credits) |
| **SEMESTER 2**<br>• Leadership Seminar 1 (2 credits)<br>• Text and Meaning (4 credits)<br>• Foundations of Design and Entrepreneurship II (4 credits)<br>• Ghana Legal System & Methods (4 credits)<br>• Legal Writing (2 credits)<br>• Introduction to Public Policy (3 credits) | **SEMESTER 4**<br>• Leadership Seminar 3 (2 credits)<br>• Constitutional Law II (4 credits)<br>• Contract Law II (3 credits)<br>• Africana elective (4 credits)<br>• Politics of Policymaking (3 credits)<br>• Philosophical Foundations of Public Policy (3 credits)<br>**MAY SEMESTER (SEMESTER 3)**<br>• Internship (Public Policy) | **SEMESTER 6**<br>• Criminal Law II (4 credits)<br>• Immovable Property II (3 credits)<br>• Law / non-major elective (3 credits)<br>• Leadership Seminar 4 (4 credits)<br>• Implementing Public Policy (3 credits)<br>**MAY SEMESTER (SEMESTER 3)**<br>Internship (Law) | **SEMESTER 8**<br>• Succession (4 credits)<br>• Jurisprudence (4 credits)<br>• Company Law (3 credits)<br>• Evaluating Public Policy (3 credits)<br>1. Capstone 2 (applied project) (4 credits) |
| **Total Credits: 35** | **Total Credits: 36** | **Total Credits: 36** | **Total Credits: 36** |

Total Credits for Law with Public Policy = 143

## 4.2 Plan of Study: Business Administration

**ASHESI UNIVERSITY**
Department of Business Administration

**BSc. Business Administration**

**Ashesi Courses**

| Freshman Undergraduate | Sophomore Undergraduate | Junior Undergraduate | Senior Undergraduate |
|---|---|---|---|
| **YEAR 1**<br>**SEMESTER 1 & 2** | **YEAR 2**<br>**SEMESTER 3 & 4** | **YEAR 3**<br>**SEMESTER 5 & 6** | **YEAR 4**<br>**SEMESTER 7 & 8** |
| **SEMESTER 1**<br>• Ashesi Success<br>• Pre-calculus 1 or Calculus 1 (4 credits)<br>• Written & Oral Communication (4 credits)<br>• Foundations of Design & Entrepreneurship 1 (4 credits)<br>• Introduction to Computing and Information Systems (4 credits) | **SEMESTER 3**<br>• Leadership Seminar 2 (2 credits)<br>• Statistics (4 credits)<br>• Microeconomics (4 credits)<br>• Financial Accounting (4 credits)<br>• Non- Major Elective (4 credits) | **SEMESTER 5**<br>• Operations Management (4 credits)<br>• Investments (4 credits)<br>• International Trade & Policy (4 credits)<br>• Leadership Seminar IV or Elective (4 credits) | **SEMESTER 7**<br>• Corporate Finance (4 credits)<br>• Business Law (4 credits)<br>• Elective (4 credits)<br>• Capstone 1 (4 or 4.5 credits) |
| **SEMESTER 2**<br>• Leadership Seminar 1 (2 credits)<br>• Pre-calculus 2 or Calculus 2 (4 credits)<br>• Text and Meaning (4 credits)<br>• Foundations of Design and Entrepreneurship II (4 credits)<br>• Organizational Behaviour (4 credits) | **SEMESTER 4**<br>• Leadership Seminar 3 (2 credits)<br>• Quantitative Methods (4 credits)<br>• Macroeconomics (4 credits)<br>• Marketing (4 credits)<br>• Introduction to Finance (4 credits)<br>**MAY SEMESTER (SEMESTER 3)**<br>Applied Calculus (Pre-Calculus Students only) (4 credits) | **SEMESTER 6**<br>• Research Methods (4 credits)<br>• Managerial Accounting (4 credits)<br>• Business Elective (4 credits)<br>• Leadership Seminar IV or Elective (4 credits) | **SEMESTER 8**<br>• Competitive Strategy (4 credits)<br>• Elective (4 credits)<br>• Elective (4 credits)<br>• Capstone 2 (4 or 4.5 credits) |
| **Total Credits: 34** | **Total Credits: 36-40** | **Total Credits: 32** | **Total Credits: 32** |

Total Credits for Business Administration Program = 134-138

## 4.3 Plan of Study: Economics

**ASHESI UNIVERSITY**
Department of Economics

**BSc. Economics**

**Ashesi Courses**

| Freshman Undergraduate | Sophomore Undergraduate | Junior Undergraduate | Senior Undergraduate |
|---|---|---|---|
| **YEAR 1**<br>**SEMESTER 1 & 2** | **YEAR 2**<br>**SEMESTER 3 & 4** | **YEAR 3**<br>**SEMESTER 5 & 6** | **YEAR 4**<br>**SEMESTER 7 & 8** |
| **SEMESTER 1** | **SEMESTER 3** | **SEMESTER 5** | **SEMESTER 7** |
| • Ashesi Success<br>• Pre-calculus 1 or Calculus 1 (4 credits)<br>• Written & Oral Communication (4 credits)<br>• Foundations of Design & Entrepreneurship 1 (4 credits)<br>• Introduction to Computing and Information Systems (4 credits) | • Leadership Seminar 2 (2 credits)<br>• Statistics with Probability (4 credits)<br>• Principles of Microeconomics (4 credits)<br>• Mathematics for Economists (4 credits)<br>• Non- Major Elective (4 credits) | • Intermediate Microeconomic Theory I (4 credits)<br>• Intermediate Macroeconomic Theory I (4 credits)<br>• Development Economics (4 credits)<br>• Leadership Seminar IV (4 credits)<br>• Non-Major Elective (4 credits) | • Advanced Microeconomic Theory (4 credits)<br>• Econometrics II (4 credits)<br>• Economics Major Elective (4 credits)<br>• Capstone 1 (4 or 4.5 credits) |
| **SEMESTER 2** | **SEMESTER 4** | **SEMESTER 6** | **SEMESTER 8** |
| • Leadership Seminar 1 (2 credits)<br>• Pre-calculus 2 or Calculus 2 (4 credits)<br>• Text and Meaning (4 credits)<br>• Foundations of Design and Entrepreneurship II (4 credits) | • Leadership Seminar 3 (2 credits)<br>• Introduction to Environmental Economics (4 credits)<br>• Principles of Macroeconomics (4 credits)<br>• The Economy of Ghana (4 credits)<br>• Non-Major Elective (4 credits)<br><br>**MAY SEMESTER (SEMESTER 3)**<br>Applied Calculus (Pre-Calculus Students only) (4 credits) | • Intermediate Microeconomic Theory II (4 credits)<br>• Intermediate Macroeconomic Theory II (4 credits)<br>• Econometrics I (4 credits)<br>• Research Methods (4 credits)<br>• Business Law (4 credits) | • Advanced Macroeconomic Theory (4 credits)<br>• Economics Major Elective (4 credits)<br>• Economics Major Elective (4 credits)<br>• Capstone 2 (4 or 4.5 credits) |
| **Total Credits: 30** | **Total Credits: 36-40** | **Total Credits: 40** | **Total Credits: 32** |

Total Credits for Economics Program = 138-142

## 4.4 Plan of Study: Computer Science

**ASHESI UNIVERSITY**
Department of Computer Science and Information Systems

**BSc. Computer Science**

| Freshman Undergraduate | Sophomore Undergraduate | Junior Undergraduate | Senior Undergraduate |
|---|---|---|---|
| **YEAR 1** | **YEAR 2** | **YEAR 3** | **YEAR 4** |
| **SEMESTER 1 & 2** | **SEMESTER 3 & 4** | **SEMESTER 5 & 6** | **SEMESTER 7 & 8** |
| **SEMESTER 1** | **SEMESTER 3** | **SEMESTER 5** | **SEMESTER 7** |
| • Ashesi Success (0 credits)<br>• Pre-calculus 1 or Calculus 1 (4 credits)<br>• Written & Oral Communication (4 credits)<br>• Foundations of Design & Entrepreneurship 1 (4 credits)<br>• Intro. To Computing & Information Systems (4 credits) | • Leadership Seminar 2 (2 credits)<br>• Statistics (4 credits)<br>• Principles of Economics (4 credits)<br>• Discrete Structures & Theory (4 credits)<br>• Object Oriented Programming (4 credits) | • Leadership Seminar 4 or Major Elective (4 credits)<br>• Web Technologies (4 credits)<br>• Algorithm Design & Analysis (4 credits)<br>• Intermediate Computer Programming (4 credits)<br>• Hardware and Systems Fundamentals (2 credits) | • Operating Systems (4 credits)<br>• Finance for non-Finance Managers (4 credits)<br>• Elective (4 credits)<br>• Capstone 1 (Undergraduate Thesis 1/ Entrepreneurship 1/ Extra major elective) (4 credits)<br>• CSIS Capstone Seminar (0 credits) |
| **SEMESTER 2** | **SEMESTER 4** | **SEMESTER 6** | **SEMESTER 8** |
| • Leadership 1 (2 credits)<br>• Pre-calculus 2 or Calculus 2 (4 credits)<br>• Text & Meaning (4 credits)<br>• Foundations of Design & Entrepreneurship 2 (4 credits)<br>• Computer Programming for CS (4 credits)<br><br>**MAY SEMESTER (SEMESTER 3)**<br>Applied Calculus (Pre-Calculus Students only) (4 credits) | • Leadership Seminar 3 (2 credits)<br>• Linear Algebra (4 credits)<br>• Data Structures & Algorithms (4 credits)<br>• Database Systems (4 credits)<br>• Introduction to Artificial Intelligence (4 credits) | • Leadership Seminar 4 or Elective (4 credits)<br>• Software Engineering (4 credits)<br>• Computer Organization & Architecture (4 credits)<br>• Research Methods (4 credits)<br>• Introduction to Modelling and Simulation (2 credits) | • Networks & Data Communications (4 credits)<br>• Elective (4 credits)<br>• Elective (4 credits)<br>• Capstone 2 (Undergraduate Thesis 2/ Entrepreneurship 2/ Applied Project) (4 credits) |
| **Total Credits: 34-38** | **Total Credits: 36** | **Total Credits: 36** | **Total Credits: 32** |

Total Credits for Computer Science Program = 138-142

## 4.5 Plan of Study: Management Information Systems

**ASHESI UNIVERSITY**
Department of Computer Science and Information Systems

**BSc. Management Information Systems**

| Freshman Undergraduate | Sophomore Undergraduate | Junior Undergraduate | Senior Undergraduate |
|---|---|---|---|
| **YEAR 1**<br>**SEMESTER 1 & 2** | **YEAR 2**<br>**SEMESTER 3 & 4** | **YEAR 3**<br>**SEMESTER 5 & 6** | **YEAR 4**<br>**SEMESTER 7 & 8** |
| **SEMESTER 1** | **SEMESTER 3** | **SEMESTER 5** | **SEMESTER 7** |
| • Ashesi Success (0 credit)<br>• Pre-calculus 1 or Calculus 1 (4 credits)<br>• Written & Oral Communication (4 credits)<br>• Foundations of Design & Entrepreneurship 1 (4 credits)<br>• Intro. To Computing & Information Systems (4 credits) | • Leadership Seminar 2 (2 credits)<br>• Statistics (4 credits)<br>• Principles of Economics (4 credits)<br>• Discrete Structures & Theory (4 credits)<br>• Object Oriented Programming (4 credits) | • Leadership Seminar 4 or Major Elective (4 credits)<br>• Web Technologies (4 credits)<br>• Systems Analysis & Design (4 credits)<br>• Finance for non-finance managers (4 credits) | • E-Commerce (4 credits)<br>• Information and Systems Security (4 credits)<br>• Elective (4 credits)<br>• Capstone 1 (Entrepreneurship 1/Thesis 1/ Extra major elective) (4 credits) |
| **SEMESTER 2** | **SEMESTER 4** | **SEMESTER 6** | **SEMESTER 8** |
| • Leadership Seminar 1 (2 credits)<br>• Pre-calculus 2 or Calculus 2 (4 credits)<br>• Text & Meaning (4 credits)<br>• Foundations of Design & Entrepreneurship 2 (4 credits)<br>• Computer Programming for CS (4 credits) | • Leadership Seminar 3 (2 credits)<br>• Quantitative Methods (4 credits)<br>• Database Systems (4 credits)<br>• Introduction to Artificial Intelligence (4 credits)<br>• Non-Major Elective or Data Structures (4 credits)<br><br>**MAY SEMESTER (SEMESTER 3)**<br>Applied Calculus (Pre-Calculus Students only) (4 credits) | • Leadership Seminar 4 or Major Elective (4 credits)<br>• Research Methods (4 credits)<br>• IT Infrastructure and Systems Administration (4 credits)<br>• IS Project Management (4 credits) | • Competitive Strategy (4 credits)<br>• Elective (4 credits)<br>• Elective (4 credits)<br>• Capstone 2 (Entrepreneurship 2/ Thesis 2/ Applied Project) (4 credits) |
| **Total Credits: 34** | **Total Credits: 36-40** | **Total Credits: 32** | **Total Credits: 32** |

Total Credits for Management Information Systems Program = 134-138

## 4.6 Plan of Study: Computer Engineering

**ASHESI UNIVERSITY**
Department of Engineering

**BSc. Computer Engineering**

**Ashesi Courses**

| Freshman Undergraduate | Sophomore Undergraduate | Junior Undergraduate | Senior Undergraduate |
|---|---|---|---|
| **YEAR 1**<br>**SEMESTER 1 & 2** | **YEAR 2**<br>**SEMESTER 3 & 4** | **YEAR 3**<br>**SEMESTER 5 & 6** | **YEAR 4**<br>**SEMESTER 7 & 8** |
| **SEMESTER 1** | **SEMESTER 3** | **SEMESTER 5** | **SEMESTER 7** |
| • Ashesi Success +Leadership 1* (0 credit)<br>• Calculus for Engineering (4 credits)<br>• Written & Oral Communication (4 credits)<br>• Foundations Design & Entrepreneurship 1 (4 credits)<br>• Introduction to Engineering (4 credits) | • Physics: Electromagnetism (4 credits)<br>• Statistics for Engineering (4 credits)<br>• Discrete Math (4 credits)<br>• Object Oriented Programming (Java) (4 credits)<br>• Leadership Seminar 3 (2 credits) | • Computer Organization & Architecture (4 credits)<br>• System Dynamics (4 credits)<br>• Signals & Systems (4 credits)<br>• Leadership Seminar 4 for Engineers +Y3GP (4 credits)<br>• Instrumentation for Engineering (2 credits) | • Operating Systems (4 credits)<br>• CE Elective (4 credits)<br>• Principles of Economics (4 credits<br>• Embedded Systems (4 credits)<br>• Elective (4 credits) |
| **SEMESTER 2** | **SEMESTER 4** | **SEMESTER 6** | **SEMESTER 8** |
| • Computer Programming for Engineering (4 credits)<br>• Multivariable Calculus & Linear Algebra (4 credits)<br>• Engineering Mechanics (4 credits)<br>• Foundations Design & Entrepreneurship 2 (4 credits)<br>• Leadership Seminar 2 (2 credits) | • Circuits and Electronics (4 credits)<br>• Materials Science & Chemistry (4 credits)<br>• Differential Equations & Numerical Methods (4 credits)<br>• Text and Meaning (4 credits)<br>• Applied Programming for Engineers (2 credits) | • Control Systems (4 credits)<br>• Networks & Data Communications (4 credits)<br>• Data Structures & Algorithms (4 credits)<br>• Digital Systems Design (4 credits)<br>• CE Elective (4 credits) | • Project Management and Professional Practice (4 credits)<br>• CE Elective (4 credits)<br>• African Studies Elective (4 credits)<br>• Senior Project & Seminar (4 credits) |
| **Total Credits: 34** | **Total Credits: 36** | **Total Credits: 38** | **Total Credits: 36** |

Total Credits for Computer Engineering Program=144

## 4.7 Plan of Study: Electrical & Electronic Engineering

**ASHESI UNIVERSITY**
Department of Engineering

**BSc. Electrical Engineering**

**Ashesi Courses**

| Freshman Undergraduate | Sophomore Undergraduate | Junior Undergraduate | Senior Undergraduate |
|---|---|---|---|
| **YEAR 1**<br>**SEMESTER 1 & 2** | **YEAR 2**<br>**SEMESTER 3 & 4** | **YEAR 3**<br>**SEMESTER 5 & 6** | **YEAR 4**<br>**SEMESTER 7 & 8** |
| **SEMESTER 1** | **SEMESTER 3** | **SEMESTER 5** | **SEMESTER 7** |
| • Calculus for Engineering (4 credits)<br>• Written & Oral Communication (4 credits)<br>• Foundations Design & Entrepreneurship 1 (4 credits)<br>• Introduction to Engineering (4 credits)<br>• Ashesi Success +Leadership 1* (0 credit) | • Physics Electromagnetism (4 credits)<br>• CAD/CAM (4 credits)<br>• Thermodynamics (4 credits)<br>• Leadership Seminar 3 (2 credits)<br>• Statistics for Engineers (4 credits) | • Electrical Machines (4 credits)<br>• System Dynamics (4 credits)<br>• Signals & Systems (4 credits)<br>• Leadership 4 for Engineers + Y3GP (4 credits)<br>• Instrumentation for Engineers (2 credits | • Power Engineering (4 credits)<br>• EE Elective (4 credits)<br>• Principles of Economics (4 credits)<br>• Embedded Systems (4 credits)<br>• Elective (4 credits) |
| **SEMESTER 2** | **SEMESTER 4** | **SEMESTER 6** | **SEMESTER 8** |
| • Computer Programming for Engineering (4 credits)<br>• Multivariable Calculus & Linear Algebra (4 credits)<br>• Engineering Mechanics (4 credits)<br>• Foundations Design & Entrepreneurship 2 (4 credits)<br>• Leadership Seminar 2 (2 credits) | • Circuits & Electronics (4 credits)<br>• Text and Meaning (4 credits)<br>• Material Science & Chemistry (4 credits)<br>• Applied Programming for Engineers (2 credits)<br>• Differential Equations & Numerical Methods (4 credits) | • Control Systems (4 credits)<br>• Electrical Machines & Power Elect II (4 credits)<br>• Digital Systems Design (4 credits)<br>• Communication Systems (4 credits)<br>• EE Elective (4 credits) | • Project Management and Professional Practice (4 credits)<br>• EE Elective (4 credits)<br>• African Studies Elective (4 credits)<br>• Senior Project & Seminar (4 credits) |
| **Total Credits: 34** | **Total Credits: 36** | **Total Credits: 38** | **Total Credits: 36** |

Total Credits for Electrical Engineering Program=144

## 4.8 Plan of Study: Mechanical Engineering

**ASHESI UNIVERSITY**
Department of Engineering

**BSc. Mechanical Engineering**

**Ashesi Courses**

| Freshman Undergraduate | Sophomore Undergraduate | Junior Undergraduate | Senior Undergraduate |
|---|---|---|---|
| **YEAR 1**<br>**SEMESTER 1 & 2** | **YEAR 2**<br>**SEMESTER 3 & 4** | **YEAR 3**<br>**SEMESTER 5 & 6** | **YEAR 4**<br>**SEMESTER 7 & 8** |
| **SEMESTER 1** | **SEMESTER 3** | **SEMESTER 5** | **SEMESTER 7** |
| • Calculus for Engineering 1 (4 credits)<br>• Written & Oral Communication (4 credits)<br>• Foundations Design & Entrepreneurship (4 credits)<br>• Introduction to Engineering (4 credits)<br>• Ashesi Success +Leadership 1* (0 credit) | • Physics Electromagnetism (4 credits)<br>• CAD/CAM (4 credits)<br>• Thermodynamics (4 credits)<br>• Leadership Seminar 3 (2 credits)<br>• Statistics for Engineers (4 credits) | • Electrical Machines (4 credits)<br>• System Dynamics (4 credits)<br>• Mechanics of Materials (4 credits)<br>• Leadership 4 for Engineers + Y3GP (4 credits)<br>• Instrumentation for Engineering (2 credits) | • Mechanics of Machines (4 credits)<br>• ME Elective (4 credits)<br>• Principles of Economics (4 credits)<br>• Heat Transfer (4 credits)<br>• Elective (4 units) |
| **SEMESTER 2** | **SEMESTER 4** | **SEMESTER 6** | **SEMESTER 8** |
| • Computer Programming for Engineering (4 credits)<br>• Multivariable Calculus & Linear Algebra (4 credits)<br>• Engineering Mechanics (4 Credits)<br>• Foundations Design & Entrepreneurship 2 (4 credits)<br>• Leadership Seminar 2 (2 credits) | • Circuits & Electronics (4 credits)<br>• Text and Meaning (4 credits)<br>• Material Science & Chemistry (4 credits)<br>• Applied Programming for Engineers (2 credits)<br>• Differential Equations & Numerical Methods (4 credits) | • Control Systems (4 credits)<br>• Mechanical Machine Design (4 credits)<br>• Fluid Mechanics (4 credits)<br>• Manufacturing Processes (4 credits)<br>• ME Elective (4 credits) | • Project Management & Professional Practice (4 credits)<br>• ME Elective (4 credits)<br>• African Studies Elective (4 credits)<br>• Senior Project & Seminar (4 credits) |
| **Total Credits: 34** | **Total Credits: 36** | **Total Credits: 38** | **Total Credits: 36** |

Total Credits for Mechanical Engineering Program = 144

## 4.9 Plan of Study: Mechatronic Engineering

**ASHESI UNIVERSITY**
Department of Engineering

**BSc. Mechatronic Engineering**

**Ashesi Courses**

| Freshman Undergraduate | Sophomore Undergraduate | Junior Undergraduate | Senior Undergraduate |
|---|---|---|---|
| **YEAR 1**<br>**SEMESTER 1 & 2** | **YEAR 2**<br>**SEMESTER 3 & 4** | **YEAR 3**<br>**SEMESTER 5 & 6** | **YEAR 4**<br>**SEMESTER 7 & 8** |
| **SEMESTER 1** | **SEMESTER 3** | **SEMESTER 5** | **SEMESTER 7** |
| • Calculus for Engineering 1 (4 credits)<br>• Written & Oral Communication (4 credits)<br>• Foundations Design & Entrepreneurship (4 credits)<br>• Introduction to Engineering (4 credits)<br>• Ashesi Success +Leadership 1* (0 credit) | • Physics Electromagnetism (4 credits)<br>• CAD/CAM (4 credits)<br>• Mechanics of Materials (4 credits)<br>• Leadership Seminar 3(2 credits)<br>• Statistics for Engineers (4 credits) | • Electrical Machines (4 credits)<br>• System Dynamics (4 credits)<br>• Signals and Systems (4 credits)<br>• Leadership 4 for Engineers + Y3GP (4 credits)<br>• Instrumentation for Engineering (2 credits) | • Mechatronics (4 credits)<br>• ME Elective [Machine Learning] (4 credits)<br>• Principles of Economics (4 credits)<br>• Embedded Systems (4 credits)<br>• Mechanics of Machines/ Elective (4 units) |
| **SEMESTER 2** | **SEMESTER 4** | **SEMESTER 6** | **SEMESTER 8** |
| • Computer Programming for Engineering (4 credits)<br>• Multivariable Calculus & Linear Algebra (4 credits)<br>• Engineering Mechanics (4 Credits)<br>• Foundations Design & Entrepreneurship 2 (4 credits)<br>• Leadership Seminar 2 (2 credits) | • Circuits & Electronics (4 credits)<br>• Text and Meaning (4 credits)<br>• Applied Programming for Engineers (2 credits)<br>• Differential Equations & Numerical Methods (4 credits) | • Control Systems (4 credits)<br>• Mechanical Machine Design (4 credits)<br>• Robotics (4 credits)<br>• Intro to AI (4 credits)<br>• ME Elective (4 credits) | • Project Management & Professional Practice (4 credits)<br>• ME Elective (4 credits)<br>• African Studies Elective (4 credits)<br>• Senior Project & Seminar (4 credits) |
| **Total Credits: 34** | **Total Credits: 36** | **Total Credits: 38** | **Total Credits: 36** |

Total Credits for Mechatronics Engineering Program = 144

## 4.10 Plan of Study: Biological Engineering

**ASHESI UNIVERSITY**
Department of Engineering

**BSc. Biological Engineering**

**Ashesi Courses**

| Freshman Undergraduate | Sophomore Undergraduate | Junior Undergraduate | Senior Undergraduate |
|---|---|---|---|
| **YEAR 1**<br>**SEMESTER 1 & 2** | **YEAR 2**<br>**SEMESTER 3 & 4** | **YEAR 3**<br>**SEMESTER 5 & 6** | **YEAR 4**<br>**SEMESTER 7 & 8** |
| **SEMESTER 1** | **SEMESTER 3** | **SEMESTER 5** | **SEMESTER 7** |
| • Calculus for Engineering 1 (4 credits)<br>• Written & Oral Communication (4 credits)<br>• Foundations Design & Entrepreneurship (4 credits)<br>• Introduction to Engineering (4 credits)<br>• Ashesi Success +Leadership 1* (0 credit) | • Physics Electromagnetism (4 credits)<br>• Molecular and Cell Biology (4 credits)<br>• General Chemistry (4 credits)<br>• Leadership Seminar 3(2 credits)<br>• Statistics for Engineers (4 credits) | • Modelling in Biological Engineering (4 credits)<br>• System Dynamics (4 credits)<br>• Biochemistry (4 credits)<br>• Leadership 4 for Engineers + Y3GP (4 credits)<br>• Instrumentation for Engineering (2 credits) | • Systems Biology (4 credits)<br>• BioE Elective] (4 credits)<br>• Principles of Economics (4 credits)<br>• Science communication and Public Engagement (4 credits)<br>• Non-Major Elective (4 units) |
| **SEMESTER 2** | **SEMESTER 4** | **SEMESTER 6** | **SEMESTER 8** |
| • Computer Programming for Engineering (4 credits)<br>• Multivariable Calculus & Linear Algebra (4 credits)<br>• Engineering Mechanics (4 Credits)<br>• Foundations Design & Entrepreneurship 2 (4 credits)<br>• Leadership Seminar 2 (2 credits) | • Circuits & Electronics (4 credits)<br>• Anatomy and Physiology for Engineers(4 credits)<br>• Text and Meaning (4 credits)<br>• Applied Programming for Engineers (2 credits)<br>• Differential Equations & Numerical Methods (4 credits) | • Transport Phenomena in Biological Systems (4 credits)<br>• Synthetic Biological Engineering (4 credits)<br>• Cellular and Tissue Biomechanics (4 credits)<br>• Biomaterials (4 credits)<br>• BioE Elective (4 credits) | • Project Management & Professional Practice (4 credits)<br>• BioE Elective Elective (4 credits)<br>• African Studies Elective (4 credits)<br>• Senior Project & Seminar (4 credits) |
| **Total Credits: 34** | **Total Credits: 36** | **Total Credits: 38** | **Total Credits: 36** |

# 5 Descriptions of Courses and Prerequisites

## 5.1 Business Administration

### 5.1.1 BUSA 100 Principles of Economics

**Required for all CS & ENG Majors**

**Prerequisite: Pre-Calculus 2 or Calculus 1**

**Offered: September Semester (Semester 1)**

**Course Type: Lecture**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

Welcome to Principles of Economics. This course is an exciting introduction to the field of economics, with application to the local context. Economics has two main divisions: microeconomics and macroeconomics. We will first tackle the microeconomics topics and then move on to the macroeconomics topics, but both topics are equally pertinent. After a general introduction to the field of economics and explaining the difference between microeconomics and macroeconomics, the course will start by delving into microeconomic theory before finishing up with macroeconomics theory.

Traditional microeconomic topics that will be treated include the concept of the invisible hand and the role of incentives in the market - supply and demand, international trade, elasticity, taxation, and the implications of government policy for individual firms. For the section on macroeconomics, we will discuss simple models of goods and services, assets, capital, and labour markets, which can be usefully applied to generate realistic predictions regarding the behaviour of such macroeconomic variables as output and growth, employment, inflation, the current account, as well as interest and exchange rates. The course will teach students to use these models to understand and interpret current and historical macroeconomic developments. Current macroeconomic developments and policy changes, such as the effects of the COVID-19 pandemic, global inflation related to rising oil prices and the geopolitical conflict between Russia and Ukraine, and possible impacts of national debt and corruption on macroeconomic stability and performance of African countries like Ghana, will be discussed. The role of the IMF in helping countries to manage economic challenges will be assessed.

### 5.1.2 BUSA 132 Organizational Behaviour

**Required for all BA Majors**

**Prerequisite: None**

**Offered: Typically taught in the September Semester (Semester 1)**

**Course Type: Lecture**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

How can managers motivate employees to go above the call of duty to get the job done? How can managers be sure their decisions are not biased? What influence tactics can managers use when they do not have formal authority to tell someone what to do? This course will help students understand life in complex organisations by covering topics that span microanalysis dealing with individuals and macro analysis dealing with the organisation. The course is managerial in orientation and focuses on the processes necessary to organise, motivate, direct and control people engaged in collective activities. The emphasis is on developing concepts and strategies that will help students become more effective managers. The course uses readings, cases, exercises, and videos to illustrate the conceptual and applied aspects of individual, group, and organisational behaviour.

### 5.1.3 BUSA 161/A Foundation of Design & Entrepreneurship I

**Required for all Ashesi Students**

**Prerequisite: none**

**Offered: September Semester (Semester 1)**

**Course Type: Lecture, Experiential**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

This is the first part of a yearlong course on design and entrepreneurship. The goal of the course is to immerse all first-year students at the University, irrespective of major, into the world of design thinking, entrepreneurship, and business management. For this semester's work, the course will cover two main aspects: design thinking for problem-solving and entrepreneurial opportunity analysis. The two areas will involve students undertaking exercises to help hone their skills in design thinking and conduct business opportunity identification and analysis, culminating in business concepts. Students will then develop and validate their business concepts and present them for evaluation. The first half of this semester will look at creativity, design thinking and innovation to position students to develop an innovative posture. Class sessions and activities will see students uncovering how the brain creates and prevents creativity, how to reframe problems, conduct research, conduct sense-making to uncover insights from research, develop a point of view, ideate, prototype, and develop solutions to the problems identified. The key focus areas teach them to deal with ambiguity and be innovative and creative amid limitations and constraints. Students will also learn how to prototype and test their ideas with users. The second half of the semester will be structured to help students evaluate their design proposals and decide how to take them further. Building on the background from the design module, students will study business opportunity analysis and business model development as entrepreneurs and intrapreneurs. They will run through the theories of business venture modelling to help them model their business concepts. This will serve as a basis for using tools like the business model canvas, which will require that students identify potential customer segments and develop and test value propositions that address their pain points, problems or needs they discovered in the first part of the course. At the end of the semester, students will reflect on the course as well as present their business concepts for evaluation and selection for the business simulation project in the second semester.

### 5.1.4 BUSA 162 Foundation of Design & Entrepreneurship II

**Required for all Ashesi Students**

**Prerequisite: FDE 1**

**Offered: January Semester (Semester 2)**

**Course Type: Lecture, Experiential**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

This course is a continuation of Foundations of Design and Entrepreneurship (FDE) I and aims to build on the work done through business simulations on the solution concepts developed. The venture teams will start the semester with continued prototyping, developing, and testing their Minimum Viable Products (MVP), launching their venture concept, and running post-launch promotions, all the while learning about the key entrepreneurship concepts that pertain to the various activities performed in this course. However, the venture teams will not be registered legal entities during the period of the class (perhaps afterwards). Hence, we refer to the nature of the business the venture team conducts during the semester as a business simulation. To elaborate on the process, by conducting Customer Discovery, Customer Validation and exploring Customer Creation and Company Building hypothetically, FDE II teams can test and update their business concepts into validated business ideas that can potentially be explored post-FDE. The testing process is iterative as teams will need to incorporate new information or pivot based on outcomes from testing in the rather continuous customer development process. Such informed customer discovery, validation, and creation activities will reveal the viability of the business concept and, therefore, help the team determine if a business concept has prospects for company building or not by the end of the semester. The simulation process, therefore, provides a rigorous experiential learning corridor through which FDE teams encounter, experience, and process relevant business knowledge for business venturing in entrepreneurship (as well as in intrapreneurship at the corporate level). Towards the end of the semester, students will be guided in determining how they will transition out of the FDE program after two semesters. If they determine that their business venture should go into the company-building phase, they will have the opportunity to enrol in the student-led Ashesi Start-up Launchpad. If

they decide they are not interested in pursuing the venture, the team will be assisted in exiting the simulation, resolving inventory, and closing the books.

### 5.1.5 BUSA 210 Financial Accounting

**Required for all BA Majors**

**Prerequisite: none**

**Offered: September Semester (Semester 1) or May Semester (Semester 3)**

**Course Type: Lecture**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

This is an introductory accounting course that exposes students to fundamental accounting principles, the regulatory framework of accounting practice, elements of financial statements, the mechanics of data entry, preparation of financial statements, financial statement analysis, control accounts and reconciliations, and ethics in the accounting profession. The course is designed to provide students with the requisite skills for analysing transactions, opening and maintaining proper books of accounts, doing basic reconciliations, preparing financial statements for sole proprietorships, applying fundamental accounting principles and ethical codes in solving accounting and business problems and evaluating the financial performance of a business entity using financial statement analysis.

### 5.1.6 BUSA 220 Introduction to Finance

**Required for all BA Majors**

**Prerequisite: Financial Accounting**

**Offered: January Semester (Semester 2) or May Semester (Semester 3)**

**Course Type: Lecture**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

This is an introductory course aimed at equipping students with the basic skills of corporate finance. In this course, students will be introduced to some fundamental principles of corporate finance, such as time, value of money and risk. Specific areas of concentration include the time value of money, investment valuation and decision-making under conditions of certainty and uncertainty, working capital management, capital budgeting, cost of capital, capital structure and dividend policy, and intermediate and long-term financing.

### 5.1.7 BUSA 224 Finance for non-Finance Managers

**Required for all MIS & CS Majors**

**Prerequisite: Pre-calculus 1 & 2 or Calculus 1; Prior or concurrent enrolment in Microeconomics**

**Offered: January Semester (Semester 2) & May Semester (Semester 3)**

**Course Type: Lecture**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

This course is designed to equip students with the necessary tools, skills and competencies required of contemporary managers of top-notch organisations to properly handle financial management and planning issues. It is a platitude that almost every activity in an organisation has some monetary implications and hence may translate into numbers. Managers must, therefore, be trained to know how their actions and inactions affect the numbers, which in turn affect the entity's profitability, a critical ingredient necessary for the long-term survival of the business.

The contents of the course are organised around four themes. The topics under the first theme cover the formation and organisation of businesses, tax compliance and planning, and participation in the financial markets in line with statutory regulations and best practices. Topics under the second theme cover the elements and components of general-purpose financial statements and the evaluation of financial performance using financial statements analysis. Topics under the third theme cover cost classification and estimation, volume planning, and profit planning. Topics under the fourth theme cover valuation concepts, risk-return profile of investments, and financial appraisal of capital projects.

The course will be delivered through lectures on key concepts, spreadsheet practicums for selected applications, and presentation of relevant cases and current developments. The last discussion introduces the students to issues in sustainable and responsible investment (SRI). This discussion will centre around the evolution of SRI, concepts, and principles. Other topics include long-term investment and corporate social responsibility, sustainable development Goals and the Millennium Development Goals.

### 5.1.8 BUSA 304 Operations Management

**Required for all BA Majors**

**Prerequisite: Quantitative Methods or Statistics for Engineering & Economics**

**Offered: September Semester (Semester 1)**

**Course Type: Lecture**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

The study of Operations Management is an exciting management area that profoundly affects the productivity of both manufacturing and services. This course aims to present a broad introduction to the field of operations realistically and practically.

When companies produce and deliver goods or services to meet customer demand, they manage operations, in other words, by executing business processes. In this course, students discover how business processes can be designed, analysed, and improved to lift the performance of any organisation, whether it is a bank, a hospital, a resort, or a fashion retailer. The course reveals how process management skills can reduce costs, lower inventories, cut waiting times, improve quality, enhance service levels, and increase revenues and company profits. Specifically, students will gain practical knowledge of process design, demand forecasting, capacity planning, workflow planning and control, quality management, and lean operations. With a focus on the basic concepts governing process management, the course also provides the foundation to pursue further development in operations and supply chain management.

Organisations need to understand how the various processes fit together, what the implications are for the weakest part of the process, identify opportunities for continuous improvement and see from a bird's eye view the approach leadership must take to ensure profitability, growth, continuous improvement, development of employees and sustainability. Throughout this course, you will also see learning outcomes in each unit. Those learning outcomes can help organise your studies and gauge your progress.

While looking out for all the above factors, there is also the issue of ensuring that the organisation, institution, or company is here for the long haul through a consistent review of sustainability requirements.

### 5.1.9 BUSA 311 Managerial Accounting

**Required for all BA & MIS Majors**

**Prerequisite: Financial Accounting or Finance for non-Finance Managers**

**Offered: January Semester (Semester 2) or May Semester (Semester 3)**

**Course Type: Lecture**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

The overall emphasis of this course is the use of accounting data within an organisation by its managers. Managers need information to carry out three essential functions:

(1) Planning operations, (2) controlling activities, and (3) making decisions.

This course aims to show what kind of information is needed, where this information can be obtained, and how managers can use information as they carry out their planning, control, and decision-making responsibilities. The course also explains why managerial accounting is vital to the future careers of all business students. It answers two questions. Topics addressed in the course are cost accumulation methods for product costing, cost structure for control and motivation, cost-volume-profit relationships, profit planning and budgeting, standard costing, and relevant costs for non-routine decisions. Current and best practices will be discussed to provide the most recent information on how businesses accumulate and use the cost information.

### 5.1.10 BUSA 321 Investments

**Required for all BA Majors**

**Prerequisite: Introduction to Finance or Finance for non-Finance Managers**

**Offered: September Semester (Semester 1) or May Semester (Semester 3)**

**Course Type: Lecture**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

This course surveys the investment media, concepts, and techniques to provide an understanding of the investment process in the economic and financial environment. The course covers the elements of investments, portfolio theory and management, security analysis, valuation of stocks and bonds, and risk-return trade-offs. The course entails only the necessary mathematical and technical details, which will provide the intuition that may illuminate the gliding path for students as they confront new ideas and challenges in their later lives as investment practitioners. On the conviction that theories such as the capital asset pricing model and the efficient market hypothesis are intellectually satisfying subjects of scientific research as they are important building blocks for the development of solid grounding in investments, aspects of these theories will be used generously to determine the value of real and financial assets. As the instructor tries to bridge the gap between theory and practice, several real-world examples are presented. The course will consist of lectures and discussions of contemporary investment and finance challenges and developments in Ghana and across the globe. Students will be exposed to trends in socially responsible investing around the globe and what lessons Ghanaian Fund Managers can take. A good dose of data will be used in the 'analysis' part of the course. Students will be required to use Microsoft Excel analytic tools to solve a large part of the problem sets. This is also intended to provide students with a taste of tools they will need to understand and use in their careers as investment analysts.

### 5.1.11 BUSA 341 Marketing

**Required for all BA Majors**

**Prerequisite: Micro-economics**

**Offered: January Semester (Semester 2)**

**Course Type: Lecture**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1. Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

Organisations, whether private, public or non-governmental, have goals and objectives they seek to achieve. The level of success of these organisations and their long-term existence depends on their ability to effectively satisfy the needs of their customers, clients or stakeholders continually. The business environment in which organisations operate is changing rapidly, and especially digital technology is permeating almost every aspect of human experience. The development of the Internet, World Wide Web and other digital technologies is changing the way business is done. Customers have a much wider variety and prices from many more suppliers and more convenient ways of accessing products and services. The Covid-19 pandemic of 2020 has also brought about changes in consumers' habits and attitudes in ways such as how they shop, what products they prioritize, and how they interact with others.

The essential or big question this course seeks to answer is: "How do organisations create value for customers, clients and stakeholders while achieving the objectives of the organisations in a dynamic business environment where digital technology is increasingly pervasive, and the Covid-19 pandemic is transforming consumer behaviour?" Students will be exposed to and have the opportunity to apply foundational knowledge of marketing concepts and principles and skills that thriving firms or organisations use to undertake the following critical tasks that address the essential question posed above.

### 5.1.12 BUSA 350 International Trade & Policy

**Required for all BA Majors**

**Prerequisite: Pre-calculus 1; Micro-Economics; Macro-Economics; Statistics**

**Offered: January Semester (Semester 2)**

**Course Type: Lecture**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

The course is designed to introduce students to the main concepts and methods of international trade using applications drawn from the real world. Throughout the course, we would convey the major ideas that have emerged from recent research while emphasising the continued importance of the old theories. Throughout this course, the objective is to guide students to understand how the evolution of international economic theory has helped shape our understanding of a rapidly changing global economy. Also, how can we use the knowledge about international trade to contribute to the ongoing debate about trade protection, free trade, regionalism, and trade preferences, among other issues.

### 5.1.13 BUSA 400A_B Thesis 1 & 2

**Capstone option for BA, MIS, CS**

**Prerequisite: 8 Credits in a Major Area of Study**

**Offered: September Semester (Semester 1) & January Semester (Semester 2)**

**Course Type: Seminar**

Ashesi Units: 1; Credit Hours: 3; Hours per Week in Classroom: 1.5; Hours per Week of Discussion: N/A; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 10 per week

The thesis capstone integrates the knowledge gained and skills acquired during a student's enrolment in the Business Administration department.

Students register for the thesis in both semesters of their fourth year. Each student enrolled on the thesis course will work independently on a research idea in an area of business studies. The research will be supervised by a member of the faculty. The thesis should be viewed as an opportunity to understand complex questions from diverse business perspectives. This requires using appropriate theories and research methodology to continue Ashesi's active engagement with the community (both local and global).

Send an e-mail to researchstudio@ashesi.edu.gh if you need further information on the BA Thesis capstone process.

### 5.1.14 BUSA 401_A Entrepreneurship 1

**Capstone option for BA, MIS, CS**

**Prerequisite: 8 Credits in a Major Area of Study**

**Offered: September Semester (Semester 1)**

**Course Type: Seminar, Experiential**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

Entrepreneurship has been held by many as the key to development in the underdeveloped world. This is because it holds the potential of aiding problem-solving through the development of innovative products and services. These will also help reduce unemployment by serving as income-generation avenues for the youth. If Africa, and indeed other developing economies, can achieve the Sustainable Development Goals (SDG), there will be the need to develop profit-generating enterprises as well as social enterprises to serve as the backbone and propellant.

This capstone session, in a bid to further position Ashesi graduates to understand the nuances of start-ups and the entrepreneurial mindset to develop into entrepreneurs and intrapreneurs, integrates the skills and knowledge obtained from courses offered in the past three years of the student's education on campus. It will teach students what a start-up is and clearly distinguish between a start-up and a small business. It will take students through opportunity analysis and the development of sustainable business models using Eric Ries' Lean Start-up, Steve Blank's Customer Development Process and Alexander Osterwalder's Business Model Canvas.

The core teaching philosophy is experiential, learner-centric, and inquiry-based to develop the mindset, reflexes, agility, and resilience an entrepreneur needs to search for certainty in the chaotic world of start-ups. This will be achieved with the adoption of several teaching aids and stress on the need to get out of the classroom to bring their businesses to life.

### 5.1.15 BUSA 401_B Entrepreneurship 2

**Capstone option for BA, MIS, CS**

**Prerequisite: Entrepreneurship 1**

**Offered: January Semester (Semester 2)**

**Course Type: Seminar, Experiential**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

Capstone Entrepreneurship II will aim to aid venture teams in validating their business models by undertaking further customer and stakeholder engagements, as well as MVP tests. This will help the teams validate their product-market fit and gain early adopters/earlyvangelists to patronise their products/ services and pay for them. Feedback from these earlyvangelists will inform further iterations and pivots. Venture teams will then be taken through the Customer Creation and company-building aspects of the Customer Development process. These form the execution aspect of the Customer Development process. The student will look at their product/ service positioning considering the market type they are entering, plan to launch their venture or its product/ service and validate the triple bottom line of their business ventures. Due to time constraints, strategies for reaching mainstream customers and company building, with a focus on structuring fast response, departments will be put in place to aid in executing this business model but may not be executed as a requirement of this session. Specifics include venture ownership, resource management, operations, and management and cultural issues. A session will also be dedicated to family business-related conversations to get students whose families own businesses to understand the nuance and peculiarity of family businesses and how they can navigate those spaces while acting as intrapreneurs.

At the end of the semester, venture teams will feed all this information into the traditional business plan format, which will be submitted to the Department. Additionally, they will pitch their businesses to a panel of experts for evaluation and feedback. They will also write an individual reflection paper on their entrepreneurial journey to ensure that they reflect on this year-long Capstone experience. Instructors will also learn from this reflection to inform future capstone sessions.

### 5.1.16 BUSA 402 Business Law

**Required for all BA Majors**

**Prerequisite: none**

**Offered: September Semester (Semester 1)**

**Course Type: Lecture, Experiential**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

The topics in this course are intended to give you an in-depth knowledge of the legal framework relevant to the business environment in Ghana. Topics in this course include an introduction to sources of law, the law of contract, the law relating to the sale of goods, company law, torts in business, and an introduction to aspects of employment law and dispute resolution.

The goal of this course is to familiarise you with the legal environment within which business is conducted in Ghana and Internationally. The course is not meant to train you to become a lawyer. However, the basis of all business activity is underlined by rules and regulations and, for that matter, laws.

It is, therefore, essential that as a student studying business law, you comprehend rudiments or have a basic understanding of the legal framework governing businesses in Ghana.

### 5.1.17 BUSA 405 Competitive Strategy

**Required for all BA & MIS Majors**

**Prerequisite: Introduction to Finance or Finance for non-Finance Managers; Macroeconomics; Prior or concurrent enrolment in Marketing recommended but not required.**

**Offered: January Semester (Semester 2)**

**Course Type: Lecture**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

Organisations have always had to find ways to stay in business and, more importantly, thrive in their chosen markets. This goal requires the development, implementation, and evaluation of business strategy. Competitive Strategy, also known as business strategy, is designed to establish a profitable and sustainable advantage and position for a business in a preferred marketplace. Although knowledge from such disciplines as Marketing and Human Resource Management is vital in managing a business, this course will focus on competition's role in business strategy development and implementation. Strategy development entails understanding the organisation and competitive environment in which a firm operates, formulating long-term direction, determining how to position a business unit, and creating a sustainable competitive advantage within a competitive environment. Strategy implementation or execution requires mobilising resources, developing capabilities to compete, deploying the strategy, and reviewing performance as the business pursues its aspirations.

In Competitive Strategy, the role of the Strategist is to understand and cope with competition. The overall purpose of this course is to equip students to become strategists and high-performing business executives by enhancing their ability to make and execute strategic business decisions in a competitive environment by:

*Understanding competition: acquire relevant tools to analyse the business and competitive environment

*Cope with competition: acquire knowledge, skills, traits, and mindsets to craft and implement a winning strategy in a competitive environment.

Students will assume the role of general managers and business teams who have the overall responsibility for the performance of a business unit within a firm. The course is modelled around the classic work of Michael Porter and will be made relevant to modern times by using examples from recent experiences of companies. The class will also explore new thinking, ideas, and frameworks in business strategy. The course will allow students to practice and develop skills and mindsets to analyse a competitive environment (i.e., business environment, industry, and company), craft strategy and evaluate their own and other practitioners' approaches to strategy and work.

The course will emphasise student-centred learning. The learning activities will include case analysis, discussions, debates, presentations, group projects, interaction with business executives and practitioners and lectures. We will use a "flipped" classroom where students will read relevant texts and prepare assigned case studies ahead of class. The class sessions will be devoted to discussing and clarifying issues and relating concepts, principles, and theories to cases.

### 5.1.18 BUSA 410 Applied Project

**Capstone option for BA, MIS, CS**

**Prerequisite: 8 Credits in a Major Area of Study**

**Offered: September Semester (Semester 1) & January Semester (Semester 2)**

**Course Type: Seminar**

Ashesi Units: 1; Credit Hours:3; Hours per Week in Classroom: 1.5; Hours per Week of Discussion: N/A; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 10 per week

The Applied Project is characterised by its engagement with a real-life organisation. Ultimately, students are expected to integrate foundational knowledge and skills gained over time and use them to solve real-life challenges for existing organizations. The successful execution of an Applied Project requires skill sets including research and critical analysis, stakeholder engagement, project management, professionalism, and communication. The benefits of an Applied Project are immense. It offers students the unique opportunity to immerse themselves in an organization and gain an understanding of business problems, relationships, and solutions. It also positions students to add value to the organization in the capacity of a junior consultant. Once the project is successfully accomplished,

it becomes a strong addition to the student's personal and professional track record, and will certainly open many doors for referrals, internship, and job opportunities. It also provides the student with insights regarding what to pursue in the area of postgraduate studies. Send an email to researchstudio@ashesi.edu.gh if you have any questions about the BA Applied Project.

### 5.1.19 BUSA 422 Corporate Finance

**Required for all BA Majors**

**Prerequisite: Investments Offered: January Semester (Semester 2) & May Semester (Semester 3)**

**Course Type: Lecture**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

This course covers numerous issues of practical relevance to the contemporary corporate finance manager. Although the central focus will be on how corporations make investment and financing decisions, the introductory classes will discuss households' saving and investment decision-making and how securities markets and financial intermediaries complement such efforts. Topics to be covered include risk and return, asset valuation, working capital management, mergers and acquisitions, and corporate restructuring. The course focuses on the application of corporate finance concepts to solving real life problems in a typical business environment. Students will learn to appreciate how the timing of and uncertainty about future cash flows and their associated risks combine to determine the current value of those cash flows. It is expected that assignments, class projects, and discussions will provide the needed motivation and enhance students' understanding of the finance theories to be discussed. The numerous real-life examples and cases are aimed at equipping the students with skills to plug-and-play in a starting finance position in any organization in Ghana and abroad.

### 5.1.20 BUSA 423 International Finance

**Major Elective for BA, MIS. Non-Major Elective for ENG and CS**

**Prerequisite: Introduction to Finance**

**Offered: Typically offered in the January Semester (Semester 2)**

**Course Type: Lecture, Experiential**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

The course aims at providing students with a basic understanding of the international financial market, and multinational finance and investment environment. This course extends the basic principles of corporate finance to dimensions peculiar to global financial markets and multinational corporations. It is designed to cover areas of international finance such as the international financial markets, international parity conditions, foreign exchange determination and quotations, derivative securities for currency risk management, and management of the risk of multinational operations. Thus, beside the discussion of issues of corporate finance such as working capital management, capital budgeting, risk and returns, and cost of capital from the perspective of multinational enterprises, additional issues such as international monetary system, currency derivatives, exchange rate changes and regimes, and political risk are also covered.

### 5.1.21 BUSA 430 Human Resource Management

**Major Elective for BA, MIS. Non-Major Elective for ENG and CS**

**Prerequisite: Organizational behaviour**

**Offered: Typically offered in the September Semester (Semester 1)**

**Course Type: Lecture**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

The purpose of this course is to familiarize you with the basic principles and techniques of human resource management. The course takes a practical view that incorporates the contributions of the behavioural sciences with the technical aspects of implementing the HR function in the 'real world.'

Surely, not everyone who takes this course will become a human resource professional, although that individual will learn a great deal about those roles. However, all managers, no matter what their specializations are, play essential roles in carrying out HR policies and practices in their organizations. Consequently, a basic understanding of human resource management (HRM) is essential wherever you find yourself in your world of work. The key objective of this course is to enable you learn that HRM is more than just accepting employment applications and keeping records. It is a central and strategic organizational activity of increasing complexity and importance.

### 5.1.22 BUSA 431 Real Estate Development

**Major Elective for BA, MIS. Non-Major Elective for ENG and CS**

**Prerequisite: Quantitative Methods or Statistics for Engineering & Economics**

**Offered: Typically offered in the September Semester (Semester 1)**

**Course Type: Lecture, Experiential**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

The real estate development course aims to introduce students to what real estate development (RED) is and what the development process entails. It seeks to provide students with a good overview of what goes into the various stages of the development process with emphasis on feasibility studies, financing, and management.

The class will undertake a feasibility study for a real-life client. This client needs a feasibility study conducted for a development they want to embark on. The outputs expected are a feasibility report and recommendations for financing and property management, post development. Students in the class will be split into teams to conduct the study, going through the 8-stages of the development process. They will do this as they are taken through the various stages of development process in the class, visit the site and interact with professionals who will help them make development and investment decisions for the client. The bottom line is a development which is sustainable where its financial model is concerned, and one that is environmentally considerate.

Students will as well engage with different persons (guest lecturers) on their experiences on different developments (Public and private). As well, class tasks will have students explore developments across the continents to learn from their successes and challenges. This task will involve an assessment of the sustainability of the developments.

It is the hope of the instructors of this class that students will enjoy working on this live case, and in the process, develop skills to benefit future interest in the industry as well as in conducting marketing and feasibility studies.

### 5.1.23 BUSA 442 Strategic Brand Management

**Major Elective for BA, MIS. Non-Major Elective for ENG and CS**

**Prerequisite: Marketing and Text & Meaning; or Foundations of Design & Entrepreneurship II Offered: Typically offered in the September Semester (Semester 1)**

**Course Type: Lecture**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

The tremendous economic growth and development that the world has experienced in recent decades before the COVID-19 pandemic in 2020 have meant individuals and business managers in most countries are inundated with a wide variety of products and services from which to choose. For the individual, finding time to select from a wide variety of products and services may be challenging, but more products and services on the market mean stiffer competition for the firm. A growing number of firms and organisations have realized that one of their most valuable assets is the brand names associated with their products or services.

The exponential rate of mobile telephony growth, growing internet access, and social media use are giving greater power and voice to consumers and other stakeholders at the expense of businesses and brand managers. Brand Managers' ability to simplify the consumer decision-making process, reduce risks, set expectations, and set apart their brands from their competitors' brands is invaluable. Creating strong brands that deliver on their promise and maintaining and enhancing those brands' strength over time is imperative for business success but rather daunting.

Additionally, it has become imperative for higher education institutions that offer strategic brand management courses to include Environmental, Social, and Governance (ESG) and sustainability elements in their curriculum due to the nature of the contemporary marketplace. Firstly, ESG and sustainability are becoming increasingly important

for companies and central to brand strategy and reputation. Including these elements in brand management education ensures that students are ready for the business world's demands and the challenges they may encounter in their careers. Secondly, business practices can significantly impact society and the environment, and incorporating ESG and sustainability into brand management education allows students to understand the role of business in promoting sustainability and the importance of responsible practices. Additionally, there is growing demand from consumers, investors, and employees for companies to prioritise ESG and sustainability, so companies need employees who are trained in these considerations. By including ESG and sustainability in brand management education, students are better equipped to meet this demand and contribute to their companies' success. The business landscape is rapidly changing, and ESG and sustainability will continue to play a crucial role in shaping its future. Including these elements in brand management education ensures that students have the necessary skills and knowledge to succeed in the future. In conclusion, incorporating ESG and sustainability into a strategic brand management curriculum prepares students for the opportunities and challenges of the business world and helps them understand the role of business in promoting sustainability and responsible practices.

### 5.1.24 BUSA 444 Supply Chain Management

**Major Elective for BA, MIS. Non-Major Elective for ENG and CS**

**Prerequisite: Quantitative Methods; or Statistics for Engineering & Principles of Economics**

**Offered: Typically offered in the September Semester (Semester 1)**

**Course Type: Lecture**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

This course presents the fundamental concepts and tools needed to understand how Supply Chains work. The content spans the typical scope of supply chains: Plan, Source, Make, Deliver and Sell set in today's global market in which there is fierce competition, more frequent innovation, and more sophisticated and demanding customers/consumers. Continuous advances in technology also provide a wide variety of continuous improvement options in supply chains. The interactions of the factors and levels of supply chains are explored for optimization and efficiency in Supply Management, Inventory Management, Product & Production Management, Distribution and Transportation Management. The Course also covers Responsible Sourcing and the Key Performance Indices that are used to determine service levels and efficiencies in supply chains.

### 5.1.25 BUSA 451 Development Economics

**Major Elective for BA, MIS. Non-Major Elective for ENG and CS**

**Prerequisite: Micro-economics or Macro-Economics or Principles of Economics; and Statistics**

**Offered: Typically offered in the September Semester (Semester 1)**

**Course Type: Lecture**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

Why do countries with low average incomes have peculiar and similar problems such as severe inflation, corruption, balance of payment and debt problems, overpopulation & teenage pregnancy, slums, poor governance, and weak institutions. What can be done about this? How did Singapore, Hong-Kong, South Korea, and Taiwan (the Asian Tigers), China, Qatar, Ireland etc. become so rich recently even though they were not so rich half a century ago and were in situations not too dissimilar from African countries at the time.

This course discusses the problems faced by Least Developed Countries (LDCs) and Lower Middle-Income countries (in Africa, Asia, and Latin America) and their efforts to improve the lives and well-being of their people. It incorporates different aspects of the development process including traditional development topics like economic growth, education, population studies, migration and rural-urban migration, and poverty as well as less traditional but equally pertinent topics like economic and political institutions, competition policy & antitrust laws, foreign aid, culture, leadership, and corruption. The course starts with a synthesis of the history of the models of economic development with growth models as a particular strand of the development theories and models. The course also includes activities that presents opportunities for students to delve into the inter-relationship between culture, corruption, and debt challenges both as a development challenge and to address the Ashesi Learning Goal of Ethics & Civic Engagement.

### 5.1.26 ECON 101 Micro-Economics

**Required for all BA, MIS Majors. CS & ENG majors can substitute Principles of Economics with this course.**

**Prerequisite: Pre-Calculus 2 or Calculus 1**

**Offered: September Semester (Semester 1) or May Semester (Semester 3)**

**Course Type: Lecture**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

This course will cover the principles of microeconomic analysis with the aim of helping students make better business decisions in their professional careers. In addition to introducing the standard basis of economic theory such as perfect information, production theory, perfect competition and imperfect competition, the course will focus on helping students think strategically about achieving competitive advantage through the management of the firm's resources. Through this course, students will develop an understanding of basic microeconomic theory and improve their ability to make sound business decisions.

### 5.1.27 ECON 102 Macro-Economics

**Required for all BA & MIS Majors**

**Prerequisite: Pre-Calculus 2 or Calculus 1**

**Offered: January Semester (Semester 2) or May Semester (Semester 3)**

**Course Type: Lecture**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

Welcome to Principles of Macroeconomics at Ashesi University. This is an exciting time to be taking be taking this course because the course is an introduction to macroeconomics, with application to the local context. Ashesi University is in Berekuso in Ghana, West Africa, and the economies of West African countries like Ghana are in flux due to local macroeconomic management challenges at the local level and global forces both related and unrelated to the Global COVID 19 pandemic.

The Principles of Macroeconomics Course at Ashesi has two objectives. First, the course will develop simple models of goods and services, assets, capital, and labour markets which can be usefully applied to generate realistic predictions regarding the behaviour of such macroeconomic variables as: output; employment; inflation; the current account; as well as interest and exchange rates. Secondly, the course will teach students to use these models to understand and interpret contemporary and historical macroeconomic developments. Current macroeconomic developments and policy challenges such as the effects of the COVID 19 pandemic, global inflation related to geopolitical conflict between Russia and Ukraine, and rising oil global prices of oil, as well as local inflation due to global forces and possible impacts of national debt and corruption on macroeconomic stability will be discussed. The role of the IMF in helping developing countries like Ghana to manage economic challenges will be assessed.

### 5.1.28 ECON 452 Econometrics

**Major Elective for BA, MIS. Non-Major Elective for ENG and CS**

**Prerequisite: Micro-economics or Macro-Economic or Principles of Economics; and Statistics and Quantitative Methods (Multi-Variable Calculus can replace Quant Methods as a prerequisite for this class)**

**Offered: Typically offered in the September Semester (Semester 1)**

**Course Type: Lecture**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

The objectives of the course are the following:

- Introduce students to techniques for performing statistical analysis on quantitative data focusing on the estimation of the regression model.

- Help students solve problems commonly encountered in estimating statistical models like the regression model.
- Teach students to interpret the estimates from such models.
- Enable students to be able to perform quantitative analysis using secondary data.

Please note: The course is ideal for current Ashesi seniors and juniors interested in the analysis of quantitative (as opposed to qualitative) data.

### 5.1.29 ECON 455 Managerial Economics

**Major Elective for BA, MIS. Non-Major Elective for ENG and CS**

**Prerequisite: Calculus 2 or Applied Calculus; Micro-economics; Macro-Economics; Statistics or Econometrics**

**Offered: Typically offered in the January Semester (Semester 2)**

**Course Type: Lecture**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

Managerial Economics is the study of the different ways in which economic principles and quantitative tools can be employed to assist managers in making effective decisions. It provides principles to foster the attainment of the goals of the organisation, as well as engineer a better understanding of the external business environment in which an organisation operates. The course enhances students' understanding of how markets operate and develops their capability to make economic predictions about market outcomes to make effective decisions to maximise profit and firm value.

### 5.1.30 ENGR 413 Project Management & Professional Practice

**Major Elective for BA, MIS. Non-Major Elective for ENG and CS**

**Prerequisite: Operations Management**

**Offered: Typically offered in the September Semester (Semester 1)**

**Course Type: Lecture**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

Projects occur in our daily lives, whether it be a simple task of taking a shower or complex tasks, such as sending a spacecraft to Mars. The process, though similar, will require different degrees of planning and resource requirements to deliver as they have different scopes and outcomes and as will influence a different set of stakeholders with specific requirements. It is thus imperative that every person knows the basics of project management to manage the various projects that they undertake in their daily lives. More so as students who undertake various class and social projects while preparing to join the world of work (filled with projects) in the very near future, acquiring good project management skills within the structured framework positions one to get certified and/or use the appropriate lingua in the line of duty in the world of projects.

This course will expose students to planning, strategizing, and executing a project in their field of study or in another field while engaging the cross-section of talent in the class: engineering, computer science, management information systems and business administration students. It will develop students' skills to manage projects and build on leadership skills and ethical reasoning they have acquired in core courses. Students will learn about organisational, environmental, safety and health issues that must be considered during the implementation of a project. Students will also learn, discuss, and reflect on professional issues such as social responsibility, ethics, licensing, and regulatory reporting. They will be introduced to Industrial Engineering, process management, work measurement, capacity utilisation and constraints management.

Hinged on the PMI® Framework for Project Management and using the PMBOK® Guide as the core text, students will network and interact with members of the PMI-Ghana Chapter as they will be recognised as student members for the year. Interested students will also be supported in preparing for the CAPM® Certification to enhance their employability after they graduate from Ashesi.

### 5.1.31 BUSA 424 Venture Capital Investment

**Major Elective for BA, MIS. Non-Major Elective for ENG and CS**

**Prerequisite: TBD**

**Offered: Typically offered in September Semester (Semester 1)**

**Course Type: Lecture**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

The course expands on the entrepreneurial skills, cash flow appraisal techniques, investing decisions, and financing decisions learned in the prerequisite courses to the structuring of a venture capital (VC) fund, raising VC funds, appraisal of entrepreneurial ventures, allocation of funds to good entrepreneurial ventures, and support for entrepreneurs through the value generation process to the exit point. Students will learn that VC is not just another financing vehicle, but a business-building endeavour pursued by the venture capitalist in strict partnership with the entrepreneur to facilitate and accelerate the success of the entrepreneur. The course asks three pertinent questions: What is an attractive sector to allocate VC funds to? Is the entrepreneurial venture a good one? Will the allocation of funds to the entrepreneurial venture allow relevant stakeholders to achieve their return goals? The course will provide students with the knowledge and skills needed to answer those questions through lectures, case studies, testimonials from industry, group discussions, and role play.

### 5.1.32 BUSA 432 Organization Development

**Major Elective for BA, MIS. Non-Major Elective for ENG and CS**

**Prerequisite: FDE 1**

**Offered: January Semester (Semester 2)**

**Course Type: Lecture, Experiential**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

How can the outcome of capstone applied projects help organisations assess themselves and their environments, leading to the revitalisation and rebuilding of their strategies, structures, and processes for competitive advantage? What influence tactics can student consultants employ to gain trust from organisations so they can open their doors and study their systems for improvement? This course is designed to build the capacities of students who desire to undertake capstone applied projects that contribute towards the effectiveness of organisations.

The course is Organization Development (OD) Consulting in orientation, with a focus on the systematic application and transfer of behavioural science knowledge to the planned development, improvement, and reinforcement of the strategies, structures and processes that lead to organisational effectiveness. It pays attention to the practical resolution of organisations' problems systematically under changing environments, organisational behaviour which impacts on its development, techniques or tools that use authentic data to identify and address organisations' problems and obstacles that inhibit their growth.

### 5.1.33 BUSA 441 Service Marketing

**Major Elective for BA, MIS. Non-Major Elective for ENG and CS**

**Prerequisite: Quantitative Methods or Statistics for Engineering & Principles of Economics**

**Offered: Typically offered in the September Semester (Semester 1)**

**Course Type: Lecture**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

A growing number of school graduates are recruited in service industries. This is because the service sector as a percentage of the Gross National Product is substantial and has grown significantly in most countries, including Ghana. However, teaching Marketing in tertiary institutions tends to focus largely on manufacturing or product-based models of business practice, which are not always adequate or even, in some cases, not very useful in making decisions in a service business. The Services Marketing course seeks to teach students the concepts, frameworks

and analytical procedures that are best suited to examine and resolve challenges faced by managers and as well as develop successful and coherent marketing strategies/plan for service products.

### 5.1.34 BUSA 471 Social Enterprise

**Major Elective for BA, MIS. Non-Major Elective for ENG and CS**

**Prerequisite: FDE, Micro-Economics**

**Other courses that complement this course include Marketing, Corporate Finance, Operations Management, Competitive Strategy, Investments, Economic Development, Branding, New Product Development, Strategic Brand Management, and Service Marketing.**

**Offered: Typically offered in the January Semester (Semester 2)**

**Course Type: Lecture, Experiential**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

Social Enterprise is an exploratory business elective offered by the business administration department that challenges the student to think in ways that produce sustainable and profitable outcomes that lead to social or environmental impact. Through various team challenges, assessments, and meet-the-leader sessions, students have the opportunity to discuss, examine, and transfer thought into action as they work together to come up with their own solutions for some of their world's toughest challenges.

### 5.1.35 BUSA 458 Data Analytics for Business

**Major Elective for BA. Non-Major Elective for MIS, ENG and CS**

**Prerequisite: Statistics; Quantitative Methods**

**Knowledge of Research Methods will aid in appreciating the content.**

**Offered: Typically offered in the September Semester (Semester 1)**

**Course Type: Lecture, Experiential**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

Businesses must make strategic, tactical, and operational decisions to improve operational efficiency and profitability and gain a competitive advantage. Traditional, intuitive, and rule-of-thumb approaches to business decision-making are valuable. However, with vast amounts of business data, improved technology, and analytic techniques, business analytics has become invaluable for business decision-making to manage businesses more effectively and efficiently. The Business Analytics for Business course is designed to equip you, as a business professional, with the knowledge to make better decisions based on business data. It will give you the knowledge and skills to summarise, visualize, and generate insights from historical business data. You will be able to use the knowledge you have gained to forecast future outcomes and improve forecasts for planning. The course will also assist you in determining and evaluating alternative business solutions using risk and uncertainty decision models. This course will teach you how to identify business problems, patterns, and trends using data analytic technologies such as Excel, R, and Tableau. This critical skill is applicable across industries, so this course is required for all professionals.

By the end of this course, you will have a deep understanding of how to leverage data to drive business growth and be equipped with the necessary skills to tackle complex business problems through the power of data analytics. This course will provide students with practical data analytics skills and the necessary knowledge to make informed decisions across different business functions, including finance, human resource management, marketing, supply chain, and online activity.

### 5.1.36 BUSA 462 New Product Development

**Major Elective for BA. Non-Major Elective for MIS and CS**

**Prerequisite: Marketing and Foundations of Design and Entrepreneurship**
**Offered: Typically offered in the September Semester (Semester 1)**

**Course Type: Lecture, Experiential**

Ashesi Units: 1; Credit Hours: 4; Hours per week classroom: 3; Hours per week discussion: 1; *Hours of Study outside of the class (reading, assignments, studying, projects, and so on): 8 per week*

New product development comprises the activities of an organisation that lead to the introduction of new or changed products over time. The new product development and management process can take a variety of approaches namely marketing, technical, creative, design and so on. The course will adopt a broader user-centric approach following design thinking and marketing perspectives in its delivery. The rationale is to put users or consumers and their needs and aspirations at the centre of the new product development efforts. Consequently, the course will concentrate on tools, techniques and principles used for gaining insights into customer needs and problems, opportunity identification, designing, testing, and introducing new products and services that satisfy if not surpass consumer expectations. In addition to gaining foundational knowledge of innovation and new product development concepts, tools and principles, students will develop relevant skills such as critical thinking, creativity and problem-solving, leadership and teamwork, professionalism, communication, empathy, agility and project management skills.

The course will be practical and hands-on; students will apply the innovation and new product development concepts, principles and tools while working in small teams on industry concepts. Students will identify industry problem areas where they could develop new spin-off innovative products or service concepts. It will start with alignment sessions on the industry areas chosen, then go to the discovery phase where the team identifies the needs of users, followed by the design phase where the team develops new product and service concepts for prototyping. The product development process will involve ethnography, user needs specification and definition, synthesis, ideation, and prototyping. The course will also cover product launch and commercialization. The learning activities will include lectures, case analysis, discussions, presentations, group projects, cons

### 5.1.37 BUSA 446 Integrated Marketing Communications

**Major Elective for BA. Non-Major Elective for MIS and CS**

**Prerequisite: Marketing and Foundations of Design and Entrepreneurship II**

**Offered: Typically offered in the September Semester (Semester 1)**

**Course Type: Lecture, Experiential**

*Ashesi Units: 1; Credit Hours: 4; Hours per week classroom: 3; Hours per week discussion: 1; Hours of Study outside of the class (reading, assignments, studying, projects, and so on): 8 per week*

Marketing continues to play a pivotal role in private, public or non-governmental organizations as they seek to pursue organizational goals and objectives. Marketing enables companies to gain insights into consumer needs and create and deliver value to customers. Marketing jobs such as Digital Marketing and Strategy Specialist and Business Development Professionals have been identified as two of the 25 top emerging jobs for the future in the World Economic Forum's The Future of Jobs Report 2020, published in October 2020. Like others, the World Economic Forum report is anchored on the insights gained from the impact of the Covid-19 pandemic, digital technology, artificial intelligence, and other emerging technologies that are having and will continue to have on the business environment, industries and jobs. One of the core tools available to the Marketer to create value for customers and achieve marketing and business goals is marketing communications. Marketing communications enable an organization to attract customers, share information about its offerings and establish a relationship with the customers and other stakeholders. Knowledge and skills in marketing communications present the opportunity for graduates to gain employment in the marketing function of organizations, effectively run their own enterprises or work as marketing communications practitioners in the communications industry.

The business environment in which organizations operate is changing fast. The inception and growth of the internet, the world wide web, the pervasive digital technology and the Covid 19 pandemic are transforming people's lives. How people consume media, buy products and services, interact with others and entertain themselves has changed and is still evolving. The proliferation of new media, such as Facebook, Twitter, Instagram, WhatsApp and Tik Tok, has led to media fragmentation and a decline in the consumption of traditional media, such as television, radio, and newspapers, especially among the youth. Consumers are also making purchases and consuming products from

digital and online platforms in the comfort of their homes. There is also growing concern about sustainability and the environment due to the increase in global warming, severe weather and environmental damage caused by practices such as pollution and deforestation. These emerging phenomena present a huge opportunity for marketers to reach their discerning target audience, especially the youth, on multiple platforms with relevant messages that address the peculiar needs of the patrons of these new media. However, it is becoming challenging to plan and, sometimes, expensive to reach out to relevant target audiences and stakeholders who may be scattered across multiple media.

The Integrated Marketing Communications course seeks to equip and prepare students to assume and excel in the role of Marketing Communications executives in organizations or practitioners in the communications industry while coping with the dynamics of the digital age and growing concerns about sustainability. Students will develop relevant skills such as critical thinking, creativity and problem-solving, leadership and teamwork, professionalism, communication, empathy and agility. They will acquire knowledge in foundational concepts and principles of marketing communications as well. The course will cover core areas in integrated marketing communications, such as campaign planning and promotion tools, namely, advertising, sales promotion, public relations and corporate communications, personal selling, sponsorship, digital marketing and social media, media planning, green marketing and ethics in marketing communications. The course will allow students to practice and develop skills to design and execute marketing communications campaigns. The learning activities will include case analysis, discussions, presentations, group projects, consumer and customer safari and interaction with marketing executives and marketing communications practitioners.

### 5.1.38 BUSA 403 Company and Commercial Law

**Major Elective for BA. Non-Major Elective for MIS and CS**

**Prerequisite: Business Law**

**Offered: Typically offered in the January Semester (Semester 2)**

**Course Type: Lecture, Experiential**

Ashesi Units: 1; Credit Hours: 4; Hours per week classroom: 3; Hours per week discussion: 1

Hours of Study outside of the class (reading, assignments, studying, projects, and so on): 8 per week

The Company and Commercial Law course is intended to build on the declarative and functional knowledge and skills gained in the BA major core Business Law course. Beyond the foundational offerings in the Business Law course, this course will consider more closely issues in company and commercial law as they are relevant to Business Administration students and future entrepreneurs or business owners. Topics in this course will cover issues in Corporate Governance, legal rules relating to the raising of corporate capital, the legal framework for restructuring financially distressed companies, basic concepts of personal property, money and payments systems, the banker-customer relationship, legal aspects of international trade and finance and commercial disputes resolution.

### 5.1.39 BUSA 446 Anti-Money Laundering

**Major Elective for BA. Non-Major Elective for MIS and CS**

**Prerequisite:**

**Offered: Typically offered in the January Semester (Semester 2)**

**Course Type: Lecture, Experiential**

Ashesi Units: 1; Credit Hours: 4; Hours per week classroom: 3; Hours per week discussion: 1

Hours of Study outside of the class (reading, assignments, studying, projects, and so on): 8 per week

According to the United Nations Office on Drugs and Crime, "the estimated amount of money laundered globally in one year is 2 to 5% of global gross domestic product, or $800 billion to $2 trillion in current US dollars. Due to the clandestine nature of money-laundering, it is however difficult to estimate the total amount of money that goes through the laundering cycle". Transparency International indicated in one if its reports that several countries in emerging markets made the bottom list in terms of corruption. Based on the information, it also appears that corruption continues to be prevalent in emerging market countries, making it a key contributor to money laundering. Institutions in advanced economy markets have been complicit in money laundering as significant enforcement actions against such institutions have indicated.

These go to show that money laundering is a global problem and does have crippling effects on socioeconomic fabrics of societies. The laundering cycle comprises of systems, infrastructures, individuals, institutions and societies. Unfortunately, we may knowingly or unknowingly be part of the cycle, which is why we have roles to play to deter money laundering. This course is designed to equip students with the effective understanding of money laundering including the vices and gaps in our societies that contribute to money laundering. The course will also help students learn the detective and preventive money laundering techniques. Particular emphasis will be on Ghana, with African and International perspectives.

The course content will include the basics of money laundering and terrorist financing, the anti-money laundering and terrorist financing regulatory framework, global co-operation strategies against money laundering and terrorist financing, specific money laundering cases and enforcement, the roles of technology and sustainability, preventive and detective strategies to combat money laundering and terrorist financing

### 5.1.40 BUSA 446 Service Marketing

**Major Elective for BA. Non-Major Elective for MIS and CS**

**Prerequisite: Marketing and Foundations of Design and Entrepreneurship II**

**Offered: Typically offered in the September Semester (Semester 1)**

**Course Type: Lecture, Experiential**

Ashesi Units: 1; Credit Hours: 4; Hours per week classroom: 3; Hours per week discussion: 1

Hours of Study outside of the class (reading, assignments, studying, projects, and so on): 8 per week

Growing number of school graduates are recruited in service industries. This is because the service sector as a percentage of Gross National Product is substantial and has grown significantly in most countries including Ghana.

However, teaching of Marketing in tertiary institutions tends to focus largely on manufacturing or product based models of business practice which are not always adequate or even some cases not very useful in making decisions in a service business.

In order to ensure that students' learning experience is both intellectually stimulating and relevant for the marketplace, students will assume the role of a marketing manager in a service organization and learn how to make effective decisions based on the latest service management thinking. Students will be exposed to relevant cases and given the opportunity to interact with marketing practitioners in service organizations.

## 5.2 Economics

### 5.2.1 ECON 201 Principles Of Microeconomics

**Required for all Economics Majors**

**Prerequisite(s): Pre-Calculus 2 or Calculus 1**

**Offered: September Semester (Semester 1)**

**Course Type: Lecture**

Ashesi Credit Units: 1; Credit Hours: 4; Hours per week classroom: 3; Hours per week discussion: 1

Hours of Study outside of the class (reading, assignments, studying, projects, and so on): 8 per week

This course will cover the principles of microeconomic analysis with the aim of helping students make better business decisions in their professional careers. In addition to introducing the standard basis of economic theory such as perfect information, production theory, perfect competition and imperfect competition, the course will focus on helping students think strategically about achieving competitive advantage through the management of the firm's resources. Through this course, students will develop an understanding of basic microeconomic theory and improve their ability to make sound business decisions.

### 5.2.2 ECON 202 Principles of Macroeconomics

**Prerequisite: Principles of Microeconomics**

**Offered: January Semester (Semester 2)**

**Course Type: Lecture, Experiential**

Credit Hours: 4; Ashesi Credit Units: 1; Hours per week classroom: 3; Hours per week discussion: 1

Hours of Study outside of the class (reading, assignments, studying, projects, and so on): 8 per week

Welcome to Principles of Macroeconomics at Ashesi University. This is an exciting time to be taking be taking this course because the course is an introduction to macroeconomics, with application to the local context. Ashesi University is in Berekuso in Ghana, West Africa, and the economies of West African countries like Ghana are in flux due to local macroeconomics management challenges at the local level and global forces both related and unrelated to the Global COVID 19 pandemic. The principles of Macroeconomics Course at Ashesi has two objectives. First, the course will develop simple models of goods and services, assets, capital, and labour markets which can be usefully applied to generate realistic predictions regarding the behaviour of such macroeconomic variables as: output; employment; inflation; the current account; as well as interest and exchange rates. Secondly, the course will teach students to use these models to understand and interpret contemporary and historical macroeconomic developments. Current macroeconomic developments and policy challenges such as the effects of the COVID 19 pandemic, global inflation related to geopolitical conflict between Russia and Ukraine, ad rising oil global prices of oil as well as local inflation due to global forces and possible impacts of national debt and corruption on macroeconomic stability will be discussed. The role of the IMF in helping developing countries like Ghana to manage economic challenges will be assessed.

### 5.2.3 ECON 211 The Economy of Ghana

**Required for all Economics Majors**

**Prerequisite: Principles of Microeconomics or Principles of Economics**

**Offered: January Semester (Semester 2)**

**Course Type: Lecture, Experiential**

Ashesi Credit Units: 1; Credit Hours: 4; Hours per week classroom: 3; Hours per week discussion: 1

Hours of Study outside of the class (reading, assignments, studying, projects, and so on): 8 per week

The course provides information about the history of the economy of Ghana, about key current and past economic policies and how the economy of Ghana works. The course exposes students to an overview of key macroeconomic indicators to help students become astute participants in the economy.

### 5.2.4 ECON 221 Statistics with Probability

**Required for all Economics Majors**

**Prerequisite: Calculus II or Applied Calculus**

**Offered: September Semester (Semester 1)**

Ashesi Credit Units: 1; Credit Hours: 4; Hours per week [classroom]: 3; Hours per week [ discussion/lab]: 1.5

Hours of Study outside of the class (reading, assignments, studying, projects, and so on: 8 per week)

What influences consumer choice? What life-style changes lead to better health and longevity? What factors influence Africans' views on social and political issues? Are you interested in understanding how climate change is impacting communities in your home country? How can the vast amount of data collected and stored online be used to improve our quality of life? The discipline of statistics seeks to turn data into useful information that can help answer these and many other questions that may pique your interest. In this course, learning statistics will be motivated by using real data to answer questions that YOU are passionate about. Each student will: (1) generate a testable hypothesis based on secondary data; (2) understand how large datasets are structured; (3) format and manage data; (4) conduct descriptive and inferential statistical analysis; and (5) communicate the results of their research to expert and novice audiences. The process of converting data into useful information draws on the following set of introductory statistical skills taught in the course:

- Producing data
- Exploratory data analysis
- Probability

Inference Statistical computing software is the essential tool that ties the quantitative research process together In this course, you will use R and R Studio to manage data, describe data, analyse data and display data – all in the service of answering your own interesting research question!

### 5.2.5 ECON 231 Mathematics for Economists

**Required for all Economics Majors**

**Prerequisite: Calculus II or Applied Calculus, and Principles of Microeconomics**

**Offered: September Semester (Semester 1)**

**Course Type: Lecture, Experiential**

Ashesi Credit Units: 1; Credit Hours: 4; Hours per week classroom: 3; Hours per week discussion: 1

Hours of Study outside of the class (reading, assignments, studying, projects, and so on: 8 per week)

This course builds on the mathematics courses undertaken in either the Calculus or Pre-calculus track in the first year of study. Also, the course builds on Principles of Microeconomics and Macroeconomics that students study in the second year. The main purpose of the course is to introduce students to topics in Mathematical Economics and their practical applications. This prepares students for further courses in economics such as intermediate microeconomics I and II, intermediate macroeconomics I and II, advanced microeconomics, advanced macroeconomics, econometrics I and II as well as economics elective courses. The course assumes basic knowledge in mathematics, microeconomics, and macroeconomics. The course is intended to teach students mathematical techniques suitable for economics analysis. The course also focuses on the practical applications of mathematics to understanding and solving economic problems.

### 5.2.6 ECON 241 Introduction To Environmental Economics

**Required for all Economics Majors**

**Prerequisite: Principles of Microeconomics**

**Offered: January Semester (Semester 2)**

**Course Type: Lecture, Experiential**

Credit Hours: 4; Ashesi Credit Units: 1; Hours per week classroom: 3; Hours per week discussion: 1

Hours of Study outside of the class (reading, assignments, studying, projects, and so on: 8 per week)

Environmental economics focuses on the role of the environment in the theory and practice of economics. It will make use of microeconomic and statistical analysis and will incorporate real-world examples. The course discusses the reasons behind why environmental problems exist, why unregulated markets sometimes fail in this context, and potential economic solutions to these problems, which include regulations, taxes, subsidies, and pollution permit trading schemes. Methods for determining the benefits and costs of environmental preservation will also be discussed. The course explores the economic principles that underpins the use and management of natural resources and ways in which economic systems interact with natural systems. The course also equips students with the necessary knowledge to discuss and analyze environmental policies from an economic perspective

### 5.2.7 ECON 301 Intermediate Microeconomic Theory I

**Required for all Economics Majors**

**Prerequisite: Principles of Microeconomics**

**Offered: September Semester (Semester 1)**

**Course Type: Lecture, Experiential**

Ashesi Credit Units: 1; Credit Hours: 4; Hours per week classroom: 3; Hours per week discussion: 1

Hours of Study outside of the class (reading, assignments, studying, projects, and so on: 8 per week)

This course discusses the nature of markets as well as the behaviour of consumers and firms and the interactions between them in markets. The course will equip students with the basic microeconomic theory and tools essential for more advanced economics courses. Additionally, the course presents real world applications to the microeconomic theories in order to understand policy options of economic agents as they bid to maximize utility. The course uses a combination of mathematics and graphs to analyse optimal behaviour of individual consumers and firms, and the coordination of these decisions through markets.

### 5.2.8 ECON 302 Intermediate Microeconomic Theory II

**Required for all Economics Majors**

**Prerequisite: Intermediate Microeconomics I and Mathematics for Economists**

**Offered: January Semester (Semester 2)**

**Course Type: Lecture, Experiential**

Ashesi Units: 1; Credit Hours: 4; Hours per week classroom: 3; Hours per week discussion: 1

Hours of Study outside of the class (reading, assignments, studying, projects, and so on: 8 per week)

This course focuses on selected microeconomic theories, models, issues, and applications and continues with the topics discussed in Intermediate microeconomics I. Relevant topics include Oligopoly models (Cournot Model, Bertrand Model, and Stackelberg Model, Game Theory and Strategic Behaviour, Nash Equilibrium), general equilibrium and welfare economics, theory of rent, uncertainty and risk.

### 5.2.9 ECON 303 Intermediate Macroeconomic Theory I

**Required for all Economics Majors**

**Prerequisite: Principles of Macroeconomics and Mathematics for Economists**

**Offered: September Semester (Semester 1)**

**Course Type: Lecture, Experiential**

Ashesi Units: 1; Credit Hours: 4; Hours per week classroom: 3; Hours per week discussion: 1

Hours of Study outside of the class (reading, assignments, studying, projects, and so on: 8 per week)

This course is built on the earlier course in principles of macroeconomics and deepens students understanding of key macroeconomic concepts to critically appraise the macroeconomic agenda and policy decisions of governments. The course is designed to enhance the student's understanding of issues related to the functioning of the economy with a special emphasis on calculating national income, inflation, money market, goods markets, labour market and financial markets. The analysis of monetary and fiscal policies come from a balanced view of the Classical and Keynesian perspectives. The course will also provide a historical account of key developments in the various schools of macroeconomic thought apart from the Classical and Keynesian perspective (such as the Monetarists, Real Business Cycle and New Keynesians). We will relate the theories to the African context (with special emphasis on Ghana and its neighbouring countries) through journal articles to cement African examples in the minds of students to complement the American and European case studies presented in the recommended texts. Our African examples, will also draw on in-house research conducted by various Central Banks and Ministries of Finance across the African continent, the World Bank and International Monetary Fund to provide consistent applications of monetary policy, fiscal policy and other stabilisation policies enacted across Africa. Our choice of extending our examples to the African continent is the similarities of the economies, the dissipation of shocks and the decision of the African Union to have a closer integration of countries. The implication, is that, we should understand the economies of our neighbours and how shocks in their economies can affect the Ghanaian economy.

### 5.2.10 ECON 304 Intermediate Macroeconomic Theory II

**Required for all Economics Majors**

**Prerequisite: Principles of Macroeconomics and Mathematics for Economists**

**Offered: January Semester (Semester 2)**

**Course Type: Lecture, Experiential**

Ashesi Units: 1; Credit Hours: 4; Hours per week classroom: 3; Hours per week discussion: 1

Hours of Study outside of the class (reading, assignments, studying, projects, and so on: 8 per week)

This course builds on intermediate macroeconomic theory I and provides the student with a deeper understanding of growth theory, open economy macroeconomics, economic fluctuations, micro foundations of consumption and investment. Additional topics including government debt, budget deficits and stabilization policy will be discussed. Following on from intermediate macroeconomics I, we will focus on providing an African context and examples in our discussion of the various topics to provide students with real world policymaking scenarios.

### 5.2.11 ECON 321 Econometrics I

**Major Elective For Economics Major**

**Prerequisite: Principles of Microeconomics or Principles of Macroeconomics or Principles of Economics; and Statistics and Quantitative Methods (Multi Variable Calculus can replace Quant Methods as a pre-requisite for this class)**

**Offered: January Semester (Semester 2)**

**Course Type: Lecture**

Ashesi Units: 1; Credit Hours: 4.5; Hours per week classroom: 3; Hours per week discussion: 1.5

Hours of Study outside of the class (reading, assignments, studying, projects, and so on: 8 per week)

The aims of the course are to (i) introduce students to techniques for performing statistical analysis on quantitative data focusing on the estimation of the regression model (ii) help students solve problems commonly encountered in estimating statistical models like the regression model (iii) teach students to interpret the estimates from such models and (iv) enable students to be able to perform quantitative analysis using secondary data.

### 5.2.12 ECON 401 Advanced Microeconomic Theory

**Required for all Economics Majors**

**Prerequisite: Intermediate Microeconomic Theory II**

**Offered: September Semester (Semester 1)**

**Course Type: Lecture, Experiential**

Ashesi Units: 1; Credit Hours: 4; Hours per week classroom: 3; Hours per week discussion: 1

Hours of Study outside of the class (reading, assignments, studying, projects, and so on: 8 per week)

The advanced microeconomic theory builds upon the economic concepts covered under the intermediate microeconomic theory courses (Intermediate microeconomics theory I and II). This course examines in detail the assumptions, properties and basis for consumer and firm decisions. Mainly through mathematical derivations, this course delves deeper into the decision-making processes of economic agents such as consumers and firms, and their interaction in different markets. It also focuses on principal-agent problems that arise as a result of imperfections in information flow. Advanced microeconomics requires a strong background in mathematics, particularly calculus, linear algebra, and optimization theory.

### 5.2.13 ECON 402 Advanced Macroeconomic Theory

**Required for all Economics Majors**

**Prerequisite: Intermediate Macroeconomic Theory II**

**Offered: January Semester (Semester 2)**

**Course Type: Lecture, Experiential**

Ashesi Units: 1; Credit Hours: 4; Hours per week classroom: 3; Hours per week discussion: 1

Hours of Study outside of the class (reading, assignments, studying, projects, and so on: 8 per week)

This course is a continuation of Intermediate Macroeconomic Theory I & II. In this course, mathematical modules and derivations are used to explain the macroeconomic theories introduced in Intermediate Macroeconomics. The course employs comparative static to explain the impact of economic policy on macroeconomic outcomes in an open economy context.

The course aims to improve the knowledge of students on macroeconomic policies and their implications on key macroeconomic variables.

### 5.2.14 ECON 422 Econometrics II

**Required for all Economics Majors**

**Prerequisite: Econometrics I**

**Offered: September Semester (Semester 1)**

**Course Type: Lecture, Experiential**

Ashesi Units: 1; Credit Hours: 4.5; Hours per week classroom: 3; Hours per week discussion: 1.5

Hours of Study outside of the class (reading, assignments, studying, projects, and so on: 8 per week)

This course expands on the topics covered in Econometrics I and enables students to estimate empirical models, interpret results and test hypotheses. Topics discussed include Time series, Panel Data, Simultaneous Equation Estimation, Instrumental Variables (IV) and Two-Stage Least Square Regression (2SLS), Models of Qualitative Dependent Variables or Limited Dependent variables. Other topics that may be treated include Indirect least squares (ILS), Quantile Regression, and Seemingly Unrelated Regression (SURE)

### 5.2.15 ECON 451 Development Economics

**Required for all Economics Majors**

**Prerequisite: Principles of Macroeconomics or Principles of Economics; and Statistics**

**Offered: September Semester (Semester 1)**

**Course Type: Lecture**

Ashesi Units: 1; Credit Hours: 4; Hours per week classroom: 3; Hours per week discussion: 1

Hours of Study outside of the class (reading, assignments, studying, projects, and so on: 8 per week)

Development Economics is an important field of study in a rapidly changing world, as it touches on issues that affect everyone directly and indirectly. The course split into two sections, with the first section focused on critically scrutinizing the theoretical underpinnings of development theory and a survey of recent discourse in economic development. The second, larger part of the class is devoted to analysing central interlocking topics in economic development. This course provides the framework for examining economic theory within the content of real-world development challenges. The aim is to enhance student's understanding of key policy debates as they relate to economic development. The module stresses the various links and relationships among topics as well as the importance of drawing on the social and natural sciences as to ascertain a more holistic picture of society.

### 5.2.16 BUSA 400 A & B- Undergraduate Thesis I & II

**Capstone option for Economic Majors**

**Prerequisite: 8 Credits in Major Area of Study or Senior Standing in Economics**

**Offered: September Semester (Semester 1) (Undergraduate Thesis I), January Semester (Semester 2) (Undergraduate Thesis II)**

**Course Type: Seminar**

Credit Hours: 4; Ashesi Credit Units: 1; Seminar hours per week classroom: 1.5; Hours per week discussion: n/a

The thesis is likely to be both a challenging and rewarding assignment for students enrolled in the Economic program. It is an opportunity to explore a historical situation of strong economic interest, idea, policy problem and a theoretical issue. This journey helps students to pursue a topic by conducting independent research that shows significant scholarship in the field of economics and contribute to the scholarship in the process.

Students register for the thesis in both semesters of their fourth year. Each student enrolled on the thesis course will work independently on a research idea in an area of Economic theories and principles. The research will be supervised by a member of faculty. The thesis should be viewed as an opportunity to understand complex questions from diverse economic foundations. This requires using appropriate economic scholarship and research methodology to continue Ashesi's active engagement with the community (both local and global). Generally, students are expected to present a thesis that is positioned on the analysis and interpretation of their study in such a way that their thesis builds an argument.

### 5.2.17 BUSA 401 A Entrepreneurship I

**Capstone option for Economic Majors**

**Prerequisite: 8 Credits in Major Area of Study or Senior Standing in Economics**

**Offered: September Semester (Semester 1)**

**Course Type: Seminar, Experiential**

Credit Hours: 4; Ashesi Credit Units: 1; Hours per week classroom: 3; Hours per week discussion: 1

Entrepreneurship has been held by many as the key to development in the developing world. This is because it holds the potential of aiding problem solving through the development of innovative products and services. These will also help in reducing unemployment by serving as income generation avenues for the youth. If Africa, and indeed other developing economies, can achieve the Sustainable Development Goals (SDG), there will be the need to develop profit generating enterprises as well as social enterprises to serve as the backbone and propellant.

This capstone session, in a bid to further position Ashesi graduates to understand the nuances of start-ups and the entrepreneurial mindset to develop into entrepreneurs and intrapreneurs, integrates the skills and knowledge obtained from courses offered in the past three years of the student's education on campus. It will teach students what a start-up is and make the clear distinction between a start-up and a small business. It will take students through opportunity analysis and the development of sustainable business models using Eric Ries' Lean StartUp, Steve Blank's Customer Development Process and Alexander Osterwalder's Business Model Canvas.

The core teaching philosophy is experiential, learner-centric and inquiry-based to develop the mind-set, reflexes, agility and resilience an entrepreneur needs to search for certainty in the chaotic world of start-ups. This will be achieved with the adoption of several teaching aids and stress on the need to get out of the classroom to bring their businesses to life.

### 5.2.18 BUSA 401 B Entrepreneurship II

**Capstone option for Economic Majors**

**Prerequisite: 8 Credits in Major Area of Study or Senior Standing in Econ and Entrepreneurship I**

**Offered: January Semester (Semester 2)**

**Course Type: Seminar, Experiential**

Credit Hours: 4; Ashesi Credit Units: 1; Hours per week classroom: 3; Hours per week discussion: 1

Capstone Entrepreneurship II will aim to aid venture teams validate their business models by undertaking further customer and stakeholder engagements, as well as MVP tests. This will help the teams further validate their product-market fit and gain some early adopters/ earlyvangelists to patronize their products/ services and pay for them. Feedback from these earlyvangelists will inform further iterations and pivots. Venture teams will then be taken through the Customer Creation and Company Building aspects of the Customer Development process.

These form the execution aspect of the Customer Development process. The student will look at their product/ service positioning considering the market type they are entering, and then plan to launch their venture or its product/ service. Due to time constraints, strategies for reaching mainstream customers and company building, with a focus on structuring fast response departments will be put in place to aid in the executing this business model but will not be executed as a requirement of this session. Specifics include venture ownership, resource management, operations, and some management and cultural issues.

### 5.2.19 BUSA 410 A & B- Applied Project I & II

**Capstone option for Economic Majors**

**Prerequisite: 8 Credits in Major Area of Study or Senior Standing in Economics**

**Offered: September Semester (Semester 1) (Applied Project I), January Semester (Semester 2) (Applied Project II)**

**Course Type: Seminar**

Credit Hours: 4; Ashesi Credit Units: 1; Seminar hours per week classroom: 1.5; Hours per week discussion: n/a

The Applied Project is characterized by its engagement with a real-life organization. Ultimately, students are expected to integrate foundational knowledge and skills gained over time and use them to solve real-life challenges

for existing organizations. The successful execution of an Applied Project requires skills sets including research and critical analysis; stakeholder engagement; project management; professionalism and communication.

The student must be committed to the three pillars of Ashesi, and as a true scholar, be able to apply rigorous research and analytical skills to a real-life challenge; as a leader, be able to demonstrate excellent self-leadership and problem-solving skills, all executed in a professional manner; as a good citizen, seek to help an organization to create value and contribute to the body of knowledge on the selected subject matter.

### 5.2.20 ECON 461 Labour Economics

**Required for all Economics Majors**

**Prerequisite: Statistics with Probability, Intermediate Microeconomic Theory I and Intermediate Macroeconomic Theory I**

**Course Type: Lecture, Experiential**

Ashesi Credit Units: 1; Credit Hours: 4; Hours per week classroom: 3; Hours per week discussion: 1

Hours of Study outside of the class (reading, assignments, studying, projects, and so on: 8 per week)

This course provides students with clear understanding of how the labour market operates. The course emphasizes analytical frameworks used to analyze the labour market. Students will examine the role of government and labour unions on the labour market. It will also cover topics such as labor supply and demand, wage determination, human capital, discrimination, labor market institutions, and international labor markets. The course aims to equip students with the theoretical and empirical tools necessary to understand the functioning of the labour market and the implications for public policy

### 5.2.21 ECON 471 Monetary Economics

**Required for all Economics Majors**

**Prerequisite: Intermediate Macroeconomic Theory I**

**Course Type: Lecture, Experiential**

Ashesi Credit Units: 1; Credit Hours: 4; Hours per week classroom: 3; Hours per week discussion: 1

Hours of Study outside of the class (reading, assignments, studying, projects, and so on: 8 per week)

This course examines monetary policy in an economy considering different models that allow the evaluation of the real effects of monetary policy, ranging from new-Classical to Keynesian Models. Specific models will be introduced and analysed, allowing students to see exactly how these models work and what differentiates one from another. For example, a simple model of money, the overlapping generations model, where money is considered a store of value will be analysed. The course also introduces students to the concept of money; what it is, why we use it, how it is created, and the role of central banks and financial institutions in the conduct of monetary policy.

### 5.2.22 ECON 441/ BUSA 350: International Trade and Policy

**Prerequisite: Pre-calculus 1; Principles of Macroeconomics; Statistics**

**Offered: September Semester (Semester 1)**

**Course Type: Lecture, Experiential**

Credit Hours: 4; Ashesi Credit Units: 1; Hours per week classroom: 3; Hours per week discussion: 1

Hours of Study outside of the class (reading, assignments, studying, projects, and so on: 8 per week)

The last 30 years have witnessed increases in the volume of international trade and investment, significant treaties reducing barriers to trade and capital movements, and the development of regional trading blocs. This course examines these real-world events and policies in a solid analytical context. We construct simple models to analyse international trade and shed light on the underlying economic, social, and political factors that affect trade patterns. A significant part of the course is devoted to evaluating the theoretical models considering recent empirical research.

The course is designed to introduce students to the main concepts and methods of international trade using applications drawn from the real world. Throughout the course, we would convey the major ideas that have emerged from recent research while emphasizing the continued importance of the old theories.

### 5.2.23 ECON 453 Behavioural Economics

**Required for all Economics Majors**

**Prerequisite: Principles of Microeconomics and Statistics with Probability**

**Course Type: Lecture, Experiential**

Ashesi Credit Units: 1; Credit Hours: 4; Hours per week classroom: 3; Hours per week discussion: 1

Hours of Study outside of the class (reading, assignments, studying, projects, and so on: 8 per week)

This course is an essential introduction to behavioural economics with the aim of enhancing the students' decision-making process and improving their judgement by exposing them to some of the inherent systematic cognitive biases that humans are naturally born with. Behavioural economics incorporates insights from psychology, decision-making and judgment into economic models in an attempt to explain behavioural anomalies that defy standard economic theory. The course is structured to broaden and deepen the analytical and decision-making skills of students. Students will study the psychological and economic factors that drive individual and organization decisions. Through active participation, class simulation, and experiments, learners will gain valuable life skills that can be addressed with behavioural economics, design "choice architecture" to change decisions and devise experiments that test the impact of their ideas.

### 5.2.24 ECON 431 Health Economics

**Required for all Economics Majors**

**Prerequisite: Intermediate Microeconomic Theory I, Intermediate Macroeconomic Theory I, ECON 221 Statistics with probability**

**Course Type: Lecture, Experiential**

Ashesi Credit Units: 1; Credit Hours: 4; Hours per week classroom: 3; Hours per week discussion: 1

Hours of Study outside of the class (reading, assignments, studying, projects, and so on: 8 per week)

This course is an introduction to the area of health Economics. The course will expose students to the role of government in providing health care and the importance of health for development. The course will also cover topics such as Demand and supply for health care, health insurance, health financing, health reforms and policy. It also focuses on economic evaluation techniques and decision-making regarding resource prioritization within health care. The course aims to expose students to health economics as a branch of economics to develop an understanding of economic principles as applied to health and health care. Emphasis will focus on developing countries in general and Africa in particular.

### 5.2.25 ECON 454 Africa and the Oil Industry

**Major Elective for BA, MIS. Non-Major Elective for ENG and CS**

**Prerequisite: Principles of Microeconomics**

**Course Type: Lecture, Experiential**

Ashesi Credit Units: 1; Credit Hours: 4; Hours per week classroom: 3; Hours per week discussion: 1

Hours of Study outside of the class (reading, assignments, studying, projects, and so on: 8 per week)

This course will introduce students to the history of the global Oil industry, and to Oil's rise to dominance as the most effective, reliable, and economic source of global energy (and later base for industrial production), despite historically viable energy alternatives like steam. The politics and dynamics associated with the use of Oil will also be discussed. The emergence of Oil in Africa and how it affected established African local governance structures, economics, commerce, and culture will be discussed. This course explains why the need for energy to power production and commerce not only led to the eventual dominance of oil as the ultimate creator of wealth but illustrates why the need for energy led to such extreme and seemingly unrelated things as the Trans-Atlantic Slave Trade in Africa and World War II.

The course will also delve into how colonization influenced Africa's introduction to and adoption of oil, and the economic and environmental ramification of Africa's historical and contemporary dependence on Oil despite environmental and sustainability-related counterarguments. The link of the Oil industry to corruption and development in Africa will also be analysed. Policy related issues such as how the Oil sector can be optimized to

catalyse the economic development of Africa more effectively will be discussed, using Ghana and other African countries such as Nigeria and Gabon as case studies.

The twin questions of whether the Global Oil sector will remain highly lucrative (or die off) and if African countries should continue to invest in the Oil sector or take a more radical stance against Oil in the spirit of the 2015 Paris Climate Change Agreement will also be discussed. Both the introduction to the course and the last section of the course will focus on current global forces dominating industrial production; for example, the rise of Tesla in the automobile sector, and emergence of alternative sources of renewable energy in power-generation, and aviation industries moving global production and commerce away from the dependence on fossil fuels. The consequences for African economies like Ghana reliant on oil exports will be analysed.

## 5.3 Computer Science and Information Systems

### 5.3.1 CS111: Introduction to Computing and Information Systems

Ashesi Units: 1; Credit Hours: 4.5; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1.5; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 9 per week

This course will guide you to expand your understanding of computer science, information systems, information technology, and how these are used throughout the business world, from small firms to large multinational companies. You will develop an understanding of computer applications, explore principles of digital computers, the internet, and data communications. You will also learn to apply problem-solving strategies, develop an online presence through LinkedIn, and become adept at using Ashesi's computerized course management and grading systems, information systems, and business applications. Through hands-on work, you will learn basic programming skills, using Thonny, an integrated development environment (IDE) for the Python programming language designed for beginners. By means of this introductory programming work, you will develop and deepen your understanding of computer programming concepts, an understanding that is key to effective leadership and management of any company that utilises software.

### 5.3.2 CS212: Computer Programming for Computer Science

Ashesi Units: 1; Credit Hours: 4.5; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1.5; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 9 per week

This course gives students an intensive introduction to programming as a means of problem-solving. It also introduces them to the broader fields of computer science and information systems and shows a connection between computer programming and other disciplines. Concepts will be illustrated in the Python programming language. This course will introduce the object concept, using and declaring functions (methods). Basic software engineering concepts will also be introduced and will be used to solve problems through approximation, simulations, recursive formulas, and data processing.

### 5.3.3 CS213: Object-Oriented Programming

**Prerequisites: Either Computer Programming for CS OR Computer Programming for Engineering**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1.5; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 9 per week

This course builds upon the programming concepts from the Computer Programming for CS course and will develop students' ability to program using the object-oriented paradigm and the Java language. It will give students an appreciation of the advantages of object-oriented programming, help them define and construct objects, and leverage abstraction, inheritance, polymorphism, and encapsulation to develop robust and maintainable applications. It will also introduce students to event-driven programming and graphical user interfaces, as well as the use of standard Java packages and the Java collections API. Good software engineering practices will be featured in various aspects of the course: characteristics of good software, documentation, testing, and coding practices which promote correctness and robustness. Also, notations like the Unified Modelling Language (UML) will be employed. Through one or more team projects, students will gain experience in designing and implementing larger applications than in their previous programming classes.

### 5.3.4 CS221 Discrete Structures and Theory

**Prerequisites: Pre-Calculus 2 OR Calculus 1 OR Engineering Calculus, Introduction to Computing & Information Systems OR Computer Programming for CS OR Computer Programming for Engineering**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1.5; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 9 per week

This course is designed to give students in Computer Science the mathematical foundations they need for their future studies. Specifically, you will learn:

- Mathematical reasoning: how to think logically and mathematically? Understanding and constructing proofs.
- Combinatorial analysis: to be a problem solver, it is important to be able to count objects. We will see some basic techniques for counting.
- Discrete structures: of course, as the name of the course suggests, you will also learn how to manipulate discrete structures (sets, permutations, relations, graphs…).
- Algorithmic thinking: sometimes, we will solve a problem by specifying a list of steps to follow (an algorithm). Algorithms can be implemented through computer programs. By the end of this course, you will know how to describe algorithms (in both English and pseudocode), verify that they work properly, and analyse the computer memory and time required to implement them.
- Applications and modelling: applications to show the relevance and practicality of mathematics. We will see applications of discrete mathematics to computer science, data networking and biology. An important problem-solving skill is the construction of mathematical models. We will build our own models while solving some of the exercises.

### 5.3.5 CS222 Data Structures & Algorithms

**Prerequisites: Object Oriented Programming**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1.5; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 9 per week

This course is about data structures, that is, the methods of organising large amounts of data. It is also about algorithm analysis, that is, the estimation of the running time of algorithms. Specifically, this course will cover fundamental abstract data types and their implementations as data structures, such as lists, hash tables, trees, priority queues, and graphs, as well as asymptotic analyses of algorithms involving these data structures. Students will also learn about recursion, searching (sequential and binary), and sorting (selection sort, insertion sort, merge sort, and heap sort). The Java programming language will be used as the language of implementation in this course, and so Eclipse or IntelliJ will be the recommended development environments.

Course Objectives: At the end of this course, students will be able to:

- Analyse and compute the running time of algorithms, expressing these runtimes using asymptotic notation (Big-O).
- Explain and implement a variety of linear and non-linear data structures.
- Explain and implement fundamental algorithms for searching and sorting.
- Identify and apply appropriate data structures for the solution of practical problems.

### 5.3.6 CS313 Intermediate Computer Programming

**Prerequisites: Either Computer Programming for CS OR Computer Programming for Engineering**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1.5; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 9 per week

This course is a continuation of Computer Programming for CS. It will introduce students to more details of object definition and construction and event-driven programming. It will also introduce additional standard Java packages, including the file system and graphical user interface elements. This course will also give students an introduction to C++. Good software engineering practices will be featured in various aspects of the course, and notations like the Unified Modelling Language (UML) will be employed. Through one or more team projects, students will gain experience in designing and implementing larger systems. However, the emphasis of the course will be on the use of prewritten packages and built-in language facilities, as well as the design and implementation of moderately sized custom classes and algorithms, rather than on the design of whole systems.

### 5.3.7 CS 314 Human Computer Interaction

**Prerequisites: Introduction to Computing & Information Systems OR Computer Programming for CS OR Computer Programming for Engineering**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1.5; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 9 per week

This course is an introduction to Human Computer Interaction (HCI), a discipline concerned with the design, evaluation, and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them. The course considers the inherently multi- and interdisciplinary nature of HCI and situates various HCI issues in the organizational and societal contexts. It introduces theories of human psychology, principles of computer systems and user interfaces designs, a methodology of developing effective HCI for information systems, and issues involved in using technologies for different purposes.

Learning Objectives: At the end of this course, the student should be able to:

- Explain HCI and interaction design to non-experts.
- Describe cognitive foundations of HCI and user-centred design process.
- Gather and understand user requirements.
- Design and evaluate UI of low and medium complexity.
- Communicate effectively about design and evaluation.
- Discuss some of the outstanding research problems in HCI.

### 5.3.8 CS323: Database Systems

**Prerequisites: Computer Programming for CS OR Computer Programming for Engineering**

Ashesi Units: 1; Credit Hours: 4.5; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1.5; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 9 per week

This course is an introduction to the design and use of database systems - systems that manage very large amounts of data. This course is an introduction to the principles, use, and applications of database systems. Students who complete the course will be able to design and create databases, be able to extract information from databases, understand in broad terms how database systems work, and understand the purposes for which databases are used. The course covers topics such as relational design using the entity-relationship model, followed by an overview of the relational model, how to convert E/R models to relations, and how one uses a relational database system to create a database. SQL (Structured Query Language), the standard query language for relational databases will be learned and experienced as well as relational algebra; normalization of relational schemes. This course will be taught using an industry-strength RDBMS like MySQL.

### 5.3.9 CS331 Computer Organization and Architecture

**Prerequisites: EITHER Computer Programming for CS OR Computer Programming for Engineering. Completion or concurrent enrolment in Discrete Structures and Theory.**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1.5; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 9 per week

This course presents the fundamental concepts of computer organization and instruction set architectures. Assembly language programming is used to present and illustrate the concepts of instruction set design. The basics of Central Processor Unit (CPU) design and implementation are covered, including some performance enhancing methods like pipelining and memory caches. The interface to the Compiler and Operating System is described in terms of the interaction between the hardware and software components of a system. The course discusses developments in modern computer system such as parallel processing, virtual computing, and other new architectures.

Course Objectives:

- Learn digital system design process.
- Understanding of modern computer architecture.
- Understand Software-Hardware interface.
- Understand low level programming and program execution.

### 5.3.10 CS341 Web Technologies

**Prerequisites: Computer Programming for CS OR Computer Programming for Engineering, Completion or concurrent enrolment in Database Systems**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1.5; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 9 per week

This course introduces the World Wide Web Consortium (W3C) standard markup language and services of the Internet. Topics covered will include basic and advanced HTML, scripting and active pages, design and active pages, design and development of Web-based applications, principles and tools for Web content creation, database fundamentals for the Web, Web management, and Web service delivery. The primary goal of this course is to introduce the relevant technologies and skills needed to design, develop, deploy, and manage effective Web Applications. To achieve this goal, we will use a set of 'programming languages': HTML, CSS, JavaScript (AJAX, jQuery, Frameworks or Libraries), PHP, MySQL (relational database management system) and Content Management Systems (CMS).

### 5.3.11 CS353 Introduction to AI Robotics

**Prerequisites: EITHER Computer Programming for CS OR Computer Programming for Engineering; EITHER Calculus II OR Applied Calculus OR Engineering Calculus**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week in Lab: 1.5; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 6-9 per week

This course gives a theoretical as well as practical hands-on introduction to AI robotics as a field that integrates expertise in Computer Science, Engineering, Design and Mathematics to create innovative robotic systems that interact with and can operate autonomously or semi-autonomously in the physical world. Topics covered include locomotion, manipulation, actuation, sensing, control, path-planning, kinematics, robot vision, task execution, robot learning, and the Robot Operating System (ROS). Building on a broad overview of field of robotics, the emphasis is on algorithms and programming approaches that enable "intelligent" behaviour in robots. Most programming tasks will be done in Python.

### 5.3.12 CS361: Introduction to Modelling and Simulation

**Prerequisites: EITHER Computer Programming for CS OR Computer Programming for Engineering; EITHER Calculus 1 OR Applied Calculus OR Engineering Calculus; Discrete Structures & Theory**

Ashesi Units: 0.5; Credit Hours: 2; Hours per Week in Classroom: 1.5; Hours per Week in Lab: 1.5; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 3-4 per week

Real-world systems, such as games, communication networks or transportation systems can be modelled using statistics and a variety of modelling formalisms. This course introduces the process of designing models of existing or proposed real-world systems, and how to use the models to perform simulations that allow for predictions about the future behaviour of the system. Programming assignments provide the opportunity to construct prototype modelling tools and simulators based on the theory. In addition, applications from a variety of domains are used to illustrate the different modelling formalism.

### 5.3.13 CS402: CSIS Research Seminar

*Ashesi Units: 1; Credit Hours: 4.5; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1.5; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 9 per week*

What does it mean to do computer science research? Is it like anthropology? Do you leave your comfort zone to reside amidst processors and RAMs observing their day-to-day charade and blogging to the rest of the world? Are you more of a biologist? Do you put a motherboard under a microscope and hope that it reveals its innermost secrets to you (and only you)? Or do you put on the hat of a psychologist, designing increasingly intricate and controversial experiments in an attempt to ascertain what your machine really thinks about your data (and you)? Well, you will be able to tell by the end of this class.

We will build an understanding of research in computer science so that we can read, critique, and extend both new and old ideas. We will first discover the many joys (and the myriad tribulations) of reading a computer science research paper: What do you look out for? What do you ignore? When someone asks you what the paper is about, what do you tell them? How to separate meaning from myth? We will then use this framework to read, assimilate, and appreciate a variety of research papers, some new some old. Throughout the semester we will read, present, and review classic research papers as well as contemporary research work from data science, machine learning, and the application of these two areas in the West African context.

### 5.3.14 CS413: Concepts of Programming Languages

**Prerequisites: EITHER Computer Programming for CS OR Computer Programming for Engineering, EITHER Data Structures and Algorithms OR Discrete Structures and Theory.**

*Ashesi Units: 1; Credit Hours: 4.5; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1.5; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 9 per week*

This course examines fundamentals concepts in programming languages and major tools and techniques to implement them. The key characteristics of major programming paradigms, including the imperative programming paradigm and the functioning programming paradigm, will be studied and compared. Topics covered include specification and informal semantic models; binding and scoping; types and type systems; control structures; data abstraction; procedural abstraction and parameter passing; higher-order functions; and memory management. Programming assignments will give students the opportunity to master the course concepts.

### 5.3.15 CS415 Software Engineering

**Prerequisites: EITHER Computer Programming for CS OR Computer Programming for Engineering, EITHER Web Technologies OR Intermediate Computer Programming OR Data Structures**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1.5; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 9 per week

This course will introduce a collection of methods which embody an "engineering" approach to the development of computer software. The content starts with development lifecycle models, such as waterSeptember Semester (Semester 1), agile development, etc. and then continues to cover requirements specification, analysis and design - the Unified Modelling Language (UML), software architecture, and testing. Software engineering is an inherently practical subject and applying the concepts being taught is a vital component of developing expertise in this area. Consequently, students undertake a substantial group project, working through several stages of the development of a (larger) software application. Students will be supervised but will be expected to largely organize themselves and their work, learning key transferable skills in management and organisation.

This course will adopt an experiential learning model which places a lot of emphasis on students learning through experiences and is more narrowly defined as "learning through reflection on doing". Also, a particular focus will be on project management and documentation.

### 5.3.16 CS424 Advanced Database Systems

**Prerequisites: Database Systems, EITHER Discrete Structures and Theory OR Data Structures and Algorithms**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1.5; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 9 per week

Advanced Database Management Systems course deals with the usage as well as concepts of design and architecture of databases. In covering the concepts, theorems and algorithms, proofs relevant to different aspects (design, architecture, and implementation) are covered. The general approach is to go through design, architecture (schema, indexes, and storage), core features (transactions, concurrency), and specialized database usage (data mining & data warehousing). The practical work done in the course goes through usage of some advanced SQL features and the implementation of some algorithms and coding of internals of an actual database system.

Students should already know structured query language. The course will build further on this to include concepts such as union types and predicates. The diagram format for design may change a bit but it provides students more expressivity for their designs.

### 5.3.17 CS432 Networks & Data Communications

**Prerequisites: EITHER Computer Programming for CS OR Computer Programming for Engineering**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week in Lab: 1.5; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 6-9 per week

This course introduces students to the fundamental concepts of computer networks and data communications, with practical applications; students will be able to recognize the components, relevance, advantages, and disadvantages of networking computers. Students will be introduced to the principles of data communications and transmission.

Protocols employed in layers 1 to 3 will be examined in depth. Layer 4 protocols will be highlighted and compared to layer 2.

Methods and mechanisms for constructing distributed computing systems and network services are discussed in the context of common Internet systems such as electronic mail, print and file servers and Web services.

Hands-on exercises are used to help reinforce the fundamental concepts learnt. Labs will cover typical network operations tasks. Students will review hardware used in practice, common topologies and set up services on typical enterprise networks.

### 5.3.18 CS 434: Parallel & Distributed Computing

**Prerequisites: Data Structures and Algorithms AND Computer Organization and Architecture**

*Ashesi Units: 1; Credit Hours: 4.5; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1.5; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 9 per week*

This is an introductory course on developing and implementing efficient algorithms and applications for parallel and distributed systems. Computer systems today generally consist of either a tightly coupled or a loosely coupled network of multi-processors, e.g., MPP, cluster, grid, and peer-to-peer. Learning how to develop and program applications for such systems is a paramount skill for all Computer Scientist. This course will cover various aspects of parallel and distributed computing architectures and efficient algorithm design to harness the multi-processor configurations with emphasis on hands-on programming. It will explore and develop fundamental skills for implementing applications using various facets of networking, parallel and distributed programming techniques. Topics addressed include but not limited to: Network Interconnects; Shared-memory and Message-Passing Architectures; OpenMP, MPI and Hybrid Computational models; Basic techniques for Parallel/distributed programming and synchronization; Parallel/distributed algorithms and Applications; Graphics Processing Unit Programming using CUDA; Data Intensive Processing with MapReduce and Parallel I/O techniques.

### 5.3.19 CS435 Operating Systems

**Prerequisites: EITHER Computer Programming for CS OR Computer Programming for Engineering, EITHER Discrete Structures and Theory OR Data Structures and Algorithms**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1.5; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 9 per week

Operating Systems are fundamental to the operation of modern computer systems. This course will help students understand how the Operating System plays an intermediary role between the user and the hardware. The course will cover the theory and practice of modern operating systems specifically focusing on specialized algorithms, protocols, mechanisms, and policies operating systems employ. Students will master skills of building systems that manage computational resources efficiently. Students will be expected to write programs that demonstrate understanding of managing computational resources. Connections will also be made between operating systems concepts and the world of containerization and cloud computing.

### 5.3.20 CS442 E-Commerce

**Required for MIS, Elective for CS**

**Prerequisites: Database Management Systems and Web Technologies**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 4; Hours per Week of Discussion: 1.5; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 9 per week

This course discusses the key electronic commerce concepts and principles and exposes students to the various technologies and techniques for implementing effective e-commerce systems. Various e-commerce models and requirements for a successful Internet business, major challenges, and corresponding solutions to such challenges are also explained. Legal and ethical issues will be discussed, as well as marketing and revenue models for online businesses. Students will acquire hands-on experience in building and securing transactional e-commerce platforms.

### 5.3.21 CS451: Computer Graphics

**Prerequisites: Computer Programming for CS OR Computer Programming for Engineering, Computer Organization, and EITHER Intermediate Computer Programming OR Data Structures.**

*Ashesi Units: 1; Credit Hours: 4.5; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1.5; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 9 per week*

This is an introductory course in computer graphics, an advanced topic in the field of computer science. Computer graphics are key to many modern software applications. This is not a class in how to use existing graphics-intensive applications (such as Macromedia's Director or Flash, or Alias' Maya or Pixar's Renderman); we will learn the algorithms underlying these tools and the importance of implementing these algorithms for speed. The course introduces the basic concepts of computer graphics, including the theoretical background as well as fundamental algorithms and data structures that are used in today's interactive graphics systems. The course will cover an introduction to 2D and 3D graphics, including scan conversion, anti-aliasing schemes, clipping, OpenGL programming, 3D viewing and transformations, homogeneous coordinates, perspective and orthographic projections, illumination, shading, and some topics needed from linear algebra. The course gives the opportunity for students to develop programming skills in computer graphics through programming assignments.

### 5.3.22 CS452 Machine Learning

**Prerequisites: Computer Programming for CS OR Computer Programming for Engineering, Multivariable Calculus & Linear Algebra**

Ashesi Units: 1; Credit Hours: 4.5; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1.5; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 9 per week

This course introduces machine learning. Topics include supervised and unsupervised machine learning, statistical inference, and prediction. A wide variety of algorithms will be presented, including logistic regression, K-nearest neighbours, naïve Bayes, decision trees, neural networks, K-means, mixtures of Gaussians, principal components analysis, Expectation Maximization. The course will also discuss modern applications of machine learning such as image segmentation and categorization, speech recognition, and text analysis.

### 5.3.23 CS 455 Applied Cryptography and Computer Security

**Prerequisites: Data Structures OR Discrete Structures & Theory; Database Systems; Computer Programming for CS/Eng.**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week in Lab: 1.5; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 6-9 per week

Computer Security concerns the theory, concepts, techniques, and tools used to ensure confidentiality, integrity, and availability. This means understanding security frameworks, threat models, security policies, and mechanisms for prevention, detection, and recovery from attacks.

### 5.3.24 CS 456: Algorithm Design & Analysis

**Prerequisites: Student is expected to have obtained grade C or better in each of the following CS 212 Computer Programming or CS 112 Computer Programming for Engineering; CS221 Discrete Structures & Theory;**

*Ashesi Units: 1; Credit Hours: 4.5; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1.5; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 9 per week*

Algorithm design is fundamental to Computer Science, and powerful algorithms are at the heart of most of the electronic tools we use every day, from Facebook to Google Maps, to airline scheduling systems. This course focuses on learning fundamental principles of algorithm design and analyzing the time and space complexity of algorithms. We will cover algorithm design strategies such as brute-force, greedy, divide-and-conquer, recursive backtracking, dynamic programming, and heuristic strategies. We will also introduce the concept of NP completeness and tractability. This course trains you to apply powerful problem-solving techniques to the complex problems you will encounter in your career as a computer scientist.

### 5.3.25 CS458 Internet of Things

**Prerequisites: Computer Programming for CS AND Database Systems (for CSIS students), Computer Programming for Engineering AND Circuits & Electronic (for Engineering students)**

Ashesi Units: 1; Credit Hours: 4.5; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1.5; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 9 per week

The Internet of Things (IoT) course takes an end-to-end view of IoT including the devices, networks, data analytics, programming, security, and business. It exposes the student to all aspects of a functional IoT system and how to design a secure, robust and scalable IoT network, taking on a hands-on approach. Labs and small projects will be used to gain understanding of key concepts at the various layers. Key among these are the devices, network protocols, data and programming aspects. Students will review hardware types and software tools and be introduced to IoT design principles which cover how to transition from an IoT idea to an IoT product, building of prototypes and commercializing them. Since IoT is still emerging, businesses are going to be either adopting IoT solutions or transforming their existing businesses to include IoT in a seamless and sustainable manner. The course addresses these aspects as well, in order to prepare participants to lead in this budding industry in the business segment.

### 5.3.26 CS459 Natural Language Processing

**Prerequisites: Computer Programming for CS OR Computer Programming for Engineering**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week in Lab: 1.5; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 6-9 per week

This an introductory course in Natural Language Processing (NLP). NLP is a subfield of Artificial Intelligence (AI) concerned with computers' ability to process and generate text in everyday human languages. NLP may also deal with textual content in audio and other modalities. This course will seek to give students a basic understanding of what NLP is and introduce them to some state-of-the-art approaches and techniques in NLP while stirring their imaginations to harness the power of NLP for African languages. Since the state-of-the-art for many tasks in NLP uses deep learning, the course will focus on using neural networks for NLP.

Course Objectives:

- To provide students with a basic understanding of NLP.
- To introduce students to state-of-the-art techniques in NLP.
- To stir students' imagination in harnessing NLP for African languages.
- To encourage students to think about and apply NLP in solving local and global problems.
- To give students a foundation for understanding NLP papers.

### 5.3.27 CS461 Data Science

**Prerequisites: Linear algebra, Calculus, Statistics with Probability AND Computer Programming for CS OR Computer Programming for Engineering**

Ashesi Units: 1; Credit Hours: 4.5; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1.5; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 9 per week

Data Science is the art of creating programming code and combining it with statistical knowledge to create insights from data. This class is an introductory level undergraduate course in data science. Throughout the class, we will be covering the topics linear regression, gradient descent and cost functions, dummy variables, one hot encoding, training and testing data, logistic regression, decision trees, support vector machines, random forest, k-means clustering, naive bayes, principal component analysis, hyper parameter tuning, L1-L2 regularizations, k-fold cross validation, artificial neural networks.

### CS462: Cloud Computing

**Prerequisites: Computer Programming for CS, Databases, Web Technologies (Familiarity with Java/C++ and/or Python).**

*Ashesi Units: 1; Credit Hours: 4.5; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1.5; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 9 per week*

Computing in the cloud has emerged as a leading paradigm for cost-effective, scalable, well-managed computing. Users pay for services provided in a broadly shared, power efficient datacenter, enabling dynamic computing needs to be met without paying for more than is needed. Actual machines may be virtualized into machine-like services, or more abstract programming platforms, or application-specific services, with the cloud computing infrastructure managing sharing, scheduling, reliability, availability, elasticity, privacy, provisioning, and geographic replication.

Cloud Computing has transformed the IT industry by opening the possibility for infinite or at least highly elastic scalability in the delivery of enterprise applications as software-as-a-service (SaaS), platform-as-a-service (PaaS) or infrastructure-as-a-service (IaaS). Amazon Elastic Cloud, Microsoft's Azure, Google Cloud, and many other Cloud

offerings give software vendors and new start-ups the option to deploy their applications to systems of infinite computational power with practically no initial capital investment and with modest operating costs proportional to the actual use. The course examines the most important APIs used in Google Cloud and Amazon Web Services (and Microsoft Azure), including the techniques for building, deploying, and maintaining machine images and applications. We will learn how to use Cloud as the infrastructure for existing and new services. We will use open-source implementations of highly available clustering computational environments, as well as RESTful Web services, to build powerful and efficient applications. We also learn how to deal with non-trivial issues in the Cloud, such as load balancing, caching, distributed transactions, and identity and authorization management. In the process we will also become very familiar with Linux operating system.

CS463: Computer Vision

**Prerequisites: Data Structures and Algorithms AND (Calculus 1 OR Applied Calculus OR Engineering Calculus) AND (Linear Algebra OR Multivariable Calculus and Linear Algebra) AND (Statistics with Probability OR Statistics for Engineering & Economics)**

*Ashesi Units: 1; Credit Hours: 4.5; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1.5; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 9 per week*

This course introduces computer vision, a subfield of artificial intelligence dealing with how computers gain high-level understanding from digital images or videos. Topics covered include the fundamentals of image formation, camera imaging geometry, feature detection and matching, stereo, motion estimation and tracking, image classification and scene understanding, depth from stereo and motion, camera calibration, object tracking, boundary detection, and object recognition. The focus will be on theory as well as on practice and implementation, using both classical machine learning and deep learning approaches.

CS463: Computer Game Development

**Prerequisites: Web Technologies OR Intermediate Computer Programming OR Applied Programming for Engineers**

*Ashesi Units: 1; Credit Hours: 4.5; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1.5; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 9 per week*

Game design is approached from historical, developmental and creative perspectives. The course proceeds through cycles of theory, game analysis and practical design exercises focusing on different eras and genres.

Study methods: Video lectures. Contact teaching sessions. Game development group projects. Home assignments.

CE451: Embedded Systems

**Prerequisite: Digital Systems Design**

*Ashesi Units: 1; Credit Hours: 4.5; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1.5; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 9 per week*

This course will cover the design and implementation of embedded systems from a hardware and software perspective. Students will go through the design process of embedded systems and analyse the tradeoff between a hardware and software implementation. They will also learn software development techniques unique to embedded systems such as real-time operations, I/O operations, and communications. The bare metal approach to embedded systems development is highlighted. Students will learn to read data sheets and implement drivers with bit-level manipulation. There is an emphasis on creating responsive multitasking systems. An introduction to a Real Time Operating System will be given

### 5.3.28 IS333 IT Infrastructure and Systems Administration

**Prerequisites: Computer Programming for CS OR Computer Programming for Engineering**

Ashesi Units: 1; Credit Hours: 4.5; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1.5; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 9 per week

This course introduces IT Infrastructure as a shared technology resource for students majoring in Management Information Systems. It covers topics related to both computer and systems architecture and communication networks, with an overall focus on the services and capabilities that IT Infrastructure solutions enable in an organizational context. It gives the students the knowledge and skills that they need for communicating effectively with professionals whose special focus is on hardware and systems software technology and for designing organizational processes and software solutions that require in-depth understanding of the IT Infrastructure

capabilities and limitations. The course focuses strongly on Internet-based solutions, computer and network security, business continuity, and the role of Infrastructure in regulatory compliance.

### 5.3.29 IS351: Systems Analysis and Design

**Prerequisites: Computer Programming for CS OR Computer Programming for Engineering**

*Ashesi Units: 1; Credit Hours: 4.5; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1.5; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 9 per week*

This course will cover the principles of information system analysis and design. Students will learn the tools and techniques for conducting feasibility analysis, requirements elicitation, and analysis, along with various methods for modeling and designing user requirements. Students will model conceptual, logical, and physical representations of information systems. They will also be exposed to various IT tools for systems analysis and design, and how they can be applied within the constraints of the domain and the business rules. User-centered design techniques, and Object-oriented systems analysis and design principles and concepts will be emphasized in this course.

### 5.3.30 IS 362: IS Project Management

**Prerequisites: Introduction to Computing and Information Systems, Prior or concurrent enrolment in Systems Analysis and Design**

*Ashesi Units: 1; Credit Hours: 4.5; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1.5; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 9 per week*

This course comprehensively introduces project management in an information technology/systems context. It will explain the need for project management and the issues associated with managing projects in the IS/IT context. The critical phases of the project management cycle and various tools, techniques, and methods used in each project phase are also discussed. The course will consider theoretical and practical perspectives and equip students with the necessary skills to better manage or participate in projects. The course is designed in line with the Project Management Body of Knowledge (PMBoK) from the Project Management Institute.

### 5.3.31 IS371: Technology & Ethics

*Ashesi Units: 1; Credit Hours: 4.5; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1.5; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 9 per week*

The digital world comes with it the ability for everyday activities technologically driven. Meaning: every sector of society – government, law, education, health, transport, agriculture, etc., will be affected. This means culture (the way of life for people), institutions, relationships, values and norms will be affected. Culture, as we know it, has some ethical foundations which are being threatened by the rise of technology. This course discusses ethical issues in emerging technologies. As society becomes more dependent on technology, students need the ability to critically assess issues (historical and future) from the virtual world to digital divide, artificial intelligence, machine learning, etc., evaluating alternative strategies or approaches and recommending policies. This course introduces and builds on theoretical and empirical understanding of how information technology shapes and is shaped by society(policies). Areas such as social media, privacy, security and surveillance will be discussed.

### 5.3.32 IS451 Information and Systems Security

**Prerequisites: Discrete Structures**

Ashesi Units: 1; Credit Hours: 4.5; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1.5; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 9 per week

This course introduces IT Infrastructure as a shared technology resource for students majoring in Management Information Systems. It covers topics related to both computer and systems architecture and communication networks, with an overall focus on the services and capabilities that IT Infrastructure solutions enable in an organizational context. It gives the students the knowledge and skills that they need for communicating effectively with professionals whose special focus is on hardware and systems software technology and for designing organizational processes and software solutions that require an in-depth understanding of the IT Infrastructure capabilities and limitations. The course focuses strongly on Internet-based solutions, computer and network security, business continuity, and the role of Infrastructure in regulatory compliance.

## 5.4 Mathematics Track

Mathematics courses taken by various majors at Ashesi are housed in the Computer Science Department.

### 5.4.1 MATH101 College Algebra

**Prerequisites: None**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week in Lab: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

The goal of this course is to help freshmen develop a good knowledge of basic mathematical principles. Because the best way to learn mathematics is to do mathematics, classes will include a lot of meaningful activities through which students will build mathematical intuition, effective problem-solving skills, and discover real-world applications of mathematics.

### 5.4.2 MATH121 Pre-calculus 1

**Prerequisites: None**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week in Lab: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

One definition of mathematics is the science of patterns. Patterns are all around us and the human brain is wired to recognize them. Pre-calculus uses the formal concept of functions to identify and describe patterns found in data, patterns expressed as a formula, and patterns identified visually in a graph. The emphasis of the course is on developing a conceptual understanding of the definition of a function, the characteristics of important function families, connections to real life, and how the study of functions facilitates the understanding of calculus. A focus on problem solving strategies, such as drawing diagrams, systematic lists, looking for patterns, matrix logic, unit analysis, estimation, and others, further develop students' skills in quantitative reasoning.

### 5.4.3 MATH122 Pre-calculus 2

**Prerequisites: Pre-calculus 1**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week in Lab: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

This course is a sequence to the Pre-calculus 1 course. Its focus continues to be on functions and their connections to real life, and how the study of functions facilitates the understanding of calculus. A focus on problem solving strategies, such as drawing diagrams, systematic lists, looking for patterns, matrix logic, unit analysis, estimation, and others, further develop students' skills in quantitative reasoning.

### 5.4.4 MATH141 Calculus 1

**Prerequisites: None**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week in Lab: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

This course seeks to equip students with an intuitive idea of limits. We will discuss continuity and the derivative of a function. Rules of differentiation would be examined and applied. The derivative of the elementary and transcendental functions would be discussed. We would apply the taught theoretical concepts to solve real-life problems.

### 5.4.5 MATH142 Calculus 2

**Prerequisites: Calculus 1**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1.5; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 6-9 per week

Many quantities in Business and the Sciences result from an accumulation or integration process. For instance, total cost of running a coffee shop for a given month, the total revenue accrued by Local Revenue Authorities over a two-year period, the total distance travelled by Inter-City Transport operators, etc. Therefore, accumulation or integration is an everyday experience. In many instances, one can only find information about the rate of change of the desired quantities. Integral calculus is the branch of Mathematics that deals with techniques that lead to complete

knowledge of such unknown quantities based on knowledge of their rates of change (derivatives). Key areas of focus of the course include Concepts, Techniques and Application of Integration to Business and related fields.

### 5.4.6 MATH152 Statistics for Engineers

**Pre-requisites: Engineering Calculus**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week in Lab: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

This course is a calculus-based, mathematical introduction to the fundamental principles of probability theory, statistics, and applications. Topics include descriptive measures, the axioms and properties of probability, combinatorial analysis used in computing probabilities, conditional probability, independence of events, sampling theory, discrete and continuous random variables, the standard distributions, estimation and hypothesis testing, analysis of variance, regression, and correlation, expected value and variance, joint distributions, distributions of a function of a random variable, and sampling distributions. Also included are theoretical results such as Bayes Theorem, Central Limit Theorem, Law of Large Numbers, the Empirical Rule, Hypothesis Testing and Confidence intervals at least for a single mean and a single proportion. Programming in R or a similar language will be used to gain experience with statistical analysis in practice.

### 5.4.7 MATH 161 Engineering Calculus

**Required for CE, EE and ME students**

**Pre-requisites: none**

This course equips students with knowledge of differential and Integral Calculus which is fundamental to the field of Engineering. The focus is three dimensional: Concepts, Methods, and Applications. Technology such as graphing utility and GeoGebra will be used to aid concept building and solution process.

### 5.4.8 MATH211 Multivariable Calculus & Linear Algebra

**Prerequisites: Calculus for Engineering**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week in Lab: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

Physical problems require problem solving approaches which combine mathematical thinking and technology to develop modern solutions. Linear algebra and multivariable calculus are a course which provides the essential and foundational toolkit needed to approach such real-life problems. In this course, you will build on your existing differentiation and integration of single variable studied in prerequisite courses and expand into multivariable calculus and linear algebra. Students will learn how to solve variety of equations in multi-dimensional spaces as well as study how to manipulate linear equations and vectors to solve some engineering problems.

### 5.4.9 MATH212 Linear Algebra

**Prerequisites: Calculus I & II or Applied Calculus**

*Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week in Lab: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week*

This course is a one semester course in Linear Algebra and its applications. The course will focus on concepts, underlying theory, techniques and applications of linear systems, linear transformations and vector spaces in the computer science and engineering domains. Aspects of the course will be hands-on and project-based and will make use of the Python programming language to aid data explorations and computations.

### 5.4.10 MATH221 Statistics with Probability

**Prerequisites: Pre-Calculus 2 or Calculus 1**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week in Lab: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

What influences consumer choices? Why are some people healthier, academically more successful, or more athletic than others? Are you interested in understanding how climate change is impacting communities in your home country? How can the vast amount of data collected and stored online be used to improve our quality of life? The

discipline of statistics seeks to turn data into useful information that can help answer these and many other questions that may pique your interest. In this course, learning statistics will be motivated by using real data to answer questions that YOU are passionate about. Each student will: (1) generate a testable hypothesis from real data; (2) understand how large datasets are structured; (3) format and manage data; (4) conduct descriptive and inferential statistical analysis; and (5) communicate the results of their research to expert and novice audiences. The process of converting data into useful information draws on the following statistical foundation skills taught in the course such as producing data, exploratory data analysis, probability, and inference. Statistical computing software is the essential tool that ties the quantitative research process together. In this course, you will use R and R Studio to manage data, carry out statistical analysis, conduct simulations, and create graphs and charts to represent data visually – all in the service of answering your own interesting research question!

### 5.4.11 MATH233 Quantitative Methods

Prerequisites: Pre-Calculus 2 or Calculus 2 AND Statistics or Statistics for Engineering & Economics

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week in Lab: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

This course will survey quantitative approaches to work in the business world. The course introduces students to concepts, techniques and software with which all successful managers should be familiar. The course has three main components: operation research/management science, project management, and statistics.

The course is hands-on, using spreadsheet techniques with minimal reference to complex or abstract mathematics and the R software. The statistical tests will be useful in nearly any senior project work, as well as any significant quantitative decision-making in a business context. Students will develop critical thinking and problem-solving kills and become proficient at applying Operational Research/Management Science techniques, construct models to inform business decisions.

### 5.4.12 MATH211 Multivariable Calculus & Linear Algebra

**Prerequisites: Calculus I & II**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week in Lab: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

Physical problems require problem solving approaches which combine mathematical thinking and technology to develop modern solutions. Linear algebra and multivariable calculus is a course which provide the essential and foundational toolkit needed to approach such real-life problems. In this course, you will build on your existing differentiation and integration of single variable studied in prerequisite courses expand into multivariable calculus and linear algebra. Students will learn how to solve variety of equations in multi-dimensional space as well as study how to manipulate linear equations and vectors to solve some engineering problems.

### 5.4.13 MATH 251 Differential Equations & Numerical Methods

**Prerequisites: Multivariable Calculus & Linear Algebra, Applied Programming for Engineering or Computer Programming for CS**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week in Lab: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

This course will introduce students to the topics associated with differential equations and applied numerical methods in solving engineering problems. Students will learn how to translate engineering problems into differential equations, develop MATLAB models and investigate different numerical methods to find solutions.

Using software, students will learn how to solve differential equations, find roots of equations, the method of gradient descent, discrete and continuous optimization, and finding the solution of linear equations using numerical methods. Techniques will be applied in a series of projects focused on engineering applications.

## 5.5 Engineering

### 5.5.1 Engineering Core

#### *5.5.1.1 ENGR 112 Introduction to Engineering*

**Prerequisites: None**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week in Lab: 1

Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

This course will provide a broad overview of the engineering discipline, with the goal of providing a foundation for the rest of the curriculum in terms of engineering concepts, hardware/software skills, and application of the design process. The course will introduce students to basic principles from computer, electrical, and mechanical engineering and challenge them to apply those concepts through the designing and building of a team project. Students will also practice fabrication skills, CAD and Arduino to successfully accomplish their interdisciplinary project. The course is designed to aid students to build an engineering approach to problem-solving. It will also expose the students to potential career trajectories, the ethical standards for professional engineers, and build an eye for using engineering to address local design needs.

#### *5.5.1.2 CS 112 Computer Programming for Engineering*

**Prerequisites: None**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week in Lab: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 6-8 per week

This is a first course in computer programming, primarily intended for students pursuing a major in computer science or engineering, and/or who have had some previous programming practice. Topics include computer representation of data, object-oriented programming, variables and assignments, primitive types and operations, conditional execution, iteration, arrays, classes, methods, recursion, object types, encapsulation, inheritance, and reasoning about programs. The course includes a laboratory component designed to enhance comprehension.

This course gives students an intensive introduction to programming as a means of problem-solving. It also introduces them to the broader fields of computer science and information systems and shows a connection between computer programming and other disciplines. Concepts will be illustrated in the Python programming language. This course will introduce the object concept, using and declaring functions (methods). Basic software engineering concepts will also be introduced and will be used to solve problems through approximation, simulations, recursive formulas, and data processing.

#### *5.5.1.3 ENGR 212 Instrumentation for Engineering**

**Prerequisites: Circuits and Electronics and Statistics for Engineering**

Ashesi Units: 0.5; Credit Hours: 2; Hours per Week in Classroom: 1.5; Hours per Week in Lab: 2; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 4-5 per week

This course continues the concept of measurement and measurement error that is introduced in the Physics sequence. Students study measurement systems, instruments, and measurement errors, and the use of probability and statistical analysis to design and execute experiments in the presence of measurement errors. An emphasis of the course is the design of instrumentation for experimental problem-solving in real systems.

#### *5.5.1.4 ENGR 300 Year 3 Group Project & Seminar**

**Prerequisites: Leadership Seminar 3**

Ashesi Units: 0.5; Credit Hours: 2; Hours per Week in Classroom: 1.5; Hours per Week in Lab: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 5-6 per week

In their third year, engineering students will participate in a one-year group project that ideally cuts across multiple engineering fields (electrical and electronic, mechanical and computer), to revisit the design process at a higher level, to deepen teamwork skills, and to reinforce system level thinking. Part 1 of the third-year project is implemented through Leadership 4 for Engineers, which will address leadership, service learning, and responsibilities of the engineering profession to the community. Projects undertaken will include a service-learning component. Students will consider more than technical feasibility in their solutions, but also the desirability and sustainability of

their solution to the community and the environment. In the course Third Year Group Project and Seminar, a weekly seminar that will facilitate group meetings and coordinate milestone completions, as well as provide a forum for discussion regarding professional issues and system level design. Students will also be required to reflect on their teamwork experiences, their own learning, and their completed group project, and present their project in a public forum. Learning objectives for the Third Year Group Project and Seminar include a maturing of design thinking and creative thinking skills, consideration of qualities such as environmental and societal impacts of their design, deepening of system-level thinking, project management experience, teamwork, and communication skills development.

#### *5.5.1.5 SC 221 Materials Science & Chemistry*

**Prerequisites: Engineering Mechanics**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week in Lab: 2; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

This course will introduce students to the basic principles of chemistry and their application to materials science and engineering. Students will study the impact of atomic, ionic, and molecular structure of materials on their micro-structure and properties, and the relationship between electronic structure, chemical bonding, and atomic order. Principal applications and properties of metals, polymers, and ceramics, and composites materials will be studied. Examples from industrial practice and emerging technologies will be used, including the environmental impact of chemical processes, the chemistry involved in energy generation and storage (e.g., batteries and fuel cells). At the end of the course, students will be able to identify materials used in engineering and understand their thermo-chemical and electrical properties.

#### *5.5.1.6 ENGR 311 System Dynamics*

**Prerequisites: Differential Equations**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week in Lab: 2; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

The aim of this course is to expose students to understanding the behaviour of engineering systems using systems thinking. The course is an introduction to mathematical modelling of dynamic systems and response analysis of these systems, including, but not limited to, mechanical, electrical, electromechanical, hydraulic, fluid, and thermal systems. The mathematical models will be obtained analytically, but an experimental approach will be introduced. Computer simulation of various systems, using appropriate software, will be conducted.

#### *5.5.1.7 ENGR 312 Control Systems*

**Prerequisites: Systems Dynamics**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week in Lab: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

This course builds on System Dynamics (ENGR311) and introduces students to the theory and practice of control systems. Emphasis is placed on the practical application of the subject to the analysis and design of feedback control systems. Students will model various control systems in the frequency and time domain; mostly, mechanical, electrical, and electro-technical dynamic systems will be considered. Students will study various classical and modern control techniques that will be used to analyse and design controllers for linear systems. Computer software will be applied in the modelling, analysing, and designing of the control systems. Simulation results will be compared with experimental results. Practical and industrial examples from different engineering fields will be discussed. The course focuses on continuous systems, but digital control systems are introduced. Non-linear dynamic models are also introduced. The course is suitable for students' pursuing computer, electrical, and mechanical engineering and computer science.

#### *5.5.1.8 ENGR 401 Senior Project & Seminar*

**Prerequisites: Year 3 Group Project**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 1.5; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 9-10 per week

A one hour per week seminar provides a discussion forum for technical writing, ethics and social responsibility, and other topics, and will also serve to guide the project management timeline of the project. At the end of the senior

project, students will write a technical report (summary) of their work and do a public presentation of their work. To reinforce professional writing, each member of a senior group project will write-up their own supporting documents.

#### *5.5.1.9 ENGR 413 Project Management and Professional Practice*

**Prerequisites: Year 3 Group Project**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week in Lab: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 6-7 per week

In this course, students will learn to plan, strategize, and execute an engineering project. The course will develop students' skills to manage projects and build on leadership skills and ethical reasoning they have acquired in core courses. Students will learn about environmental, safety and health issues that must be considered during the implementation of a project. Students will also learn, discuss, and reflect on professional issues such as social responsibility, ethics, licensing, and regulatory reporting.

#### *5.5.1.10 SC 113 Physics: Electromagnetism*

**Prerequisites: Multivariable Calculus & Linear Algebra**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week in Lab: 2; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 7-8 per week

This course is an introduction to electrostatics, electrodynamics, and electromagnetism. The basic principles behind electrical engineering and electronic communication will be discussed. At the end of the course, students will understand simple electronic circuits and the fundamental theories and principles needed to continue their study of electronics and electrical systems. Writing quality lab reports will continue to be emphasised.

#### *5.5.1.11 CS213 Object-Oriented Programming*

**Prerequisites: Either Computer Programming for CS OR Computer Programming for Engineering**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1.5; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 9 per week

This course builds upon the programming concepts from the Computer Programming for CS course and will develop students' ability to program using the object-oriented paradigm and the Java language. It will give students an appreciation of the advantages of object-oriented programming, help them define and construct objects; and leverage abstraction, inheritance, polymorphism, and encapsulation to develop robust and maintainable applications. It will also introduce students to event-driven programming and graphical user interfaces, as well as the use of standard Java packages and the Java collections API. Good software engineering practices will be featured in various aspects of the course: characteristics of good software; documentation, testing; and coding practices which promote correctness and robustness. Also, notations like the Unified Modelling Language (UML) will be employed. Through one or more team projects, students will gain experience in designing and implementing larger applications than in their previous programming classes.

#### *5.5.1.12 CS331 Computer Organization and Architecture*

**Prerequisites: EITHER Computer Programming for CS OR Computer Programming for Engineering. Completion or concurrent enrolment in Discrete Structures and Theory.**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1.5; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 9 per week

This course presents the fundamental concepts of computer organization and instruction set architectures. Assembly language programming is used to present and illustrate the concepts of instruction set design. The basics of Central Processor Unit (CPU) design and implementation are covered, including some performance enhancing methods like pipelining and memory caches. The interface to the Compiler and Operating System is described in terms of the interaction between the hardware and software components of a system. The course discusses developments in modern computer system such as parallel processing, virtual computing and other new architectures.

#### *5.5.1.13 CE 122 Applied Programming for Engineers**

**Prerequisites: Computer Programming for Engineers**

Ashesi Units: 0.5; Credit Hours: 2; Hours per Week in Classroom: 1.5; Hours per Week in Lab: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 4-5 per week

In this course, you will be introduced to basic computer programming techniques and build on your existing computer programming experience and learn how to use programming to solve real-life engineering and scientific problems. You will improve on the modelling skills you have gained from the mathematics and physics courses you took and apply them to develop engineering simulations. You will gain experience in writing computer programs in the MATLAB and C programming languages. You learn how to write about your project in a scientific report. We will also discuss/introduce different ways of applying some programming techniques in courses like Big Data Analysis, Differential Equations, Numerical Methods, Control Systems and System Dynamics.

#### *5.5.1.14 EE 222 Circuits and Electronics*

**Prerequisites: Physics Electromagnetism**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week in Lab: 2; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8-9 per week

In this course students will study the principles and workings of electronic components and design circuits common in electronic systems like amplifiers and filters. Students will learn how to develop mathematical models for electronic circuits and analyse circuit responses in the time and frequency domain. At the end of the course students should have learnt how to model and design simple analogue electronics systems. Students will learn to analyse electrical circuits in single- and three-phase power systems.

#### *5.5.1.15 CE 322 Digital Systems Design*

**Prerequisites: Communication Systems**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week in Lab: 2; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 7-8 per week

In this course students will study the principles of digital systems and computers. They will learn digital system theory and design techniques, including Boolean algebra, binary arithmetic, digital representation of data, truth tables, gates, flip-flops, finite state machines, memory, and timing issues. Students will gain experience with several levels of digital systems, from simple logic circuits to microcontrollers, in order to design, simulate and implement digital systems. They will also learn how processors and microcontrollers are used for control by interfacing sensors and actuators.

#### *5.5.1.16 CE 451 Embedded Systems*

**Prerequisites: Digital System Design**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week in Lab: 2; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8-9 per week

This course will cover the design and implementation of embedded systems from a hardware and software perspective. Students will go through the design process of embedded systems and analyse the trade-off between a hardware and software implementation. They will also learn software development techniques unique to embedded systems such as real-time operations, I/O operations, and communications. The bare metal approach to embedded systems development is highlighted. Students will learn to read data sheets and implement drivers with bit-level manipulation. There is an emphasis on creating responsive multitasking systems. An introduction to a Real Time Operating System will be given.

## 5.5.2 Electrical Engineering Courses

### *5.5.2.1 EE 242 Electrical Machines*

**Prerequisites: Circuits and Electronics**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week in Lab: 2; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8-9 per week

This course introduces students to the fundamental principles underlying electro-mechanical machines and devices, their design, and their maintenance. It provides a treatment of transformers, synchronous generators and motors, induction motors, speed and torque control, protective devices, and introduction to DC Machines.

### *5.5.2.2 EE 342 Advanced Electrical Machines*

**Prerequisites: Electrical Machines I**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week in Lab: 2

Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8-9 per week

This is an advanced class that provides students further principles governing the operation of electro-mechanical machines and devices, their design, and their maintenance. There is also a treatment of special purpose motors such as variable reluctance machines and stepping motors. It provides an advanced treatment of power electronics and motor drives, DC motors and DC generators.

### *5.5.2.3 EE 421 Digital and Analog Signal Processing in Telecommunications*

**Elective for CE and EE students**

**Prerequisite: Communication Systems**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week in Lab: 2; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 7-8 per week

This course includes the study of signal processing and technology used in the telecommunication industry. Students will study various digital and analogue signal processing techniques. Starting from the basic definitions of a discrete-time signal, through Fourier analysis, filter design, sampling, interpolation and quantization, more advanced tools are studied to aid the study and design of digital communications systems. Note: CE and EE students wishing to work in the telecommunications industry are advised to take Digital and Analog Signal Processing in Telecommunications as one of their electives.

### *5.5.2.4 ME 301 Mechanical Machine Design*

**Prerequisites: Mechanics of Materials**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week in Lab: 2; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8-9 per week

This course covers the principles and current practices of machine element design, including solid modelling and finite element analysis (FEA). The course introduces the design of machine members for static and fatigue strength. The design and selection of common machine elements such as shafts, gears, bearings, January Semester (Semester 2)s, keys, power screws and fasteners will be considered. As part of the course there will be a group design project that will involve the use of engineering (mechanical) design process, CAD, FEA, CAM, fabrication of machine components and assemblies to design a physical system and build a working prototype to satisfy design requirements for a given need. Other topics such as codes and standards, project planning and communication skills are also covered.

### *5.5.2.5 ME 311 Mechanics of Materials*

**Prerequisites: Material Science**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week in Lab: 2; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8-9 per week

This course introduces the theory and application of static engineering mechanics as it relates to statically determinant and indeterminant structural systems. The course involves determination of stresses, deformations, and strains. The course will cover internal resultant loadings in simple plane trusses and beams, elastic properties

of solids under axial and torsional loads, stress, strain, and deformation due to axial, torsional, bending, thermal, transverse loads, combined loading, deflection of beams, and columns. Also, transformation of stress and stresses in thin-walled pressure vessels will be covered. The course includes the use of computational software to solve practical engineering problems numerically.

#### *5.5.2.6 ME 212 Thermodynamics*

**Prerequisites: Engineering Mechanics**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week in Lab: 2; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8-9 per week

This course is an applied foundation course in thermal science designed to introduce students to the fundamental concepts and the laws of thermodynamics. It extends to the applications of the first and second laws of thermodynamics to systems devised to produce mechanical power, cooling and heating. The course teaches students about the principles, operations, design, and analysis of thermal systems including power generation, refrigeration, Air conditioning and combustion of fuels. Students will also be introduced to non- conventional power generation resources and utilization.

#### *5.5.2.7 ME 422 Heat Transfer*

**Prerequisites: Fluid Mechanics**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week in Lab: 2; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8-9 per week

The course builds understanding of the physical behaviour of various modes of heat transfer, including conduction, convection, and radiation. It also includes the design and sizing of heat exchangers; fundamentals of air conditioning and refrigeration vapor cycles, and an introduction to numerical modelling and analysis using finite element analysis software (e.g., SolidWorks Simulation). Labs and projects will involve temperature measurements and the design-build-analysis-test of thermal systems.

#### *5.5.2.8 ME 431 Fluid Mechanics*

**Prerequisite: Thermodynamics**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week in Lab: 2; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8-9 per week

How can we model and analyse problems involving fluids? This course investigates the application of fluid mechanics in engineering and industrial processes. We will discuss theories and principles of fluid dynamics and statics using engineering applications as examples. Students will learn various analytical approaches to model and solve basic fluid problems. They will experimentally solve problems during the labs, and they will learn to design to a first-order, fluid systems like pipes and pump systems. At the end of the course students should be able to design and analyse different fluid systems.

#### *5.5.2.9 EE 453 Power Systems Analysis*

**Elective for EE and ME students**

**Prerequisite: Power Engineering**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week in Lab: 2; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8-9 per week

This course is a study of advanced topics in electric power distribution systems planning and operation. In this course, students will learn how to analyse flows on power networks and their applications to real systems. It provides students with a working knowledge of power system problems and computer techniques used to solve some of these problems. It also provides a technical treatment of the general problem of power system stability and its relevance. They will learn how to strategically bring together power technology to make energy available to industry by considering need, environment and sustainability. Note: EE and ME majors wishing to work in the power systems industry are advised to take Power Engineering and Power Systems Analysis as their two electives.

*5.5.2.10 EE 454 Renewable Energy and Smart Power Grid*

**Elective for EE and ME students**

**Prerequisite: Power System Engineering and Power Electronics**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion/lab: 1.5.

Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 9 per week

A Smart Grid is the integration of numerous technologies, systems and processes with the aim to modernize and fully automate the entire electricity grid covering generation, transmission, distribution, utilization plus conservation of energy. This course introduces students to smart grids and intelligent distribution networks. Renewable energy sources and their integration in smart grids as well as energy storage technologies are discussed and these include distributed generation technologies, control technologies, modelling and storage technologies. Demand side/load management is explored, including reactive power optimization. Other topics that this course addresses are smart metering techniques, grid network security and best practices in this domain. Students will also be introduced to electric vehicles in smart grids.

*5.5.2.11 ENGR 442 Mechatronics Systems Design*

**Elective for EE and ME students**

**Prerequisite: Mechanics, Sensors, Control Theory, Microcontrollers, Electronics, and Electrical Motors.**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion/lab: 1.5.

Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 9 per week

Mechatronics is the synergistic integration of mechanical disciplines, controls, electronics, and computers (software) in the design of high-performance machines, devices and processes. This course reviews principles in software programming, machine design, modelling of multi-domain dynamic systems, controls theory, electronics circuits, real-time controls implementation, and system-level integration. Hands-on lab exercises and projects provide extensive coverage of mechanical components, sensors, actuators, electrical drives, signal conditioning circuits, modelling, and simulation tools, DAQ hardware and software (microcontrollers), and microprocessors. The main idea of the course is to review and interface the described subsystems to design fully integrated mechatronics systems that meet specified requirements.

*5.5.2.12 EE 442 Power Electronics*

**Elective for EE and ME students**

**Prerequisite: Circuits & Electronics, Introduction to Electrical Machines**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion/lab: 1.5.

Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 9 per week

In Power Electronics the students will study various static methods to control the power flow between source and load. Due to the high level of power, the main solution for these methods is either forced switching for transistors or naturally for diodes; the thyristors present a forced switching ON and naturally switching OFF.

This subject aims at familiarizing the student with power electronic components in terms of how they work and how they are applied. First of all, the student must learn to know the operation and limitations of the different components. Secondly this course aims at creating an understanding of how these components are applied in different basic types of converters like ac-to-dc converters (rectifiers), dc-ac converters (inverters), dc-dc converters (choppers & switch-mode power supplies) and other types of power conversion methods. A foundation is also laid concerning the parameters with which the performance of these converters is measured.

Power Electronic converters like ac and dc drives are used more and more to control the speed and torque of ac and dc motors which are covered in subjects like Electrical Machines III & IV. The controlling of these motors by drives is used in factory processes.

### 5.5.3 Mechanical Engineering Electives

#### *5.5.3.1 ME 432 Computational Fluid Dynamics*

**Elective for EE and ME students**

**Prerequisite: Fluid Mechanics**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion/lab: 1.5.

Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 9 per week

This course provides students with an in-depth understanding of thermal-fluid science and its application in solving problems. The course will introduce students to how to model thermofluid problems, write simple computer programming codes, and use basic computational/numerical tools to solve engineering problems. The course will cover computational simulations using MATLAB, SolidWorks, and Ansys Workbench.

#### *5.5.3.2 ME 412 Advanced Thermodynamics*

**Elective for EE and ME students**

**Prerequisite: Thermodynamics**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion/lab: 1.5; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 9 per week

This course is an applied aspect of thermal science and engineering. It is designed to introduce students to the design, analysis and implementation of thermal systems. Students will apply the principles of thermodynamics to the operation of different thermal systems including thermal power generation, conventional automobile engine power operations, refrigeration, psychometry and air conditioning processes, fuels and combustion processes. Students will also be introduced to non-conventional and utilization of energy resources and energy management.

#### *5.5.3.3 ME 423 Refrigeration and Air-conditioning*

**Elective for EE and ME students**

**Prerequisite: Heat transfer**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion/lab: 1.5.

Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 9 per week

This course a specialized area in thermal engineering. It is designed to expose students to the field of heating, ventilation, air conditioning and refrigeration (HVACR) principles, processes, and systems. It is treated in two parts, Refrigeration Engineering, followed by Air Conditioning Engineering. Each part begins with introduction of the basic theory of the subject and thereon to the practical system and its components with the aim of equipping the student sufficient background to pursue a future career in the HVACR profession. This course advances on the theory behind refrigeration and air conditioning and brings the student closer to the practical systems.

#### *5.5.3.4 ME 402 Advanced Mechanical Machine Design*

**Elective for EE and ME students**

**Prerequisite: Mechanical Machine Design**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion/lab: 1.5.

Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 9 per week

This course builds on Mechanical Machine Design (ME 301) and covers the principles and current practices of design and selection of various machine elements, including solid modelling and finite element analysis (FEA). The elements include gears, January Semester (Semester 2)s, keys and seals, belt drives, chain drives, screws, fasteners, nonpermanent joints, clutches, brakes, coupling, flexible mechanical elements, flywheel, welding, bonding, and design of permanent joints.

*5.5.3.5 ME 444 Advanced Manufacturing Processes*

**Elective for EE and ME students**

**Prerequisite: Manufacturing Processes**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion/lab: 1.5.

Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 9 per week

This course builds on Manufacturing Processes (ME 441) and covers theory, application, and design considerations in manufacturing processes, including: solidification processes (glass-working, shaping processes for plastics, and processing of polymer matrix composites and rubber), processing of ceramics and cements, material removal processes (power and energy in machining, cutting-tool technology, economic and product design considerations in machining, and grinding and other abrasive processes), surface processing operations, joining and assembly (fundamentals of welding, welding processes, brazing, soldering, and adhesive bonding, mechanical assembly), special processing and assembly technologies (rapid prototyping and additive manufacturing, processing of integrated circuits, and electronics assembly and packaging), manufacturing systems (automation technologies for manufacturing systems and integrated manufacturing systems), and manufacturing support systems (process planning and production control and quality control and inspection). Also, machines and tooling, machine tools design, dimensional and tolerances analyses, design of jigs, fixtures, and tools in modern manufacturing processes will be covered. Machine shop and factory design will be introduced.

*5.5.3.6 ME 461 Composite Design and Fabrication*

**Elective for EE and ME students**

**Prerequisite: Materials Science & Chemistry**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion/lab: 1.5

Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 9 per week

This course provides knowledge on the fabrication of different types of composites, and the understanding of the dependence of their behaviour on the characteristics, relative amounts, geometry/distribution, and properties of the constituent phases. It seeks to equip students to be able to select and combine different engineering materials based on their properties to maximize their durability and performance. The possibility of designing materials with property combinations that are better than those found in any monolithic metal alloys, ceramics, and polymeric materials will also be explored.

*5.5.3.7 ME 445 Machine Shop and Factory Design*

**Elective for EE and ME students**

**Prerequisite: Manufacturing Processes**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion/lab: 1.5.

Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 9 per week

This introductory course deals with choosing location for industrial plants, machine shop and factory designs. It also covers Planning the layout of the shop or factory to avoid unnecessary handling. Batch production, line-flow production. Handling work at machine; moving work about the shop: transport conveyors and work handling appliances - gravity, chain, and belt conveyors, hoists, cranes, trucks. Workflow; plant capacity. Storing materials and finished products. Tool rooms; accessibility of tool rooms. Tool room layouts, Industrial ventilation, lamination, quality and quantity, lighting design and economics. Sound, noise and ultrasonic noise control and applications. Accidents prevention, mechanical guarding of machines. Electrical equipment; occupational hazard and fire protection.

*5.5.3.8 ME 433 Gas Dynamics and Jet Propulsion*

**Elective for EE and ME students**

**Prerequisite: Fluid Mechanics**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion/lab: 1.5.

Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 9 per week

This course introduces students to the basic concepts and importance of gas dynamics and jet propulsion. Areas to consider include basic concepts and isentropic flows: energy and momentum equations of compressible fluid flow, stagnation states, Mach waves and Mach cone-effect of Mach number on compressibility; Flow through ducts: flows through constant area ducts with heat transfer (Rayleigh flow) and friction (Fanno flow), variation of flow properties; Normal and oblique shocks: governing equations, variation of flow parameters across the normal and oblique shocks, Prandtl-Meyer relations, Applications; Jet propulsion - theory of jet propulsion, thrust equation, thrust power and propulsive efficiency; Space propulsion: types of rocket engines, propellants feeding systems, ignition and combustion, etc.

*5.5.3.9 ME 443 Renewable and Non-renewable Energy Systems*

**Elective for EE and ME students**

**Prerequisite: None**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion/lab: 1.5.

Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 9 per week

This course introduces renewable and non-renewable energy systems, with a scientific scrutiny of the energy field and an emphasis on alternate energy sources and their technology and application. The course will explore our society's present needs and future energy demands, review conventional energy sources and systems, including fossil fuels and nuclear energy, and then focus on alternate, renewable, and non-renewable energy sources.

*5.5.3.10 ME 453 Automotive Engineering*

**Elective for EE and ME students**

**Prerequisite: Mechanics of Machines**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion/lab: 1.5.

Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 9 per week

This course provides students with knowledge and understanding of basic principles on which automobiles function. Students will be introduced to the various components of automobiles (Powerhouse, Clutch, Transmission, Drive Line Suspension, Steering, Brakes, Wheel and Tyres, Emission Control, Electricals, etc.) their working principles. The course will also introduce maintenance, safety regulations, workshop practice and equipment used in the automobile industry. There will be practical and workshop for students to gain hands-on experience in the automobile industry. Finally, students will be acquainted with modern issues facing automotive engineering.

*5.5.3.11 ME 451 Aerospace Projects*

**Elective for EE and ME students**

**Prerequisite: Fluid Mechanics**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion/lab: 1.5.

Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 9 per week

How does one design and build aerospace systems? This course is an overview of aerospace engineering, covering the major topics on which analysis must be carried out. This includes aerodynamics, aircraft performance, aerospace materials and their structural properties, flight dynamics, and stability and control. Students will learn analytical approaches in each of these topics and then apply them to the design of real aerospace systems. The lab sessions will be used to cultivate relevant fabrication skills, measure aerodynamic and material properties, and build and test prototypes. Three different aerospace systems will be built in the course, and the last one serves as a final project that will be a team-based vehicle design competition.

#### *5.5.3.12 ENGR 444 Automation and Production Systems*

**Elective for EE and ME students**

**Prerequisite: Manufacturing Processes**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion/lab: 1.5.

Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 9 per week

This course provides students with up-to-date coverage of production systems, how they are sometimes automated and computerized, and how they can be mathematically analysed to obtain performance metrics. The course is designed primarily for engineering students at the advanced undergraduate or beginning graduate levels in industrial, mechanical, and manufacturing engineering, who wish to learn about automation and production systems technologies in modern manufacturing. Students will also be exposed to computer-integrated manufacturing.

### 5.5.4 Computer and Electrical and Electronics Engineering Electives

#### *5.5.4.1 EE 421 Digital and Analog Signal Processing in Telecommunications*

**Elective for CE and EE students**

**Prerequisite: Communication Systems**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion/lab: 1.5.

Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 9 per week

This course includes the study of signal processing and technology used in the telecommunication industry. Students will study various digital and analogue signal processing techniques. Starting from the basic definitions of a discrete-time signal, through Fourier analysis, filter design, sampling, interpolation and quantization, more advanced tools are studied to aid the study and design of digital communications systems. Note: CE and EE students wishing to work in the telecommunications industry are advised to take Digital and Analog Signal Processing in Telecommunications as one of their electives.

#### *5.5.4.2 CS 432 Networks & Data Communications*

**Required of CE and CS majors, elective for MIS, EE and ME majors**

**Prerequisite: Computer Programming**

Credit Hours: 4; Ashesi Credit Units: 1; Hours per Week in Classroom: 3; Hours per Week in Lab: 1.5; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 9 per week

This course introduces students to the fundamental concepts of computer networks and data communications, with practical applications; students will be able to recognize the components, relevance, advantages, and disadvantages of networking computers. Students will be introduced to the principles of data communications and transmission. Protocols employed in layers 1 to 3 will be examined in depth. Layer 4 protocols will be highlighted and compared to layer 2.

Methods and mechanisms for constructing distributed computing systems and network services are discussed in the context of common Internet systems such as electronic mail, print and file servers and Web services.

Hands-on exercises are used to help reinforce the fundamental concepts learnt. Labs will cover typical network operations tasks. Students will review hardware used in practice, common topologies and set up services on typical enterprise networks.

#### *5.5.4.3 EE 422 Advanced Communication Systems*

**Elective for CE and EE students**

**Prerequisite: Communication Systems**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion/lab: 1.5.

Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 9 per week

The course will describe the protocols used in current networks. It will provide skills needed in designing and deploying efficient and effective data communications and network technologies. This course will also develop understanding of some fundamental concepts of information theory, as well as techniques used to model and analyse

communication networks. It will briefly highlight how to develop analytical tools and conceptual models for modelling and analysing network performance. Subtopics will include Fairness and network utility maximization, Optimization based routing and congestion control, Basic queueing models and their application to switching and scheduling in networks.

#### *5.5.4.4 CE 458 Internet of Things*

**Elective for CE and EE students**

**Prerequisite: Circuits and Electronics for Engineering students, Database Systems for CS/MIS students**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion/lab: 1.5.

Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 9 per week

The Internet of Things (IoT) course takes an end-to-end view of IoT and tackles the devices, networks, data analytics, programming, security, and business aspects. This holistic approach exposes the student to all aspects of a functional IoT system and how to design robust, scalable and a secure IoT network. Labs and small projects will be used to gain understanding of key concepts at the various layers and drive a hands-on experience. Key among these are the devices, network protocols, database, and programming aspects. Students will review hardware types and software tools and be introduced to IoT design principles which cover how to transition from an IoT idea to an IoT product or solution, building prototypes and commercializing them. Since IoT is still emerging, businesses are going to be either adopting IoT solutions or transforming their existing businesses to include IoT in a seamless and sustainable manner. The course introduces students to business concepts that prepare participants to lead in this budding industry.

#### *5.5.4.5 CS 452 Machine Learning*

Machine learning is the science of getting computers to act without being explicitly programmed. In the past decade, machine learning has given us self-driving cars, practical speech recognition, effective web search, and a vastly improved understanding of the human genome. Many researchers also think it is the best way to make progress towards human-level AI. This course introduces machine learning techniques. Students will learn how the techniques are applied, the mathematical and statistical unpinning of the models and how to explore proper application of the models. Topics include supervised and unsupervised machine learning, statistical inference, and prediction. A wide variety of algorithms will be presented, including logistic regression, K-nearest neighbours, naïve bayes, decision trees, neural networks, k-means, mixtures of Gaussians, principal components analysis, expectation maximization. The course will also discuss modern applications of machine learning such as image segmentation and categorization, speech recognition, and text analysis. This course will briefly touch on societal and ethical effects of AI technologies. Students will explore the effects of these new technologies on culture.

#### *5.5.4.6 EE 421 Digital and Analog Signal Processing in Telecommunications*

**Elective for CE and EE students**

**Prerequisite: Communication Systems**

Credit Hours: 4; Ashesi Credit Units: 1; Hours per Week in Classroom: 3; Hours per Week of Discussion/lab: 3; Hours of Study Outside of the Class: 9 per week

This course includes the study of signal processing and technology used in the telecommunication industry. Students will study various digital and analogue signal processing techniques. Starting from the basic definitions of a discrete-time signal, through Fourier analysis, filter design, sampling, interpolation and quantization, more advanced tools are studied to aid the study and design of digital communications systems. Note: CE and EE students wishing to work in the telecommunications industry are advised to take Digital and Analog Signal Processing in Telecommunications as one of their electives.

#### *5.5.4.7 CS 445 Applied Cryptography and Computer Security*

**Elective for CS, CE and EE students**

**Prerequisite: Data Structures or Discrete Math, Database management Systems, Computer programming for Eng**.

Credit Hours: 4; Ashesi Credit Units: 1; Hours per Week in Classroom: 3; Hours per Week of Discussion/lab: 3; Hours of Study Outside of the Class: 9 per week

Computer Security concerns the theory, concepts, techniques, and tools used to ensure confidentiality, integrity, and availability. This means understanding security frameworks, threat models, security policies, and mechanisms for prevention, detection, and recovery from attacks.

#### *5.5.4.8 CE 452 Very Large-Scale Integration (VLSI)*

**Elective for CE and EE students**

**Prerequisite: Digital Systems Design**

Credit Hours: 4; Ashesi Credit Units: 1; Hours per Week in Classroom: 3; Hours per Week of Discussion/lab: 3; Hours of Study Outside of the Class: 9 per week

This class will be using a variety of tools that will give students experience with full-custom and automated CMOS semiconductor design.

As part of this class, we will be designing chips for OpenRoad (full custom) / OpenLane (synthesized) chips and possibly fabricating chips with eFabless. To accomplish this, we will be using several open-source tools.

#### *5.5.4.9 CE 432 Neural Networks*

Artificial neural network (ANN) is a numerical implementation of the processing functionality of the human brains to solve real world or physical problems. The concept is based on the notion of massive parallel and distributed computing with learning approach of the brain. Neural networks can self-generate when given an objective, training data, and computing power. Typical of an intelligent system, neural networks possess abilities such as being able to acquire information by themselves, have a structure that is flexible enough to represent the information, and have mechanisms that enable them to adapt to their environment using the information acquired. By virtue of its capabilities and versatility, neural networks hold significant promise on how complex engineering and scientific problems could be solved. Neural networks techniques have brought major innovations in applications such as driverless cars, robotics, face recognition, speech and pattern recognition, prediction systems, industrial automation, smart manufacturing, autonomous vehicles, aerospace, financial systems, banking system, defence, entertainment, telecommunications, transportation, agriculture, social media, medical diagnosis, etc. This course will provide the fundamental concepts on operations of neural networks, architectures, and design, learning rules and training of the neural network for applications. Emphasis will be placed on the design principles, mathematical analysis of the networks, methods of training, and their application to solve engineering problems. MATLAB tool will be used to design and test various network architectures. As part of the course students will undertake a special course project that will involve developing a neural network model to solve a practical engineering problem.

#### *5.5.4.10 CS 313 Intermediate Computer Programming*

This course is a continuation of Object-Oriented Programming (OOP) with Java. It will introduce students to the C++ programming language and teach them to implement in C++ the OOP concepts and ideas they have previously learned. It will introduce additional concepts that will enable students to develop moderately sized applications. These additional concepts will include event-driven programming, multi-threading, design patterns and Unified Modelling Language (UML). The unique advantages of C++ will also be emphasized such as those they bring to Operating Systems and Big Data.

#### *5.5.4.11 CS 441 Mobile Application Development*

This course introduces the principles of developing interactive mobile applications and services that may be resident on a phone or the web. There will generally be interaction between the client app and the service online. Students will be exposed to a variety of different popular, contemporary, or emerging platforms and operating systems, and be sufficiently informed about the different options and capabilities available on these platforms. Students will also be exposed to the features (both hardware and software) and sensors available on mobile devices and will be encouraged to explore their use in building applications and services. This course requires good programming skills

in at least a working knowledge of one language, as well as web development ability. Principal topics include mobile friendly mobile web application development. Client-side application development on platforms which include at the minimum Android will be explored. Contemporary cross platform approaches will also be investigated. Insight into entrepreneurship (building a business around a mobile application) will be provided. Attention will be paid to emerging technologies. The course is very project oriented, as students must receive many hours of hands-on practice and experimentation.

#### *5.5.4.12 CS 461 Data Science*

Data Science is a powerful toolkit for using data to answer questions and guide decision making. It involves skills and knowledge from statistics, software engineering, machine learning, and data engineering. This course is designed for students interested in using a powerful data science toolkit to collect, clean, pre-process, visualize datasets and fit models. It will provide most of the knowledge needed to start applying statistical and machine learning algorithms to projects by combining hands-on practice with essential theory. In this class, students work on data science projects that involve collecting data or finding data sources, exploratory data analysis and interactive visualization, statistical analysis, predictive analytics, model selection and validation. Course work also involves readings and case studies on ethical practice in data science.

### 5.5.5 Bioengineering Core

#### *5.5.5.1 BENG 181 Molecular and Cell Biology*

This course will introduce students to the concepts of structure and function of biologically important molecules through a range of theoretical knowledge and practical lab skills. Students will learn about DNA, RNA and proteins and the molecular events that govern cell function while exploring the relevant aspects of biochemistry, genetics and cell biology. Students will discuss several large genome projects that are changing the face of modern biology, especially in medicine, agriculture and biotechnology. Students will investigate the molecular basis of illnesses' emergence and how genetic manipulation in biotechnology is used in the development of valuable products including blood clotting factors, insulin and vaccines.

#### *5.5.5.2 BENGR 281 General Chemistry*

This course will discuss the fundamental principles and laws of chemistry. Some of the topics include measurement, atomic and molecular structure, periodicity, chemical reactions, chemical bonding, stoichiometry, thermochemistry, gas laws, and solutions. Upon completion, students should be able to demonstrate an understanding of the fundamental chemical laws and concepts. Laboratory experiments and computer-based exercises augment and reinforce the basic principles discussed in the lectures as well as provide practical examples.

#### *5.5.5.3 BENGR 282 Anatomy and Physiology for Engineers*

This course provides students with the underpinning knowledge needed in biomedical engineering designs. The anatomic and physiological functional knowledge gained in this subject will enhance the prototype development of biomedical designs. Students will gain familiarity with anatomical and physiological terms and their meanings, an understanding of the gross anatomy of the major systems in the human body and their importance in the design of biomedical devices and an understanding of the major physiological principles which govern the operation of the human body.

#### *5.5.5.4 BENGR 382 Biochemistry*

This course equips students with an overview of biological processes at the molecular level with an emphasis on protein structure and function, enzyme mechanism and kinetics, fundamentals of physical biochemistry and chemistry of the biological molecules, carbohydrates, lipids and nucleic acid.

#### *5.5.5.5 BENG 482 Transport Phenomena in Biological Systems*

This course will cover basic concepts in transport phenomena, including fluid dynamics (momentum transport) and heat transfer (energy transport), with applications to biological systems, both medical and non-medical. Students will analyse real-world applications in the development and design of medical devices, artificial organs, drug delivery systems and tissue engineering.

#### *5.5.5.6 BENGR 483 Biomaterials*

This course will cover the fundamentals of the synthesis, properties and biocompatibility of metallic, ceramic, polymeric and biological materials that are in contact with tissues and biological fluids. Different discussion topics will cover biomaterials for hard and soft tissue replacement, organ replacement, coatings and adhesives, dental implants and drug delivery systems. Emergent trends in biomaterials will also be discussed. Topics cover electrically conductive polymers, and piezoelectric biomaterials, amongst others. Case studies and real-world scenarios will be used to highlight current opportunities and challenges of using biomaterials in medicine.

#### *5.5.5.7 BENGR 484 Systems Biology*

Systems Biology is a course that gives an integrated approach to studying biology through experiments and the use of computer models with both predictive and explanatory power. It is interdisciplinary, requiring the participation of biological, physical, mathematical, engineering and computational sciences. This course introduces cellular and population-level systems biology concepts with an emphasis on synthetic biology, modelling of genetic networks, and cell-cell interactions. Population-level systems include models of pattern formation, cell-cell communication, and evolutionary systems biology.

#### *5.5.5.8 BENGR 482 Cellular and Tissue Biomechanics*

This course develops and applies scaling laws and the methods of continuum and statistical mechanics to biomechanical phenomena over a range of length scales, from molecular to cellular to tissue or organ level. The course will introduce students to the mechanical principles that can be applied to human structure and function.

#### *5.5.5.9 BENGR 381 Modeling in Biomedical Engineering*

This course will introduce students to the fundamental principles of good modelling methodology in biological systems. Students will be involved in discussions on creating valid mathematical models supported by detailed explanations, extensive case studies, examples and applications. Students will work with different software, such as BioCAD, Mathlab, The AnyBody modelling technology and different machine learning concepts.

#### *5.5.5.10 BENGR 485 Science Communication and Public Engagement*

Good science communication ensures the public engages with and understands relevant scientific research. In this course, students will learn how best to share scientific findings with an intended audience. Students will explore how the relationship between society and science has evolved and discover how traditional and social media can be used to share research. They will learn to identify the target audience and define the message to build a shareable story.

#### *5.5.5.11 BENGR 412 Synthetic Biological Engineering*

This course will familiarize students with the principles of genetic engineering, synthetic biology and the design of biological machines. Topics covered in this course include, Bacterial genetics, Plasmid architecture, DNA parts and assembly, genetic engineering and synthetic biology applications, and bioethical issues. We will discuss biological network structure, gene control, switches, cellular Boolean logic gates, oscillators, feedback and computer modelling of cellular networks. Students will be guided through several experiments designed to familiarize them with molecular techniques and the capabilities and applications of synthetic biology. Finally, the students will be asked to design their own genetic machine to address a problem of their choice.

### 5.5.6 Bioengineering Electives

#### *5.5.6.1 BENGR 486 Biomimetic Design*

The course will build on tasks of increasing complexity in developing and applying the biomimicry process framework. It starts with the Biology to Design process, which focuses on analyzing a biological system, thus making observations, understanding the function/mechanism and identifying the design principles. Next, Challenge to Application stage, will identify an application, observe the function, identify a shortcoming and analyze how the biology solved that problem. Finally, Challenge to Biology stage will focus on identifying a problem. get inspiration from nature and design and innovate a solution. Each major will focus on topics relevant to their areas (i.e. Computer Engineering can look at topics of communication and networks in biology etc.)

#### *5.5.6.2 CS453 Robotics*

This course gives a practical hands-on as well as theoretical introduction to robotics as a field that integrates expertise in Computer Science, Engineering, Design and Mathematics to create innovative systems that interact with and can operate autonomously or semi-autonomously in the physical world. In this course, students will work individually and in groups to implement robotics projects using robotics platforms such as the Lego Mindstorms and EV3 kits, and the TurtleBot robot, as well as other electronic and mechanical components. Through these projects, they will learn how to build and write programs for an autonomous physical device that interacts with its environment. They will also learn to read and understand robotics research papers, to give presentations to technical and non-technical audiences, and follow a project through from an initial idea through design to implementation and testing.

#### *5.5.6.3 CS254 Introduction to Artificial Intelligence*

This course introduces the concept of Artificial Intelligence (AI) and gives students the opportunity to explore use cases and applications of AI. It introduces AI concepts and terms such as agents, classical AI, machine learning, deep learning and neural networks. It also introduces various issues and concerns surrounding AI such as ethics and bias, and the future of work. Through hands-on projects with Python, students gain exposure to the theory behind topics in Artificial Intelligence such as graph search algorithms, classification, optimization, reinforcement learning, and machine learning. Students will gain experience using libraries for machine learning and will emerge with knowledge of artificial intelligence principles that enable them to design intelligent systems of their own.

#### *5.5.6.4 CS452 Machine Learning (CS Elective)*

Machine learning is the science of getting computers to act without being explicitly programmed. In the past decade, machine learning has given us self-driving cars, practical speech recognition, effective web search, and a vastly improved understanding of the human genome. Many researchers also think it is the best way to make progress towards human-level AI. This course provides an introduction to machine learning techniques. Students will learn how the techniques are applied, the mathematical and statistical unpinning of the models and how to explore proper application of the models. Topics include supervised and unsupervised machine learning, statistical inference and prediction. A wide variety of algorithms will be presented, including logistic regression, K-nearest neighbors, naïve bayes, decision trees, neural networks, k-means, mixtures of Gaussians, principal components analysis, expectation maximization. The course will also discuss modern applications of machine learning such as image segmentation and categorization, speech recognition, and text analysis. This course will briefly touch on societal and ethical effects of AI technologies. Students will explore the effects of these new technologies on culture.

#### *5.5.6.5 EE421 Digital and Analog Signal Processing in Telecommunications*

This course includes the study of signal processing and technology used in the telecommunication industry. Students will study various digital and analog signal processing techniques. Starting from the basic definitions of a discrete-time signal, through Fourier analysis, filter design, sampling, interpolation and quantization, more advanced tools are studied to aid the study and design of digital communications systems.

#### *5.5.6.6 BUSA 471 Social Enterprise*

Social Enterprise is an exploratory business elective offered by the business administration department that challenges the student to think in ways that produce sustainable and profitable outcomes that lead to social or environmental impact. Through various team challenges, assessments, and meet the leader sessions students have the opportunity to discuss, examine, and transfer thought into action as they work together to come up with their own solutions for some of their world's toughest challenges.

#### *5.5.6.7 BENG 487 Bioinformatics*

Introduction to fundamental principles of bioinformatics and to problems that could be investigated using these principles in modern healthcare. Students will be introduced to concepts of genome and proteome sequences. Computationa methods in the context of genomics will discuss DNA sequencing and fragment assembly, identification of genes in DNA, gene regulation, expression and large data arrays. In the context of proteomics computational methods will explore topics like similarity, homology and analogy, protein folding and protein structure.

#### *5.5.6.8 BENGR Neuroengineering*

This course offers a broad introduction to the fundamental principles at the interface of neuroscience, bioengineering and computer science. Students will explore how neural engineering tools are used to measure, modulate and image the nervous system in the context of neurological function, dysfunction and injury.

#### *5.5.6.9 ENGR 401 Senior Project & Seminar*

A two hours per week seminar provides a discussion forum for technical writing, ethics and social responsibility, and other topics, and will also serve to guide the project management timeline of the project. At the end of the senior project, students will write a technical report (summary) of their work and do a public presentation of their work. To reinforce professional writing, each member of a senior group project will write-up their own supporting documents.

## 5.6 Law and Public Policy Core

### 5.6.1 Law with Public Policy Core

#### *5.6.1.1 LLB112 Ghana Legal Systems & Methods*

**Prerequisite: None**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 2; Hours per Week in Lab: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

This core course introduces law students to the legal system of Ghana. What does it consist of? How does it work? What does it do? Where did it come from? etc. This course will answer these foundational questions. We will consider the methodology for bringing civil suits and criminal proceedings and analyse the process of judicial decision-making focusing particularly on the doctrine of stare decisis and the rules of interpretation in the common law tradition.

#### *5.6.1.2 LLB114 Legal Writing*

**Prerequisite: Language for Law, Written and Oral Communication**

Ashesi Units: 0.5; Credit Hours: 2; Hours per Week in Classroom: 1.5; Hours per Week in Lab: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 4 per week

This course is designed to equip law students with the essential skills needed for effective legal writing and research within the context of the Ghanaian legal system. Recognizing the paramount importance of clear, concise, and persuasive legal communication, this course will guide students through the intricacies of legal research methodologies, proper citation techniques, and the art of constructing well-reasoned legal documents.

#### *5.6.1.3 LLB150 Introduction to Public Policy*

**Prerequisite: None**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 2; Hours per Week in Lab: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

This course introduces prospective Law and Public Policy students to the world of public policy. What is it? What does it do? Who works in that space and what exactly do they do? We also disaggregate governing to define and identify the nature of governmental tasks and the methods of achieving them.

#### *5.6.1.4 LLB213 Constitutional Law I*

**Prerequisite: None**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week in Lab: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

The course introduces students to the literature of the key constitutional theory concepts that have shaped our legal experience. While it is focused on the constitutional law of Ghana, it discusses the legal concepts within the wider context of the Common Law tradition to which Ghana belongs.

#### *5.6.1.5 LLB214 Constitutional Law II*

**Prerequisite: Constitutional Law I, Ghana Legal System**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 2; Hours per Week in Lab: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

This class traces the history of Ghanaian constitutional law through key events in history. We then study important themes in the 1992 Constitution and examine how it has developed through the case law. A firm understanding of the theoretical discussions from Constitutional Law I is critical to a full engagement with the material in this course.

#### *5.6.1.6 LLB215 Contract Law I*

**Prerequisite: None**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 2; Hours per Week in Lab: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

This is a course on the rules of law governing the formation, execution, and termination of contracts in Ghana. This body of rules is partly statutory and partly case law created. Students will learn the common law rules and the Ghana-specific changes that we have made to them. This course is critical to every legal career whether as a solicitor, barrister or judge.

#### *5.6.1.7 LLB216 Contract Law II*

**Prerequisite: Contract I**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 2; Hours per Week in Lab: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

Following through from the knowledge gained in Contract I, the second wave of the course focuses on teaching students what may render an otherwise valid contract unenforceable, or factors that may relieve parties to a contract of their obligations under the agreement, as well as consequences for the breach of parties' obligations under the contract.

#### *5.6.1.8 LLB217 Torts*

**Prerequisite: None**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week in Lab: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

This course explores the kinds of non-contractual wrongs that one can sue over and what remedies are available for such actions. With the exception of labour related spaces, much of Tort law is not statutorily regulated. The rules are borne of common law. As such, this is a case-heavy course and substantial engagement with the voluminous case law is required to achieve full comprehension. This course will equip students with the critical skill of creating order out of chaos in the way they deal with facts.

#### *5.6.1.9 LLB218 P0litics of Policymaking*

**Prerequisite: None**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 2; Hours per Week in Lab: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

Can policy operate entirely separately from politics? How does politics undermine or drive policy choices? Should an unelected policy officer be mindful of political considerations in choosing or implementing policy? Can be they be effective if they are? How should private policy advocacy organisations such as thinktanks interact with politics and political actors? How does policy making remain responsive to the people in a democratic order. This course engages with these fundamental questions.

#### *5.6.1.10 LLB250 Philosophical Foundations of Public Policy*

**Prerequisite: None**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 2; Hours per Week in Lab: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 6 per week

This course explores some fundamental concepts in the three key areas of public policy: politics, philosophy, and economics. Students discover how issues in each of these fields manifests in the others. We consider important philosophical questions that underpin the determination of what goods a society should pursue, how those goods should be distributed and who should get a say in those decisions.

#### *5.6.1.11 LLB255 Economic Analysis for Public Policy*

**Prerequisite: None**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week in Lab: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

This course introduces some foundation principles of economics and situate them in the context of the policymaking process. The focus, in this course, is not simply the accuracy of the students' economic analyses, but importantly, the application of the analyses to policy making, implementation or evaluation.

#### *5.6.1.12 LLB321 Criminal Law I*

**Prerequisite: None**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week in Lab: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

This course teaches the vague and yet fundamental conceptual blocks of criminal law. A solid understanding of what is known in the law as the "General Part of Criminal Law' is critical to understanding what the elements of the specific offences are and by what acts and for what reasons they are held to be met.

#### *5.6.1.13 LLB322 Criminal Law II*

**Prerequisite: Criminal Law I**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 2; Hours per Week in Lab: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

Applying the knowledge of the General Part acquired in Criminal Law I, this course studies the major and most frequently occurring statutory offences in Ghana. we discuss the elements of each crime and reflect briefly on why the conduct involved has been proscribed.

#### *5.6.1.14 LLB323 Immovable Property I*

**Prerequisite: None**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 2; Hours per Week in Lab: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

This course introduces the customary law regime on land in Ghana. we take special note of the regional differences and their implications. The course travels through time and examines both the colonial and postcolonial statutory frameworks through which the state has sought to regulate land resources and resolve disputes over proprietary interests in land in this jurisdiction.

#### *5.6.1.15 LLB324 Immovable Property Law II*

**Prerequisite: Law of Immovable Property I**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 2; Hours per Week in Lab: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

This course follows through as a sequel to Immovable Property Law I, building upon the foundational principles introduced, focusing on legal and equitable interests in land and exploring the relationship between landlords and tenants and the peculiar nature of leases and licenses as interests in land. The course also delves into the dynamics of the state's power of eminent domain as well as the rules governing same.

#### *5.6.1.16 LLB325 Public International Law*

**Prerequisite: None**

Ashesi Units: 0.5; Credit Hours: 2; Hours per Week in Classroom: 1.5; Hours per Week in Lab: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 4 per week

The course introduces students introduced to the principles of state responsibility, responsibility of international organizations, international human rights law, diplomatic law, law of the sea and the use of force in international law. It further seeks to help students to develop certain skills and competences such as effective communication, problem solving and group work.

#### *5.6.1.17 LLB351 Designing Public Policy*

**Prerequisite: Philosophical Foundations of Public Policy**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 2; Hours per Week in Lab: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

Public Policy is a tool for solving identified problems in society through the use of public power. This course introduces students to the processes and methods by which governments choose which policies to pursue. The course tracks the policy process from how an identified problem is articulated as a policy priority and the conceptualisation of the framework to how it becomes a detailed framework with clear action steps.

#### *5.6.1.18 LLB352 Implementing Public Policy*

**Prerequisite: Philosophical Foundations of Public Policy, Designing Policy**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 2; Hours per Week in Lab: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

This course teaches students about the process by which policies become and create facts in the lives of citizens. We not only learn the how of implementation, we pay attention to the aims of implementation, which become the driving force of implementation and inform the methods and assessable targets set. It is therefore critical that future policymakers engage with what the pillars of implementation are. We will discuss aims like efficiency, justice, popular demands etc.

#### *5.6.1.19 LLB401 Capstone 1 (Thesis)*

**Prerequisite: 8 Credits in Major Area of Study or Senior Standing in Law & Public Policy**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 1.5; Hours per Week in Lab: 0; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

The thesis is a journal article length work of legal scholarship. Students conduct independent research that shows significant scholarship in the field of Law and contributes to the scholarly discourse in the process. The research will be supervised by a member of faculty and is an opportunity to understand complex questions from diverse legal foundations.

#### *5.6.1.20 LLB402 Capstone 2 (Applied Project)*

**Prerequisite: 8 Credits in Major Area of Study or Senior Standing in Law with Public Policy**

Ashesi Units: 1; Credit Hours: 3; Hours per Week in Classroom: 1.5; Hours per Week in Lab: 0; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 6 per week

The Law Moot is designed for students to demonstrate their ability to function in the real legal world and to make a positive impact therein. Students are expected to integrate foundational knowledge and skills gained over time and use them to solve real-life legal problems The successful execution of a Law Moot requires skills sets including research and critical analysis; stakeholder engagement; project management; professionalism and communication.

#### *5.6.1.21 LLB403 Public Policy Practicum*

**Prerequisite: 8 Credits in Major Area of Study or Senior Standing in Law with Public Policy**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 1.5; Hours per Week in Lab: 0; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

The Public Policy Practicum is designed for students to demonstrate their ability to function in the real world of policy and to make a positive impact therein. Students are expected to draw on both their public policy and legal training to resolve a real-life problem. The problem they are assigned will be calibrated to the appropriate level of complexity for an undergraduate challenge and will test the full range of policy making and policy advocacy skills students will have garnered in the course of the program. The skills include research and critical analysis; stakeholder engagement; project management; professionalism and communication.

#### *5.6.1.22 LLB425 Equity & Trusts*

**Prerequisite: None**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week in Lab: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

This course is a comprehensive inquiry into the Law of Equity, a component of legal systems that supplements and complements common law principles. Students will delve into the historical evolution of equity, its fundamental doctrines, and the equitable remedies available to address legal disputes. Through a combination of theoretical analysis, case studies, and practical applications, students will gain a profound understanding of the principles that underpin equity, its relevance in modern legal practice, and its contribution to the development of a just legal system.

#### *5.6.1.23 LLB426 Company Law*

**Prerequisite: None**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 2; Hours per Week in Lab: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

This course delves into the law regarding conducting business and other economic activity through the special purpose vehicle of a company. Students will be introduced to key legal concepts and statutory framework on the special legal status of companies, their distinctiveness from the founders and shareholders, as well as the legal relationships that arise in the conduct of business including corporate governance, shareholder rights, directors' duties among others.

#### *5.6.1.24 LLB427 Commercial Law*

**Prerequisite: Contract Law I &II**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 2; Hours per Week in Lab: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

This branch of the law regulates trade in the supply of goods and services. Commercial Law I focuses on the aspects of commercial law that have been statutorily regulated in Ghana. For ease of digestion, it is taught in two parts. The first focuses on the Sale of Goods and the latter half of the semester is dedicated to hire purchase and conditional sale transactions.

#### *5.6.1.25 LLB428 Jurisprudence*

**Prerequisite: Constitutional Law I, Philosophical Foundations of Public Policy**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week in Lab: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

As an introduction to the subject of legal thought, the course will focus primarily on equipping students with requisite skills to aid their understanding of the philosophy of law by navigating the epistemology of law. Through a combination of theoretical inquiry and practical application, the course aims to cultivate critical thinking, ethical reasoning, and a holistic appreciation for the complexities of law.

#### *5.6.1.26 LLB429 Legislative Writing*

**Prerequisite: Language for Lawyers I & II, Written & Oral communication, Text & Meaning**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 2; Hours per Week in Lab: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

This course trains students to understand and be competent in the processes of drafting legislation. It emphasises the importance of detail and grammar to the effectiveness of a legislation's control over citizen behaviour in respect of the legislation's subject matter.

#### *5.6.1.27 LLB430 Succession*

**Prerequisite: Equity & Trusts, Immovable Property I & II**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week in Lab: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

This is a course in the law governing the distribution of estates i.e. inheritance. We examine the rules that govern the distribution of property under a will as well as in intestacy. Customary Law plays a strong role here and we discuss its implications. Familiarity with this area of law is critical for every lawyer as it is one of the most emotive spaces of legal practice.

#### *5.6.1.28 LLB454 Evaluating Public Policy*

**Prerequisite: Philosophical Foundations of Public Policy, Implementing Policy, Statistics with Probability**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 2; Hours per Week in Lab: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

This course is about feedback in public policy. How do we know a program, policy, or some intervention or "treatment", is working or has worked? What does the data we have mean. In this course, we will be learning the tools that a policymaker must have in order to be sure that well intentioned, well-executed policies do not, nonetheless. misfire in terms of policy objectives. It is also a critical set of tools for would-be policy advocates, researchers, and politicians.

### 5.6.2 Law with Public Policy Electives

#### *5.6.2.1 LLB331 Gender and the Law*

**Prerequisite: None**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 2; Hours per Week in Lab: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

This course is designed to introduce students to the relationship between law and gender by demonstrating how the law accounts for the manner in which gender issues are constructed. The course will explore gender-based stereotypes, the inequalities between men and women and the role law plays in eliminating these stereotypes/ inequalities or reinforcing them. The course will particularly focus on how women in general and specifically in Ghana have been historically disadvantaged and continue to be marginalised. This will be done by questioning social norms and the biases of law. The role of feminist legal thinking and perspectives will also be discussed. The law has been, and continues to be core to the critique and reconstruction of gender issues. The inherent characteristic of law to engineer social change necessitates an assessment of the unique relationship between gender and law.

#### *5.6.2.2 LLB332 Intellectual Property*

**Prerequisite: None**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 2; Hours per Week in Lab: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

Intellectual Property (IP) law consists of various specialized areas of law which aim to protect the interests of creators, designers, inventors and other producers of intellectual goods and services and to regulate the use of their products by recognizing certain legal rights they have over them to the exclusion of others. It covers areas ranging from purely artistic works like paintings or drawings to highly scientific and sophisticated works like computer programs. The law of copyright protects works of art including books, music and software etc. Intellectual Property

Law therefore generally seeks to safeguard the economic benefits of works produced as a result of mental exertion or conception, as opposed to purely physical/manual labour.

#### *5.6.2.3 LLB333 International Trade Law*

**Prerequisite: None**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 2; Hours per Week in Lab: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

The course introduces students to the most important treaties regulating international trade. It spans the two main treaties of the World Trade Organization - the General Agreement in Trade and Tariffs and the General Agreement in Trade in Services - and the most important trade treaty in the Africa- the African Continental Free Trade Agreement. The courses cover not only the technicalities of the law, it also explores the strengths and weaknesses of the global trading system, whether it achieves what it set out to achieve, and if it helps eliminate or accentuates economic inequities in the comity of states. We also assess the AfCTFA's potential to help Africa fulfil her developmental aspirations.

#### *5.6.2.4 LLB334 Law of Taxation*

**Prerequisite: None**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 2; Hours per Week in Lab: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

As an introductory course, this course is designed to provide students with a comprehensive understanding of the legal framework governing taxation in Ghana. Students will explore the foundational principles of taxation, examine the practical application of tax laws, and analyze the evolving policy landscape. Through a combination of theoretical study, case analysis, and practical exercises, participants will gain the knowledge and skills necessary to navigate the complexities of taxation law in Ghana.

#### *5.6.2.5 LLB335 Alternative Dispute Resolution*

**Prerequisite: None**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 2; Hours per Week in Lab: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

This course looks at some of the more important methods of resolving disputes outside of litigation. It pays particular attention to those methods that are common in Ghana ie good offices, arbitration, negotiation and mediation. Through role play simulations, students will gain experience of and insights into the practice of ADR.

## 5.7 Humanities and Social Sciences Core and Electives

#### *5.7.1.1 AS 111 Ashesi Success*

**Required for All Freshmen**

**Prerequisite(s): None**

Credit Hours: 3; Ashesi Credit Units: 0; Hours per Week in Classroom: 3; Hours per Week of Discussion: 0

A program designed to enhance your overall success in college and in life. The most important objective of the program is personal empowerment: learning who you are as a college student, learning who you are as a human being and what you stand for, learning how to speak up when your values conflict with those around you, and learning what it takes for you to keep yourself balanced and on course to success. When you are empowered, your actions are more purposeful and your choices more deliberate. When you are empowered, you are more engaged and more motivated every day. And when you are empowered, you have a greater sense of well-being and enjoyment in life.

## 5.7.2 First-Year Experience Courses

### *5.7.2.1 ENGL 001 Writing, Public Speaking, and Multimedia Communications*

**Required for All Freshman**

**Prerequisite(s): None**

Credit Hours: 4; Ashesi Credit Units: 1; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1

This course is designed to equip you with effective communication, research, and analysis skills that will enable you to successfully present your team's work for the Challenge and prepare you for further development of these skills in the Written and Oral Communications course in January Semester (Semester 2). You will specifically hone your skills in the following areas: writing, public speaking, argumentation, multimedia communication, and research. You will also build your teamwork skills by collaborating on the culminating project together, which will be in-class team debates on contemporary issues related to the African Development goals 3, 7, and 18 (healthy and nourished citizens, environmental sustainability, and youth empowerment).

### *5.7.2.2 FYE 001 How to Communicate Like a Leader (Optional)*

**Required for All Freshmen**

**Prerequisite(s): None**

Credit Hours: 4; Ashesi Credit Units: 1; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1

In this intensive, two-week course experience, students model leadership scenarios by learning the elements of oral communication by leaders, analysing real-world examples, and finally role-playing competing interests while collaborating on an original speech. This course builds on skills learned in Written, Oral, and Multimedia Communication class in Ashesi's the first-year experience in Semester 1 of the academic year 2020-2021 by reflecting on the motivations and trade-offs involved in pleasing different constituencies of the audience for a speech. Structured discussion and reflection enable students to gain a deeper understanding of the opportunities and challenges inherent in winning support while remaining ethical.

### *5.7.2.3 FYE 002 English Bridge (Optional)*

**Required for All Freshmen**

**Prerequisite(s): None**

Credit Hours: 4; Ashesi Credit Units: 1; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1

Students will hone their reading writing skills through intensive workshops focused on developing their reading comprehension and writing clarity and concision. This optional module is for students who qualified for this module based on the first week diagnostic assessment and for any other students who would like to join the course.

### *5.7.2.4 ENGL 112 Written and Oral Communication*

**Required for all BA, MIS & CS, ENG Majors**

**Prerequisite(s): None**

Credit Hours: 4; Ashesi Units: 1; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

While academic work can be demanding, anyone can become better at it with some effort. The primary objective of this class is to help first-year students take charge of their academic communication, which will help them write and speak confidently and effectively. By the end of this semester, students should have gained an ever-widening skillset that will help them navigate the different stages of academic life at Ashesi University.

### *5.7.2.5 ENGL 113 Text and Meaning*

**Required for all MIS & CS, ENG Majors**

**Prerequisite(s): Written & Oral Communication**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

Text and Meaning is one of the foundational courses at Ashesi University. This course invites students to turn their critical and creative attention to the study of literary and critical theories such as Feminism, Marxism, and Postmodernism among others. Through readings and activities that welcome critical thinking, students will participate in a range of activities that will enhance their ability to pose questions, propose hypotheses, gather, and analyse data, and make arguments. Within this course, the term 'text' is used in its broadest possible sense, and includes literature, newspapers, magazines, speeches, advertising, websites, blogs, film, music, and documentaries. Likewise, reading is theorized and given an expansive scope that covers not only the processing of letters on a page but text consumption more broadly, including listening, viewing/watching, observing, and other modes.

#### *5.7.2.6 SOAN 325 Research Methods*

**Required for all BA, MIS & CS Majors**

**Prerequisite: Statistics, or Statistics for Engineering & Economics**

Credit Hours: 4; Ashesi Credit Units: 1; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

The course is designed to provide students with the fundamentals of research methods and experiential guidance to develop research proposals. Students will gain content knowledge, skills, and dispositions on the progressive steps of the research process, which includes problem identification, literature review, design of methodology, data collection, analysis and report writing. This research experience will provide foundational skills for capstone project execution.

### 5.7.3 Leadership Seminar Series

The Leadership Seminar Series is a series of interdisciplinary seminars designed to promote self-awareness among Ashesi's students and to expose them to the ideas of great historical thinkers and contemporary leaders. Students will be asked to think broadly and to explore how they might use the examples set by other leaders to achieve their goals in their future professional lives. The leadership seminar series draws upon experts in different fields of corporate, social and academic life. Students must complete the full series to graduate from Ashesi University. The series consists of the following seminars:

#### *5.7.3.1 SOAN 111 Leadership Seminar 1*

**Required for all BA, MIS & CS, ENG Majors**

**Prerequisite(s): Ashesi Success; Written and Oral Communication**

Ashesi Units: 0.5; Credit Hours: 2; Hours per Week in Classroom: 1.5; Hours per Week of Discussion: 0; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 3 per week

This course explores such questions as "What is good leadership?", "What are the attributes of a Great Leader?" and "What does a good leader do or not do?" In this seminar, students will do readings of various historical and contemporary public and business leaders and explore the ethical dimensions of leadership. This is a half unit seminar taught in the format of discussions and assigned readings.

Course content addresses the purpose of leadership and the qualities of a great leader. Students will explore ethics and civic engagement in course readings and discussions. By comparing frameworks for leadership and ethical decision-making and applying those frameworks to leaders in a variety of contexts, students learn to analyse and evaluate the leadership they observe around them. Weekly writing assignments build students' skills in reflective writing. In-class discussions and debate build students verbal communication and presentation skills.

#### *5.7.3.2 SOAN 211 Leadership Seminar 2*

**Required for all BA, MIS & CS, ENG Majors**

**Prerequisite(s): Leadership Seminar 1**

Ashesi Units: 0.5; Credit Hours: 2; Hours per Week in Classroom: 1.5; Hours per Week of Discussion: 0; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 3 per week

This seminar probes the most fundamental questions about the good society: "What are the most fundamental rights of humanity? "What impact does the national government have on the trajectory of nations? "What is the Social Contract - Rule of Law, and what impact does it have on civilisations?

After taking this seminar, students should have a deeper understanding of constitutional law and the concept of nations, whose leaders are expected to be servants of the people. This seminar also expands on the discussion of ethics, from corporate social responsibility to ethical issues in public office. Students will develop their skills in writing analytical and reflective papers.

#### *5.7.3.3 SOAN 311 Leadership Seminar 3*

**Required for all BA, MIS & CS, ENG Majors**

**Prerequisite(s): Leadership Seminar 2**

Ashesi Units: 0.5; Credit Hours: 2; Hours per Week in Classroom: 1.5; Hours per Week of Discussion: 0;

Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 3 per week

Ashesi University's mission is to educate a new generation of ethical entrepreneurial leaders in Africa, instilling in students the critical thinking skills, compassion for others, and the courage necessary to enact transformative change across the continent. This course is designed to provide students, who are the future leaders, with an in-depth understanding of the theoretical foundations of economic activity within society. It aims to empower leaders to effectively organize economic activities in a manner conducive to creating a desirable societal environment. Additionally, the course delves into strategies for achieving a balanced distribution of economic activities within society, tailored to the specific needs and aspirations of the community, and guided by models that prioritize equity.

#### *5.7.3.4 SOAN 411 Leadership Seminar 4*

**Required for all BA, MIS & CS, ENG Majors**

**Prerequisite(s): Leadership Seminar III**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

This course is a capstone to the Leadership Seminar Series and puts into practice many of the general concepts discussed in the previous leadership seminars and other courses taken at Ashesi. Service-learning, a vital component of the course, is intended to help you develop a sense of citizenship by becoming engaged with your surrounding community, putting the lessons learned throughout your leadership journey in the various seminars into practical use.

Servant leadership is the core concept we will explore in this seminar. You will have opportunities to reflect on the concept in different ways, including assigned readings and class discussions, debates, identifying and finding solutions to a service project in a community of your choice, various reflective assignments, team, and individual presentations, flip classrooms, shared readings, journaling, and guest speakers. This seminar is a full-unit capstone; it is not meant to be a 'cerebral' course. It's supposed to tug at your heart primarily; therefore, reading ahead of class is crucial. You will be expected to:

- Respect our Circle of Trust, as we share both shallow and deeply personal experiences and thoughts. NOTHING is a taboo topic in this class. If it's on your mind, let's share it!
- Open up and participate fully in all discussions so we can learn from you. No silent spectators!
- Be willing to serve and serve well! Quantum leaders inspire & institutionalize positive change!

The overarching purpose of this seminar fits squarely within Ashesi's mission with its focus on ethical leadership. If the next generation of leaders embraces service as central to leadership, we can help transform our continent and the world! The course content will challenge you to reflect deeply on your leadership journey through the lenses of multiple Servant leadership concepts, including self-awareness, personality, and communication and public speaking for impact, leading quietly, followership, power versus service models of leadership, managing and learning from failure, Ubuntu, key practices of Servant leaders, through the examples of Servant leaders and changemakers across the African continent and in-class guests culminating into a practical opportunity to act out your sense of citizenship through your service project. Finally, the seminar aims to equip you with the needed skills to identify, analyse and evaluate the actions and activities of Servant leaders around you with a particular focus on civil society, advocacy and activism, private and public sectors, NGOs, and social entrepreneurship.

### 5.7.4 Africana/African Studies Elective Courses

#### *5.7.4.1 ENGL 231 African Literature & Film*

**Non-major elective**

**Prerequisite(s): Written & Oral Communication, Text & Meaning**

Credit Hours: 4; Ashesi Credit Units: 1; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1.

Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

This course aims to introduce students to some of the major debates in the subjects of African Literature and Film. Through an interdisciplinary approach, we will study African cultural creations in both mediums and others subtending or related to them, supplemented with short theoretical readings centred on the following interconnected topics: decolonisation, gender, language, and storytelling.

We will cover a range of themes, issues and debates, including but not limited to the following: the continent's engagement with Western thought and literary traditions, explore traditional oral literatures, examine commonalities in style and theme and tackle issues of gender and ethnicity. We will also examine literary works as complex expressions of their contexts, as well as indicators or an index of the values and worldviews of the societies in which they were composed from which they emerged, and those they came to subsequently enter.

The class is delivered through a variety of means, employing various techniques. Through class discussions, writing assignments and individual research, students will be able to combine, integrate and ultimately contribute to the sum of knowledge learned in this class with knowledge and skills gained in other courses, notably Written & Oral Communication and Text & Meaning.

#### *5.7.4.2 POLS 221 African Philosophical Thought*

**Non-major elective**

**Prerequisite(s): Written & Oral Communication, Text & Meaning**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

A serious thinking through or reflection on the practical/tangible aspects of the human experience is the goal of philosophy. This course is an introduction to a variety of themes of philosophical thinking in Africa. The approach adopted to advance the goals of the course, differs from traditional philosophy courses in a significant way. Specifically, we will read about the works of African philosophers; apply/interrogate such thoughts in such works to grounded cultural practices in actual and mediated lives; and think through and dialogue with fellow colleagues on the readings in this class. Thus, throughout the course we will use concrete examples to ground readings which may sometimes be abstract. The goal of this grounded approach is to demonstrate the relevance of philosophical thinking in contemporary times and to negate the idea that 'philosophy' does not 'touch ground' (that is, it is only intellectual exercise) and is thus only a 'thinking' (and boring) subject.

#### *5.7.4.3 POLS 231 Africa in International Settings: Africa Beyond Aid*

**Non-major elective**

**Prerequisite(s): Written & Oral Communication, Text & Meaning**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

Across the African continent many want to do away with decades of aid dependency striving instead for a more assertive Africa on the international scene. This course encourages informed debate and a varied assessment of what overseas development assistance has evolved into over the years and how can it be complemented and replaced by more effective and relevant resources. It will offer a variety of case studies from individual African countries as well as identifying regional trends and characteristics.

The course aims to locate the topical 'Beyond Aid' debate in a theoretical, historical, and regional perspective. It offers an introduction to main tenets of development theory and provides an overview of how international norms guiding development policy have evolved from the first development decade of the 1960s to the Sustainable Development Goals (SDGs) adopted by the UN in 2015.

Furthermore, the course assesses the changing role of development assistance in the context of African economic and social development and will compare contemporary data on the role of aid relative to trade, remittances, and foreign direct investments. It will look at challenges confronting African countries aiming to offer a more diverse and varied understanding of development options and constraints relative to the often-stereotyped perceptions of 'one size fits all' presumably meant to apply across 54 very different nations on the continent. And it will look at how access to financial resources influence the position of African governments in shaping current geopolitical alliances.

#### *5.7.4.4 POLS 332 Governance in Africa*

**Non-major elective**

**Prerequisite(s): Written & Oral Communication, Text & Meaning**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

**Scope & Sequence**

'Governance in Africa' forms part of the African Studies Elective course for level 300 designed for students pursuing 3rd and 4th years. The course helps students prepare for capstone projects and may further provide useful context for other courses taught in social theory, leadership 3 and 4, international trade & policy. During the course, students will be assisted to understand basic research methods, familiarize with the American Psychological Association (APA) formatting and referencing requirements, use of library and web resources to acquire relevant data and literature, and apply analytical skills and critical thinking to class debates as well as the submission of summative assessment papers.

**Research Base**

Ordinarily, the concept of 'governance' mirrors activities being undertaking by government(s). In international diplomacy, public policy and social theory, the concept is usually associated with prefixes such as good or bad governance, responsible or accountable governance, effective or ineffective governance, amongst others.

Since the 1990s, international development partners have addressed, and continue to engage in diverse development challenges in response to the changing global dynamics. In the Sub-Saharan Africa, where under development continue to linger, 'good governance' has found space in governance lexicology and considerably shaped policy direction as well as formed part of precondition(s) for development assistance.

Primarily, stakeholders' efforts have focused on the supply side of governance: enhancing capacity of state institutions to public participation, coordination, engagement, accountability, equity, transparency, and other well-intentioned considerations. Later developments witnessed a shift of attention to the demand side where civil society and non-state players articulate interests and demand access to government. Subsequently, academic literature has focused on the interface of both the demand and supply side of governance.

Accordingly, 'Governance in Africa' seeks to unveil governance beyond the prerogative of government. The course presents an institutional process involving multiple actors in and outside the confines of government striving at authoritative decision-making arrangements. Governance is presented recognizing the geographical and social contexts, thus, projecting a 'best-fit' practical approach as opposed to the superlative conception of 'best practice'.

The course offers students analytical track to understanding existing governance arrangements in Africa, considers available opportunities and institutional arrangements and how these can be fine-tuned to ensure more responsiveness to the needs of society – public and private interests.

#### *5.7.4.5 SOAN 225 Ghanaian Popular Culture*

**Non-major elective**

**Prerequisite(s): Written & Oral Communication, Text & Meaning**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

This Ghanaian Popular Culture course is an undergraduate, 300-level, African Studies elective at Ashesi University. The course uses creative and engaging content in Ghanaian Popular Culture (for instance, video movies, vehicle inscriptions, political cartoons) as a channel for teaching disciplinary analytical thinking and reasoning skills to focus on academic writing, and to indirectly prepare students for capstone projects.

*5.7.4.6 SOAN 233 African Music and the Contemporary Art Music Scene*

**Non-major elective**

**Prerequisite(s): Written & Oral Communication, Text & Meaning**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

This course explores how the character of traditional African traditional music and culture has been reimagined and integrated in contemporary times as Popular, World, Jazz, and Afro Beat and Art/classical music forms by nationalistic African composers. We analyse these music genres for African 'signifiers', consider selected scholarly theories about Afro-classical music by Akin Euba, John Nketia, and Kofi Agawu, formulate theories, applications, and conclusions about the marketing and reception Afro-classical music, and reflect on our own social responsibility to this music genre as educated Africans.

The course content is found in Canvas. Reading articles are stored in Canvas in their pdf formats. The lecture itself is on zoom and accompanied by Google slides. All relevant data can be found on the slide which can be accessed through a link. A significant portion of the lecture is spent listening to music and discussing the compositions. Music links are found on the weekly google slides. Weekly announcements as well as a calendar are presented on Canvas and updated by the Faculty Intern to keep students apprized about weekly expectations. In addition to (2) two weekly lectures, there is an hour-long discussion class held by the FI.

Mission: The mission of Ashesi University is to educate a new generation of ethical, entrepreneurial leaders in Africa; to cultivate within our students the critical thinking skills, the concern for others and the courage it will take to transform a continent.

Vision: Our vision is an African renaissance driven by a new generation of ethical, entrepreneurial leaders. We aim to educate such leaders, and to drive a movement in African higher education to scale up the education of such leaders.

*5.7.4.7 SOAN 322 African Cultural Institutions*

**Non-major elective**

**Prerequisite(s): Written & Oral Communication, Text & Meaning**

Credit Hours: 4; Ashesi Credit Units: 1; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1.

Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

Contemporary African societies reflect the interplay of tradition and change. The institutions of the past have not simply given way to the newer ones of the present. It is an interplay among what Ali A. Mazrui called a "Triple Heritage" of Indigenous Africa, Islamic Africa, and Euro-Christian/Western Africa. Kwame Nkrumah identified the same dynamic and described it as "Consciencism"—how these three influences on contemporary African life and institutions generate a "crisis of conscience". Thus, African cultural institutions and practices continue to give direction to the internal and external changes that are taking place in Africa and in the Americas today. This course examines the social, political, economic, and religious institutions embodying patterns of culture that have evolved over thousands of years and represent Africa's contribution to global civilization. The course enables students to see Africa in a global perspective and provides a framework for scholarly reflection. We approach this course from socio-anthropological perspectives and identify culture as:

- A lived experience developed over time with contours and detours based on geography, history, and environment,
- African cultures as different yet similar to all other cultures

The course focuses on three interrelated themes: (a) Cultural processes and institutions that existed just prior to the "arrival" of Europeans, (b) the raptures to these cultural processes and institutions—caused especially by the trans-Atlantic slave trade and its subsequent colonial phase, and (c) the legacies of these ruptures during the postcolonial era to the present. Of particular concern will be the effect on processes of development and democratization. The integration and/or influences of African cultural institutions with other parts of the world, and the centrality of "Africa" in the world receive attention.

*5.7.4.8 SOAN 227 Religion in Africa*

**Non-major elective**

**Prerequisite(s): Written & Oral Communication, Text & Meaning**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

This course is an introduction to a cross-cultural study of religions and cultures of Africa through the disciplines of anthropology, history, and sociology of religion. The goal of the course is to teach students to think critically about the traditional religious heritage of Africa as a profound reflection on the human condition. This goal is achieved through a systematic study of the attitudes of mind, beliefs, as well as practices which have evolved in the many African societies such as the Akan of Ghana, Yoruba and Ibo of Nigeria, Malinke of Guinea, the Ewe/Fon of Dahomey/Benin, the Luo of Tanzania, K(G)ikuyu and Masai of Kenya, the Zulu of Southern Africa, and the Mende of Sierra Leone. Through the viewing of documentary films, movies, lectures, and discussions, the meaning, structure, nature, and world views of contemporary Africans are closely examined.

In addition, the course offers an overview of how cultural and religious knowledge is generated, understood, and used as Africans in general and Sub-Saharan Africans in particular, draw on their music and dance, myths, art forms and symbols to articulate and elaborate on the cosmos, life, sickness, health, and death, as they organize their lives. It does so by retrieving and analysing the significance of creation myths, religious personalities such as rulers, diviners, and healers, in relation to the role of the ancestors.

Finally, it reflects on the social, cultural, and historical factors which have engendered religious changes in Africa. Particularly it unpacks the problematic emergence of two world religions, Christianity, and Islam "Guest Religions" and their encounters with the indigenous religions of Africa. Attention is paid to the impact is the "host" on the "guest" religions. In the end, it is hoped that students are enabled to interpret, articulate, and synthesize religious knowledge, experience, and reflection as they deal with African ideas, belief systems and practices.

*5.7.4.9 SOAN 301 Introduction to Africana Studies: The Global Black Experience*

**Non-major elective**

**Prerequisite(s): Written & Oral Communication, Text & Meaning**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

Introduction to Africana Studies surveys the sum-total of the content of Black peoples' lives historically and in the present. The course raises and attempts to answer some key questions: What is the nature and historical contours of the Global Black Experience? How have our understandings and appreciations of this experience changed over time? What is "Africa" to (a) Continental Africans? (b) Caribbean/South American Africans? (c) North American Africans and (d) Indian (Asia) Africans—such as the Sidi of Mumbai? The term "Africana" therefore encapsulates the "wide community" of Africa. It offers an openly conceptual framework to attract new and emerging ways of understanding the global Black experience.

The course therefore explores the interconnectedness of Black subject identities, experiences, issues, themes, as well as topics, and applies them dynamically to diverse locations of the Black world. Specifically, it sheds light on the global approach to the African Diaspora, showing how globalism underscores the distinctive role that Africa and African people have played in their contributions to world affairs. It seeks to demonstrate how Africana people have reclaimed their own "story", noting that "until lions have their own historians, tales of hunting will always glorify the hunter."

Thus, the methodology of this course uses a paradigm which identifies the multiple levels of Black reality over time. The basic facts and perspectives of the course come from the synthesis of three main sources: Africana intellectual tradition, the traditional academic disciplines (particularly the humanities and social sciences), and the Black Studies Movement. The course is also concerned with the development of academic skills. Through lectures, discussions, documentary and feature films, students are guided to learn how to read and interpret the scholarly output of the field of Africana Studies, master key concepts, definitions, and terminologies. In addition, students learn to express their understandings and reactions to the subject matter both verbally (oral presentations) and in writing in the mode associated with the discipline of Africana Studies.

*5.7.4.10 POLS 322 China-Africa Relations*

**Non-major elective**

**Prerequisite(s): Written & Oral Communication, Text & Meaning**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

The period from the 1990s has witnessed rapidly bourgeoning Sino-Africa ties, even though ties between them are not new. This is an interdisciplinary course intended to study the historical, economic, cultural, military, and political relations between the People's Republic of China and independent Africa. Employing a miscellany of primary source documents and secondary sources, the course will explore these interactions between China and Africa. We shall be particularly interested in several pertinent questions, including, does present-day Chinese engagement in Africa amount to a "new scramble for Africa" or "neo-imperialism"? Is China a hegemonic power in Africa? What are the implications of the "Beijing Consensus", and how has China's embrace of market reform in the 1980s changed her economic and ideological ties with Africa? This course also investigates the nascent role of Chinese companies and businesses in a fast-developing Africa. The goal is to augment students' comprehension of the dynamics of China-Africa relations in a progressively globalized world.

*5.7.4.11 POLS 234 Comparative Politics: Politics in Africa*

**Non-major elective**

**Prerequisite(s): Written & Oral Communication, Text & Meaning**

Credit Hours: 4; Ashesi Credit Units: 1; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

This course is an introductory survey of politics in sub-Saharan Africa from the pre-colonial period to the contemporary era. The course examines the common themes, issues, and trends that shape politics and development across the forty-nine countries in sub-Saharan Africa. The course is organized around the following broad themes: pre-colonial and colonial legacies, nationalistic politics and independence, personal rule and military interventions, economic reforms, and democratic transition/consolidation/backsliding.

*5.7.4.12 SOAN 239 African & Diasporan Choir*

**Non-major Elective**

**Prerequisite(s): Written & Oral Communication, Text & Meaning**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

The Course offers students the opportunity to:

- Sing choral repertoire from Africa and the African Diaspora
- Learn the fundamentals of reading music and vocal production.
- Explore the historical, cultural, and socio-political context of African choral repertoire
- Represent Ashesi on and off campus as part of the Official University Choir

*5.7.4.13 SOAN 302 Travel Seminar: Living Ghana's History, Culture, and Politics*

**Non-major elective**

**Prerequisite(s): Written & Oral Communication, Text & Meaning**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

Tell me, and I forget. Teach me, and I remember. Involve me, and I learn." This travel seminar embraces Benjamin Franklin's advice. It is intended to enable students to observe and experience contemporary Ghana firsthand, in order to understand what has defined and shaped its history, culture, and politics. The seminar uses social science methodology to explore among other topics, religion, and ethnicity. "Geography is the mother of history," observed Ali A. Mazrui. It uses Ghana as a specimen to examine West Africa's postcolonial life, specifically, how and why the country has been able to withstand the shocks and disintegration of the social, cultural and political glues in comparison with other states such as Nigeria, Sierra Leone, Liberia, among others. By focusing on the geographical

features of Ghana earmarked at the "Berlin Conference" at which rivers and mountains formed the boundaries of colonial Africa, students are enabled to see, feel, and understand the country experientially.

As a subtheme, therefore, the seminar addresses leadership in postcolonial Africa, a central component of Ashesi University's mission. It argues that Kwame Nkrumah, the first postcolonial leader inherited not only a postcolonial state; it was also notoriously weak and fragile. Loyalties were primarily primordial. However, the careful responses to the issues of ethnic and religious affiliations by Nkrumah have shaped Ghana's political, social, and cultural lives. Students are guided through readings, lectures, discussions, and firsthand observations and interviews during the cross-country travel to witness the ethic of tolerance, and how this ethic informs Ghanaian entrepreneurial spirit as well. Thus, the seminar sets up some core introductory themes that would enable international students to navigate their stay in Ghana.

#### *5.7.4.14 SOAN240 Neo-Traditional African Dance Forms*

**Non-major elective**

**Prerequisite(s): Prerequisite(s): Written & Oral Communication, Text & Meaning**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

This course invites the student to embark on a captivating journey into the world of African dance forms, focusing on vibrant Ghanaian traditions, contemporary expressions and importantly modern expressive areas where students will be encouraged to incorporate technology into their performance outputs . Students will delving into both foundational movement techniques and the rich cultural and historical contexts that imbue these dances with life. Throughout the course, students will not only gain technical proficiency but also cultivate creativity, self-expression, increase in mental and emotional wellbeing and a sense of community through shared movement and rhythm.

#### *5.7.4.15 SOAN237 Crafting Cultures: Exploring African History through Ceramics and Pottery*

**Non-major Elective**

**Prerequisite(s): Text and Meaning**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

This course delves into the rich tapestry of African history, unravelling the cultural narratives and societal dimensions through the lens of ceramics and pottery. Students will embark on an immersive journey, tracing the significance of pottery in diverse African cultures, unravelling symbolism, mastering practical techniques, and examining the intersections of art, history, and culture.

#### *5.7.4.16 ENG232 African Folktales - How Stories Shape Us*

**Non-major elective**

**Prerequisite(s): Text and Meaning**

In this course, we will explore the ways in which African folktales inform and influence our live experiences. Embarking on this exploration will help us appreciate the role that folktales play in shaping our identity, preserving our culture, as well as cultivating a sense of pride. Over the course of the semester, we will investigate the evolution of folktales from different parts of the African continent, exploring factors such as: time, location, ownership, orality and transcription. Finally, through a series of hands-on activities, students will develop a body of work that will culminate in a class project: an immersive storytelling event exhibiting original tales.

#### *5.7.4.17 SOAN 236 ESG: Corporate Ethics in Africa*

**Non-major elective**

**Prerequisite(s): Leadership Seminar 2**

This course offers a comprehensive examination of Environmental, Social, and Governance (ESG) principles and their growing impact on corporate governance and the regulatory landscape across various sectors of the global economy, with a special focus on Africa. It challenges the perception of ESG as merely an element of corporate social responsibility or governance, encouraging a deeper exploration into the essence of corporate ethics.

Students will engage with foundational theories of corporate ethics, dissecting notions of legal personality and corporate accountability. This theoretical framework serves as a January Semester (Semester 2)board into an in-depth analysis of ESG, debating its validity as either an investment strategy, a governance framework, or a transient trend. The curriculum includes a look at "green finance" mechanisms, such as carbon credit markets, green bonds, and sustainability-linked bonds, along with their governing documents and classification systems.

Set against the backdrop of African corporate law and theory, the course evaluates Africa's response to ESG trends through market, economic, and legal lenses. It invites comparison with global efforts, questioning the intrinsic value of Corporate Ethics in the African context and its significance for the continent's corporations. Discussions will extend to how ESG and corporate ethics can enhance social initiatives, particularly those aimed at increasing racial and gender diversity, and address the complexities of corruption and its impact on the burgeoning technology sectors in Nigeria and Kenya.

As the culmination of the course, students will be encouraged to engage critically with the question of whether ESG represents a worthwhile investment of time and resources for African corporations in the pursuit of tangible corporate ethics.

#### *5.7.4.18 POLS 222 Political Economy of Healthcare in Ghana*

**Non-major elective**

**Prerequisite(s): Prerequisite(s): Written & Oral Communication, Text & Meaning**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

The provision of healthcare – by state and non-state actors – has become a worldwide conversation, especially in the twenty-first century. Politics, herein defined as the authoritative allocation of resources or values, is a critical piece of the conversation about healthcare provision. Through lectures, discussions, and fieldwork, this course examines healthcare provision in Ghana from three crucial assessment points: policy development and implementation on a) accessibility to care, b) affordability of care, and c) quality of care.

The course is divided into three parts. Part I is organized under five main themes:

1) the history and politics of healthcare provision in Ghana, 1957-1969;
2) the influence of military regimes and rapid urbanization on healthcare policy in Ghana, 1970-1982;
3) the influence of donor organizations and nations on healthcare provision in Ghana, 1983-1996;
4) democracy and citizen participation in the development of healthcare policy in Ghana, 1997-2000, and
5) politics and national health insurance in Ghana, 2001-present.

Part II allows students to be put in groups of no more than two to conduct fieldwork and collect data on the critical assessment points using the qualitative method, specifically interviews. Students MUST submit their research proposals by the end of Week 6. (Efforts will be made to secure some financial support to facilitate fieldwork.) Students may be permitted to work alone with the permission of the course instructor.

In Part III, students will write and present their research findings at a class mini-conference. While students may be paired to conduct fieldwork, their papers and presentations are expected to be individual work. The goal is that the papers will be put together and submit to an academic journal for publication consideration.

#### *5.7.4.19 SOAN 238 Introduction to Sociocultural Anthropology*

**Non-major elective**

**Prerequisite(s): Prerequisite(s): Written & Oral Communication, Text & Meaning**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

Sociocultural anthropology is the study of human beings and involves the comparative study of societies throughout the world and how and why they change over time. Students will learn the core concepts, fundamental key terms, issues, debates, theories, and research methods of contemporary applied cultural anthropology.

## 5.7.5 French Elective Courses

### *5.7.5.1 FRENC 111 Conversational French I*

**Non-scoring**

**Prerequisite(s): None**

Ashesi Units: 0.5; Credit Hours: 3; Hours per Week in Classroom: 3; Hours per Week of Discussion: 0; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 6 per week

The purpose of this course "Conversational French" is to provide an avenue for students to master the art and skill of speaking and communicating freely in the French language. Through a combination of interactive activities, discussions, presentations, and practical exercises, students will develop fluency, pronunciation, and effective communication strategies in French with an emphasis on the West African sub-region. This course is structured primarily using the Communicative Language Teaching (CLT) approach, which focuses on developing students' ability to communicate in real-life situations, and also the Task-Based Language Teaching (TBLT) approach, and Global Simulation (GS), which centers learning around completing meaningful tasks, encouraging the use of language in authentic contexts. These three approaches emphasize interaction as both the means and goal of learning.

The course aims to create a supportive environment for students to express themselves confidently in various real-life situations, particularly related to the francophone African culture.

### *5.7.5.2 FRENC 123 Conversational French II*

**Non-scoring**

**Prerequisite(s): None**

Ashesi Units: 0.5; Credit Hours: 3; Hours per Week in Classroom: 3; Hours per Week of Discussion: 0; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 6 per week

This course offers flexible work on the acquisition of basic active skills (speaking, reading, writing and expanding vocabulary). We will use a wide range of authentic documents anchored in the West African context (primary and secondary sources, including articles, short novels, photographs, and advertisements, flyers, interviews, videos, audios).

The course aims to create a supportive environment for students to express themselves confidently in various real-life situations, particularly related to the francophone African culture.

### *5.7.5.3 FRENC 213 Professional French (Global communication in French)*

**Non-major elective**

**Prerequisite: None**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

Ghana's strategic location among Francophone countries and her trade relations with the sub-Saharan region underscore French's significance as a key communication language. To remain competitive in the subregion, businesses increasingly prioritize bilingualism in English and French, driving demand for language-proficient professionals.

In response, Ashesi University provides French language training to equip students as independent users, capable of navigating Francophone environments. The program aligns with the Common European Framework of Reference for Languages (CEFRL), aiming for proficiency at the B1 or B2 level.

This course is designed to develop practical communication skills in French for professional settings. It emphasizes oral and written communication, cultural understanding, and the vocabulary necessary for workplace interactions, enabling students to confidently engage in Francophone environments.

### *5.7.5.4 FRENC 318 Langue Francaise: La Culture En Plus*

**Non-major elective**

Ashesi Units: 1; Credit Hours: 4; Hours per Week in Classroom: 3; Hours per Week of Discussion: 1; Hours of Study Outside of the Class (reading, assignments, studying, projects, and so on): 8 per week

In this course you will learn how to communicate in a francophone professional setting. This training also aims to help you become more confident of your French communication skills especially the oral skills.

For this course we will not be using any book, but authentic documents anchored in the French and West African context (primary and secondary sources, including articles, short novels, photographs, and advertisements, flyers, interviews, videos, audios).

# 6 Pre-Admission Preparatory Experience

Conducted during the Admissions Process

All students admitted to Ashesi yet to be matriculated are highly encouraged to take the preparatory module courses. Following a needs assessment which indicated that first-year students experienced the steepest challenge in their transition to learning at university, incoming pre-matriculation first-year students are asked to register on an Ashesi eLearning online platform, a link provided by the Admissions Office. The eLearning platform has content which focuses on foundational knowledge designed to prepare incoming college students for college level thinking. Ashesi hopes to mitigate the learning challenges faced by first-year students and ensure that all admits, regardless of background, enter university prepared to succeed. The modules hosted on the e-learning platform introduce and train students' minds in different ways of thinking, preparing them to move beyond the rote learning and memorization to which they are accustomed. The preparatory courses include design thinking, data visualization, Entrepreneurship, Communications (writing and public speaking), introduction to computer science, Math Bridge, and CAAD (Creative Approaches for Africa's Development), were designed to promote the development of skills such as critical thinking, ethics, systems thinking, as well as subject matter competencies. The transdisciplinary foundation is key to student academic success at university.

# 7 European Credit Transfer and Accumulation System (ECTS) per Department

## 7.1 ECTS for Degree in Business Administration

| Learning Activity | Learning Hours |
|---|---|
| Per Semester | |
| • In class instruction per course | 39 hours (3 hrs. X 13 weeks) |
| • In class discussion associated with course | 13 hours (1 hr. X 13 weeks) |
| • Out of class independent study associated with course instruction and discussion | 104 hours ([39 hrs. + 13 hrs.] X 2) |
| • Independent Activities Period | Minimum 40 hours |
| TOTAL per course | 196 hours |
| There is a minimum of 33.5 courses in a program for a degree | 6,566 hours (196 hours X 33.5) |
| Experiential Learning per Program | |
| • Foundations of Design and Entrepreneurship I | 60 hours |
| • Foundations of Design and Entrepreneurship II | 60 hours |
| • Internship | 160 hours |
| • Leadership IV | 50 hours<br>(10 hrs. pre and post fieldwork + 40 hrs. fieldwork) |
| • Capstone | 140 hours |
| **TOTAL hours of learning per program** | 7076 hours |
| ECTS (using 1 ECT = 25 hours) | Approx. 283 ECTS |

## 7.2 ECTS for Degree in Engineering

| Learning Activity | Learning Hours |
|---|---|
| Per Semester | |
| • In class instruction per course | 39 hours (3 hrs. X 13 weeks) |
| • In class lab associated with major course | 39 hours (3 hr. X 13 weeks) |
| • In class discussion associated with general courses | 13 hours (1 hr. X 13 weeks) |
| • Out of class independent study associated with major course instruction and discussion | 156 hours *([39 hrs. + 39 hrs.] X 2)* |
| • Out of class independent study associated with general course instruction and discussion | 104 hours *([39 hrs. + 13 hrs.] X 2)* |
| • Independent Activities Period | Minimum 80 |
| TOTAL per major 16 courses | 234 hours |
| TOTAL per general 18 courses | 156 hours |
| There is a minimum of 16 major courses in a program for a degree | 3,744 hours *(234 hours X 16)* |
| There is a minimum of 18 general courses in a program for a degree | 2,808 hours *(156 hours X 18)* |
| Experiential Learning per Program | |
| • Foundations of Design and Entrepreneurship I | 60 hours |
| • Foundations of Design and Entrepreneurship II | 60 hours |
| • Internship | 160 hours |
| • Leadership IV | 50 hours<br>*(10 hrs. pre and post fieldwork + 40 hrs. fieldwork)* |
| • Capstone | 240 hours |
| **TOTAL hours of learning per program** | 7,202 hours |
| ECTS (using 1 ECT = 25 hours) | Approx. 288 ECTS |

## 7.3 ECTS for Degree in Computer Science and Information Systems

| Learning Activity | Learning Hours |
|---|---|
| Per Semester | |
| • In class instruction per course | 39 hours (3 hrs. X 13 weeks) |
| • In class discussion associated with major course | 19.5 hours (1.5 hr. X 13 weeks) |
| • In class discussion associated with general course | 13 hours (1 hr. X 13 weeks) |
| • Out of class independent study associated with major course instruction and discussion | 117 hours *([39 hrs. + 19.5 hrs.] X 2)* |
| • Out of class independent study associated with general course instruction and discussion | 104 hours *([39 hrs. + 13 hrs.] X 2)* |
| • Independent Activities Period | Minimum 80 |
| TOTAL per major course | 175.5 hours |
| TOTAL per general course | 156 hours |
| There is a minimum of 14 major courses in a program for a degree | 2,457 hours *(175.5 hours X 14)* |
| There is a minimum of 19.5 general courses in a program for a degree | 3,042 hours *(156 hours X 19.5)* |
| Experiential Learning per Program | |
| • Foundations of Design and Entrepreneurship I | 60 hours |
| • Foundations of Design and Entrepreneurship II | 60 hours |
| • Internship | 160 hours |
| • Leadership IV | 50 hours<br>*(10 hrs. pre and post fieldwork + 40 hrs. fieldwork)* |
| • Capstone | 200 hours |
| **TOTAL hours of learning per program** | 6,109 hours |
| ECTS (using 1 ECT = 25 hours) | Approx. 244 ECTS |

# 8 Course Catalogue for Masters in Mechatronics Engineering Programs

## 8.1 Sequence for 3-year Joint MAS and MSc. Mechatronics Engineering Programs

List of courses to be taken for graduation:

1. Advanced Fundamentals [MAS]
    - Mathematical Tools I
    - Mathematical Tools II
    - Thermofluids
    - Computer Programming / Embedded Systems
    - Digital Electronics
    - Material Engineering
    - Signals and Systems
    - Dynamics
    - Statics and Solid Mechanics
    - Computational Methods

2. Mechatronics [MSc]
    - Control Systems I
    - Control Systems II and Optimal Control
    - Introduction to Robotics and Mechatronics
    - System Identification and Modelling
    - Communication Networks and Internet of Things
    - Data Analysis and Machine Learning

3. Engineering in Perspective [MSc]
    - Investment Appraisal and Cost Effectiveness Analysis
    - Leading Teams
    - Corporate Responsibility and Sustainability
    - International Environmental Politics
    - Introduction to Development Economics
    - Sustainable Engineering

4. Energy Systems [MSc]
    - Renewable Energy Technolgies
    - Energy Systems and Mobility

5. Production [MSc]
    - Manufacturing Processes
    - Process Engineering
    - Product Development
    - Reliability and Risk

6. Thesis and Internships

## 8.2 MAS Curriculum (Year I)

### 8.2.1 Mathematical Tools I

This course covers mathematical concepts and techniques necessary to model, solve and discuss scientific problems - notably through ordinary differential equations. The key is the so-called mathematical modelling cycle, i.e., the translation of problems from outside of mathematics into mathematics, the study of the mathematical problems and the interpretation of the results in the original environment. The content will span from single-variable calculus and linear algebra to ordinary differential equations.

### 8.2.2 Mathematical Tools II

This course is continuation of Mathematical Tools I and the focus is on multivariable calculus and partial differential equations. The goal of Mathematics II is to provide the mathematical foundations relevant for this paradigm. Differential equations are by far the most important tool for modelling and are therefore a focus of the course.

### 8.2.3 Thermofluids

This course introduces to the fundamentals of thermodynamics and fluid dynamics. It introduces the 1st and 2nd law of thermodynamics, the concept of energy, properties of compressible substances, and the kinetic theory of gases.

### 8.2.4 Embedded Systems and Computer Programming

An embedded system is some combination of computer hardware and software, either fixed in capability or programmable, that is designed for a specific function or for specific functions within a larger system. The course covers theoretical and practical aspects of embedded system design and includes a series of lab sessions. The focus of this lecture is on the design of embedded systems using formal models and methods as well as computer-based synthesis methods.

### 8.2.5 Digital Electronics

The course provides basic knowledge and methods to understand and to design digital circuits and systems. The content of the course includes digital signals and their representation, Boolean algebra, circuit analysis and synthesis, the MOS transistor, CMOS logic, static and dynamic behaviour, tristate logic, Karnaugh-Maps, hazards, binary number systems, and coding. Moreover, will be also covered combinational and sequential circuits and systems (Boolean algebra, K-maps, etc.), memory building blocks and memory structures, programmable logic circuits, finite state machines, and architecture of microprocessors.

### 8.2.6 Material Engineering

This module provides fundamental training in the behaviour and manufacturing properties of materials as well as an introduction to materials selection and design considerations as practiced in industry, including related concepts such as Design for Manufacturing and "green" design. The objectives of the course include the understanding of the societal implications of materials development, the appreciation of the challenges in materials selection, following the economical aspect of process selection, and grasp that any material is much more than its chemical composition.

### 8.2.7 Signals and Systems

Signals arise in most engineering applications. They contain information about the behaviour of physical systems. Systems respond to signals and produce other signals. In this course, we explore how signals can be represented and manipulated, and their effects on systems. We further explore how we can discover basic system properties by exciting a system with various types of signals. The course will cover discrete-time signals and systems, Fourier- and z-Transforms, frequency domain characterization of signals and systems, system identification, time series analysis, and filter design.

### 8.2.8 Dynamics

This course aims at providing a graduate level introduction into the identification and condition assessment of structural systems. Upon completion of the course, the students will be able to: Test Structural Systems for assessing their condition, as this is expressed through stiffness, analyse sensor signals for identifying characteristic structural properties, such as frequencies, mode shapes and damping, based on noisy or incomplete measurements of the

structural response, Establish relationships governing structural response (e.g. dynamics equations), Identify possible damage into the structure by picking up statistical changes in the structural "signature" (behaviour).

### 8.2.9 Statics and Solid Mechanics

The course revisits the basic concepts of forces and mechanical power and introduces methods for the analysis of statics problems: distributed forces, centre of gravity, equilibrium, principle of virtual power, trusses, frames, forces and moments in beams and cables, friction. For the mechanical design of deformable bodies, the concepts of stress and deformations and introduced, thus allowing the formulation of the basic problem of continuum mechanics. Different constitutive models are discussed, including anisotropic linear elasticity, linear viscoelasticity, plasticity, viscoplasticity. The course will cover basic structural theories and their applications for the analysis of structural stability and fatigue problems.

### 8.2.10 Computational Methods

This module introduces numerical methods and techniques for solving initial boundary value problems in solid mechanics (heat conduction, static and dynamic mechanics problems of solids and structures), finite difference methods, indirect and direct techniques, variational methods, finite element (FE) method, FE analysis in small strains for applications in structural mechanics and solid mechanics.

## 8.3 Mechatronics [MSc]

### 8.3.1 Control Systems I

This course will allow the students to identify the role and importance of control systems in everyday life. Over the course of the lectures, the students will learn how to analyse systems and synthetize controllers for linear time invariant systems with one input and one output signal.

### 8.3.2 Control Systems II and Optimal Control

This course focuses on the theory and practice of advanced control techniques. The course will touch the concept of state feedback, and the analysis and synthesis of linear multi-variable control systems.

### 8.3.3 Introduction to Robotics and Mechatronics

The aim of this lecture is to expose students to the fundamentals of mechatronic and robotic systems. Over the course of these lectures, topics will include how to interface a computer with the real world, different types of sensors and their use, and different types of actuators and their use.

### 8.3.4 System Identification and Modelling

This course addresses system modelling for control. Different modelling approaches are analysed: starting from generic modelling approaches based on first principles to Lagrangian and energy-based methods. Model parametrization and parameter estimation are then further discussed.

### 8.3.5 Communication Networks and Internet of Things

The objective of this course is to provide an understanding of the principles for transport technologies for modern communications networks and architectures as well as the Internet of Things. Industrial communications and sensor technology will be addressed.

### 8.3.6 Data Analysis and Machine Learning

The course will introduce the foundations of learning and making predictions from data. We will study basic concepts such as trading goodness of fit and model complexity. We will discuss important machine learning algorithms used in practice and provide hands-on experience in a course project.

## 8.4 Engineering in Perspective [MSc]

### 8.4.1 Investment Appraisal and Cost-effectiveness Analysis

Decision-makers in the private and public sectors must understand how to make informed investment decisions. This course introduces engineering students to fundamental concepts of finance and public policy related to

technology and innovation. Besides theoretical knowledge, this course uses several case studies in which the concepts and methods are applied in conducting investment appraisal and cost -effectiveness analysis relating to technology and innovation projects. A particular focus will be on risk and de-risking, which affects any investment but is particularly relevant in the sub-Saharan

### 8.4.2 Leading Teams

The processes of human resource management are discussed (selection, reward systems, performance evaluation, career development) and embedded in the broader context of leadership in teams. Leadership concepts and group processes are presented. Practical instruments supporting leadership functions are introduced and applied in business settings.

### 8.4.3 Corporate Responsibility and Sustainability

What is the responsibility of companies to contribute to society, if any? And how can companies integrate their responsibility into the business model and along the supply chain? This course introduces approaches to corporate social responsibility such as international soft-laws or self-regulation instruments and discusses the challenges companies face when implementing corporate social responsibility in business operations.

### 8.4.4 International Environmental Politics

This course deals with how and why international cooperation in environmental politics emerges, and under what circumstances such cooperation is effective and efficient. This course examines the key challenges and strategies in managing global environmental issues. Students will explore topics such as international water management, climate policy, biodiversity protection, and pollution prevention. By analyzing case studies and policy responses, students will gain insight into effective approaches for addressing critical environmental concerns on a global scale.

### 8.4.5 Introduction to Development Economics

The goal of this lecture is to introduce students to basic development economics. The course builds on both theories and empirics on poverty, growth, and inequality. Based on this understanding, important drivers of economic development and poverty reduction are discussed, with a focus on the role technological and social innovations and experimental approaches to evaluate development policies.

### 8.4.6 Sustainable Engineering

In 2015, the UN Conference in Paris shaped future world objectives to tackle climate change. In 2016, other political bodies made these changes more difficult to predict. What does it mean for the built environment? This course introduces the notion of sustainable development when applied to our built environment.

## 8.5 Energy Systems [MSc]

### 8.5.1 Renewable Energy Technologies

This course delves into the engineering aspects of renewable energy technologies, focusing on energy conversion methods for solar (thermal and photovoltaics), biomass, wind, geothermal, hydro, and waste-to-energy systems. Students will explore the design principles, operational efficiencies, and integration of these technologies within modern energy systems. Additionally, the course will cover advanced technologies for energy optimization, aiming to enhance the performance and sustainability of renewable energy solutions.

### 8.5.2 Energy Systems and Mobility

This course provides and introduction to current and future propulsion systems behaviour, focusing on energy generation and utilisation. It will address electrical aspects of energy engineering and topics in renewable energy. Moreover, it will also cover system optimisation and controller design for vehicles.

## 8.6 Production [MSc]

### 8.6.1 Manufacturing Processes

The course discusses fundamental terms of production engineering, plastic deformation, machining, laser-machining, mechatronics in production machine construction, quality assurance, and process chain planning.

### 8.6.2 Process Engineering

The course will introduce the students to the biological and chemical processes used in wastewater treatment, organic waste management, and biological resource recovery. The focus will be on fundamental principles of biological and chemical processes as well as process design based on kinetic and stoichiometric principles, e.g., anaerobic digestion for biogas production and aerobic wastewater treatment.

### 8.6.3 Product Development

The course introduces students to the product development process. In a team, you will explore the early phases of conceptual development and product design, from ideation and concept generation through to hands-on prototyping. This is an opportunity to gain product development experience and improve your skills in prototyping and presenting your product ideas. The project topic changes each year.

### 8.6.4 Reliability and Risk

The course provides advanced tools for the risk/vulnerability analysis and engineering of complex technical systems and critical infrastructures. It covers application of modelling techniques and design management concepts for strengthening the performance and robustness of such systems, with reference to energy, communication, and transportation systems.

## 8.7 Research Methods

This course provides an introduction to essential research methodologies used in engineering. It covers the principles of designing research studies, formulating research questions, conducting literature reviews, and selecting appropriate qualitative and quantitative methods. Students will learn how to collect, analyze, and interpret data, as well as how to evaluate research outcomes. The course also includes training in technical writing, ethics in research, and effective presentation of findings to both academic and industry audiences. Emphasis is placed on critical thinking, problem-solving, and applying research methods to real-world engineering challenges.

## 8.8 Thesis

Thesis I

This is a year long sequence where the student under supervision of faculty research a chosen subfield.
Thesis I serves as the foundational course in the thesis process, where students begin by identifying a research topic, formulating research questions, and conducting an extensive literature review. Under faculty supervision, students will refine their research methodologies and prepare a proposal for their thesis project. This course emphasizes the development of critical research skills, effective academic writing, and the creation of a solid plan for completing the thesis in Thesis II.

Thesis II

This is a year long sequence where the student under supervision of faculty research a chosen subfield.
In Thesis II, students execute the research plan developed in Thesis I, setting up experiments, collecting and analyzing data, and writing the thesis document under ongoing faculty guidance. This course focuses on the completion of the research project, refining the thesis structure, and ensuring rigorous academic standards. Students will present their findings in a final thesis document, which will be reviewed and assessed as part of the course's culmination. Successful completion of this course marks the completion of the thesis requirement.

## 8.9 MSc Curriculum: Semester-by-semester structure/schedule of course

| Semester | Course Code | Module | Credit Hours (TPC) |
|---|---|---|---|
| **Year 1** | | | |
| **September Semester Sep – Jan** | MECH 581 | Analysis and Design of Control Systems | (2,2,3) |
| | MECH 521 | Data Analysis and Machine Learning | (2,2,3) |
| | MECH 501 | Leading Teams* | (2,0,2) |
| | MECH 531 | Renewable Energy Technologies | (2,2,3) |
| | MECH 503 | Corporate Responsibility & Sustainability* | (2,0,2) |
| | MECH 511 | Reliability and Risk | (2,2,3) |
| | Semester 1 total credits | | 16 |
| **January Semester Jan – May** | MECH 582 | Optimal Control | (2,2,3) |
| | MECH 584 | Robotics | (1,2,2) |
| | MECH 586 | Mechatronics | (1,2,2) |
| | MECH 502 | Reducing Societal and Environmental Footprint* | (2,0,2) |
| | MECH 532 | Energy Systems and Mobility | (2,2,3) |
| | MECH 542 | Process Engineering | (2,2,3) |
| | MECH 504 | Investment Appraisal and Cost Effectiveness Analysis* | (2,0,2) |
| | Semester 2 total credit | | 17 |
| **Year 2** | | | |
| **September Semester Sep – Jan** | MECH 681 | System Identification and Modelling | (2,2,3) |
| | MECH 611<br>MECH 613 | *Electives: (1 of these)*<br>Sustainable Engineering<br>Process Improvement & Optimization | (2,2,3) |
| | MECH 631<br>MECH 633 | *Electives: (1 of these)*<br>Communication Networks and Internet of Things<br>Automation and Production Systems | (2,2,3) |
| | MECH 601 | Development Economics | (2,0,2) |
| | MECH 613<br>MECH 651 | *Electives: (1 of these)*<br>Product Development<br>Machine Tools (Jigs, Fixtures and Tools) Design | (2,2,3) |
| | MECH 641<br>MECH 645 | *Electives: (1 of these)*<br>Manufacturing Processes<br>Food Production Technology | (2,2,3) |
| | Semester 1 subtotal | | 17 |
| **January Semester Jan – May** | MECH 690 | Internship<br>Master Thesis | 4<br>6 |
| | **Total Program Credit** | | **60** |

## 8.10 Course Descriptions of Mechatronics Engineering Programs

### 8.10.1 MECH 581 Analysis and Design of Control Systems (2,2,3)

Objective: The students will learn how to analyse systems and synthesise controllers for linear time invariant systems with one input and one output signal.

**Content**

Modelling and linearisation of dynamic systems with single input and output signals; State-space description; Analysis (stability, reachability, observability, etc.) of open-loop systems; Laplace transformation; Systems analysis in the frequency domain; Transfer functions and analysis of the influence of its poles and zeros on the system's dynamic behaviour. Frequency response; Analysis of closed-loop systems using the Nyquist criterion; Formulation of performance constraints; Specification of closed-loop system behaviour; Synthesis of elementary closed-loop control systems; Proportional-Integral-Derivative (PID) controllers; Lead/lag compensation; Loop shaping; Discrete-time state space representation and stability analysis.

### 8.10.2 MECH 582 Optimal Control (2,2,3)

Objective: This course focuses on the theory and practice of advanced control techniques like state feedback, linear multi-variable control systems, and model predictive control.

**Content**

Extension of the basic SISO ideas (time and frequency domain, controllability, observability, eigenvalues, poles, zeros, frequency response, etc.) to MIMO systems; Design of state feedback controllers in time domain; Pole allocation; Finite-horizon LQR; Infinite-horizon LQR; Design of state observers and observer-based controllers with state feedback; LQG approaches; Invariance; Nominal Model Predictive Control; Tracking Model Predictive Control; Stability and robustness analysis of Model Predictive Control; Robust Model Predictive Control

### 8.10.3 MECH 584 Robotics (1,2,2)

Objective: This introduces the fundamentals of robotic systems, including kinematics and dynamics as applied to manipulators and mobile robots.

**Content**

Manipulators; Kinematics; Actuators, sensors, and simple sensor processing algorithm; Trajectory planning; Motion control; Teleoperation, Master-slave systems - Supervisory control - Latency problems. Vision Systems; Path Planning

### 8.10.4 MECH 586 Mechatronics (1,2,2)

Objective: By the end of the course, the students will be able to independently choose, design and integrate these different building blocks into a working mechatronics system.

**Content**

Over the course, the lecture topics will include an overview of

- Robotics in the Mechatronics Context
- An introduction to different types of sensors and their use
- Data acquisition; Microcontrollers programming
- Interfacing embedded computers with the real-world
- Digital signal filtering; Digital signal processing
- Introduction to different types of actuators and their use
- An overview of computer vision
- Forward and inverse kinematics in mechatronics systems
- Control strategies for mechatronics systems
- Human-Robot interaction.

### 8.10.5 MECH 681 System Identification and Modelling (2,2,3)

Objective: Learn how to mathematically describe a physical system or a process in the form of a model usable for analysis and control purposes.

**Content**

Introduction to system modelling for control. First principles modelling; Lagrangian modelling; Energy-based methods. Model parametrisation; Parameter estimation; Data fitting and statistics; Least-squares estimation; Frequency-domain identification; Time-domain identification; Prediction error methods; ARX Models; Closed-loop identification.

### 8.10.6 MECH 631 Advanced Communication Systems and Internet of Things (2,2,3)

Objective: The objective of this course is to provide an understanding of the principles for transport technologies for modern communications networks and architectures as well as the Internet of Things.

**Content**

The course will cover:

- protocol layers (both computing & IoT environment)
- delay, loss, throughput; routing algorithms

- ethernet, switching, link layer
- LANs, Constrained node networks
- Internet protocol, Forwarding, Internet routing, routing policies, BGP challenges, and solutions
- TCP protocol
- DNS, HTTP, IPv6
- Fieldbus, Modbus, Profibus, Profinet, Powerlink Ethernet, CANOpen
- Constrained devices
- Communications channels as adapted for IoT including 802.15.4 variants, (Zigbee, 6LoWPAN, WirelessHart, etc) NB-IoT, Bluetooth, Cellular, PLC, VLC et
- Protocols suited for IoT: Technologies for IoT
- IoT sensors, MCU, communication modules, database technologies, data mining technologies, and hosting, visualisation
- Programming for IoT Data Collection and Communication
- Industrial Internet of Things protocols; IoT Security

### 8.10.7 MECH 521 Data Analysis and Machine Learning (2,2,3)

Objective: The course will introduce the foundations of learning and making predictions from data. We will discuss important machine learning algorithms used in practice and provide hands-on experience in a course project.

**Content**

The course will cover:

- Linear regression; Overfitting; Cross-validation/bootstrap; Model selection; Regularization; [Stochastic] gradient descent; Linear classification; Logistic regression; Feature selection; Sparsity; Multi-class classification; Kernels and the kernel trick; Properties of kernels and applications to linear and logistic regression; K-nearest neighbour; Neural networks; Backpropagation; Regularization; Convolutional neural networks; Unsupervised learning; K-means; PCA; Neural network auto-encoders; The statistical perspective (regularization as prior; loss as likelihood; learning as MAP inference); Statistical decision theory (decision making based on statistical models and utility functions); Discriminative vs. generative modelling (benefits and challenges in modelling joint vs conditional distributions); Bayes' classifiers (Naive Bayes, Gaussian Bayes; MLE); Bayesian approaches to unsupervised learning (Gaussian mixtures, EM).

### 8.10.8 MECH 504 Finance and Public Policy for Engineers (2,0,2)

Objective: This course will provide engineering students with basic knowledge on finance and public policy related to technology and innovation. It will have a particular focus on developing country-specific finance and policy aspects.

**Content**

- Evaluation and financing of capital projects. Methods taught include investment appraisal; cost-effectiveness analysis, cost-benefit analysis; technological forecasting, expert elicitation; cash flows for a project; time value of money; evaluation criteria for investment decisions, taxation; sensitivity, scenario, and other decision analysis techniques; risk and return, sources of finance for projects, etc. Hands-on case studies, in which the students take an investor's or policy maker’s role.

### 8.10.9 MECH 501 Leading Teams (2,0,2)

Objective: This course will provide an understanding of the basic HRM functions and their relationship to leadership and how to manage team processes and diversity.

**Content**

- The policies, practices, and systems that influence employees' behaviour, attitudes, and performance. Practical instruments supporting leadership functions; basic HRM functions and their relationship to leadership; instruments for selection, performance appraisal, compensation, management, and personnel development (from team leader’s perspective); leadership requirements and success factors in leadership; fundamental processes in teams; how to manage team processes and diversity; Fundamentals of effective leadership and dynamics in teams. semester projects to apply HRM instruments in company contexts.

### 8.10.10 MECH 611 Sustainable Engineering (2,2,3)

Objective: Students will learn a holistic approach of sustainable development. Ecological, economic, and social constraints will be presented, and students will learn about methods for argumentation and tools for assessment) that influence our built environment. An objective is to address current challenges of climate change mitigation and resource depletion.

**Content**

The following topics give an overview of the themes that are to be worked on during the lecture:

- history and emergence of sustainable development; current understanding and definition of sustainable development. the role of cities, urbanization, and material resources (i.e., energy, construction material) in social economic and environmental sustainability; role of stakeholders, their motivations, and constraints; how to evaluate challenges, identify deficits and define strategies to promote a more sustainable construction. Method 1: Life cycle assessment (planning, construction, operation/use, deconstruction). Method 2: Life Cycle Costing. Method 3: Labels and certification. Operation energy at building, urban and national scale, mobility and density questions, and embodied energy for developing and developed world. theory and application of current scientific pathways towards sustainable development.

### 8.10.11 MECH 601 Development Economics (2,0,2)

Objective: The goal of this course is to provide students with a basic understanding of both theories and empirics on poverty, growth and inequality. Based on this understanding, important policies for sustainable economic development and poverty reduction are discussed, with a focus on the role of technological innovations.

**Content**

- How development can be defined and measured – building on Sen's capability approach. Classical and endogenous growth theory and the role of capital, technological innovation, governance, education, and health for economic development. How various forms of market failures lead to environmental destruction and extreme poverty and the policies that are needed by a state to confront it. The role of globalisation for the future development of countries in sub-Saharan Africa will be discussed.

### 8.10.12 MECH 502 Reducing Societal and Environmental Footprint (2,0,2)

Objective: The objectives of this course are to (1) gain an overview of relevant questions in international environmental politics from a social sciences viewpoint; (2) learn how to identify interesting/innovative questions concerning this policy area and how to answer them in a methodologically sophisticated way; (3) gain an overview of important global and regional environmental problems and how they could be solved.

**Content**

This course deals with how and why international cooperation in environmental politics emerges, and under what circumstances such cooperation is effective and efficient. Based on theories of international political economy and theories of government regulation various examples of international environmental politics to be discussed include:

- the management of international water resources; political responses to global warming; the protection of the stratospheric ozone layer; the reduction of long-range transboundary air pollution; protection of biodiversity; how to deal with plastic waste; the prevention of pollution of the oceans, etc.

### 8.10.13 MECH 503 Corporate Responsibility & Sustainability (2,0,2)

Objective: This course introduces approaches to corporate social responsibility. It will address questions such as - What is the responsibility of companies to contribute to society, if any? How can companies integrate their responsibility into the business model and along the supply chain?

**Content**

The course will cover international soft-laws or self-regulation instruments and discuss the challenges companies face when implementing corporate social responsibility in business operations.

### 8.10.14 MECH 531 Energy Systems (2,2,3)

Objective: Students learn the potential and limitations of renewable energy technologies and their contribution towards sustainable energy utilisation.

**Content**

Engineering aspects of energy conversion for solar thermal, solar photovoltaics, biomass, wind, geothermal, hydro, and waste-to-energy technologies. Technologies for energy optimisation

### 8.10.15 MECH 532 Energy Systems and Mobility (2,2,3)

Objective: This course introduces current and future propulsion systems behaviour, focusing on energy generation and utilisation. It addresses electrical aspects of energy engineering and topics in renewable energy. Moreover, it will also cover system optimisation and controller design for vehicles.

**Content**

Physical description and mathematical models of components and subsystems; Power utilisation; Power electronics; Propulsion; load control; supercharging, emissions; drive train components; HV & LV power distribution.

### 8.10.16 MECH 641 Manufacturing Processes (2,2,3)

Objective: The course discusses fundamental terms of production engineering and process chain planning.

**Content**

Basic principles of manufacturing techniques; functionality of a manufacturing shop. Plastic deformation- and separative - manufacturing processes; laser machining (welding and cutting) and their layouts, product defining properties; limitations of applications such as the associated workshop facilities; principles of the industrial measurement technique; mechatronics concepts in machine tool construction; quality assurance,

### 8.10.17 MECH 542 Process Engineering (2,2,3)

Objective: Students should be able to evaluate and design biological, chemical (or similar) processes and develop simple mathematical models to simulate the processes.

**Content**

Biological and chemical processes used (e.g., in wastewater treatment, organic waste management, and biological resource recovery. Also, an overview of other common industrial processes. Fundamental principles of biological and chemical processes; process design based on kinetic and stoichiometric principles, e.g., anaerobic digestion for biogas production and aerobic wastewater treatment. Process technologies, equipment, and systems; Industrial Processes; Process technology operations; Quality, Safety, Health, and Environment.

### 8.10.18 MECH 613 Product Development (2,2,3)

Objective: The course introduces students to the product development process. Students will, in a team, explore the early phases of conceptual development and product design, from ideation and concept generation to hands-on prototyping.

**Content**

Introduction to product development and engineering design; product planning and social-economic-technology (SET) factors; user-centred design and product specification; concept generation and selection methods; system design and embodiment design; hands-on prototyping and prototype planning; material selection in engineering design; product lifecycle and sustainability; design for manufacture and design for additive manufacture.

### 8.10.19 MECH 511 Reliability and Risk (2,2,3)

Objective: Students will be able to model complex technical systems and critical infrastructures, including their dependencies and interdependencies, with appropriate numerical methods. In the end, they will be able to propose design improvements and protection/mitigation strategies to reduce the risks and vulnerabilities of these systems.

**Content**

Preamble: Modern technical systems and critical infrastructures are complex, highly integrated, and interdependent. Examples of these are highly integrated energy supply, energy supply with high penetrations of renewable energy sources, communication, transport, and other physically networked critical infrastructures that provide vital social services. As a result, standard risk-assessment tools are insufficient in evaluating vulnerability, reliability, and risk levels. This course offers suitable:

- Analytical models and computational methods to evaluate levels of vulnerability, reliability, and risk with scientific accuracy. Introduction to complex technical systems and critical infrastructures; basics of the Markov approach to system modelling for reliability and availability analysis; Monte Carlo simulation for reliability and availability analysis, Markov Chain Monte Carlo for applications to reliability and availability analysis, dependent, common cause and cascading failures; complex network theory for the vulnerability analysis of complex technical systems and critical infrastructures; basic concepts of uncertainty and sensitivity analysis in support of the analysis of the reliability and risk of complex systems under incomplete knowledge of their behaviour.

## 8.11 Two-year MPhil Mechatronics Engineering

The MPhil program offers a subset of courses from the joint 3-year MAS-MSc program but places an emphasis on research. There are therefore time allocations for research and a course in research methods. The sequence of courses taken are as follows.

| Semester | Module | Semester | Module |
|---|---|---|---|
| 1 | Computer programming & Embedded Sys | 3 | Leading Teams |
| | Math Tools | | Investment appraisal |
| | Signals and Systems | | Thesis II |
| | Mechanics | | Elective: e.g. Manufacturing Processes |
| 2 | Analysis and Design of Control Systems (Control Systems I) | | Optimal Control (Control Systems II) |
| | Research methods | 4 | Applied System Engineering |
| | Thesis I | | Product Development |
| | Data Analysis and Machine Learning | | Master Thesis |
| | System Identification and Modelling | | |
| | Robotics & Mechatronics | | |

## 8.12 Two-year standalone MSc Mechatronics Engineering

The standalone MSc program offers most of the courses in the MSc program plus a few advanced core courses from the MAS program. The sequence of courses taken are as follows:

| Semester | Module | Semester | Module |
|---|---|---|---|
| 1 | Computer programming & Embedded Sys | 3 | Leading Teams + Investment appraisal |
| | Math Tools | | Computational methods |
| | Signals and Systems | | Manufacturing Processes |
| | Mechanics | | Optimal Control (Control Systems II) |
| 2 | Analysis and Design of Control Systems (Control Systems I) | | Reliability and Risk |
| | Communication Networks & IoT | 4 | Applied System Engineering |
| | Renewable Energy Technologies | | Product Dev |
| | Data Analysis and Machine Learning | | Internship |
| | System Identification and Modelling | | Master Thesis |
| | Robotics & Mechatronics | | |

# 9 Course Catalogue for the Ashesi MBA Program

## 9.1 Overview of the Ashesi MBA Program

| Block | Course Code | Module | Credit Hours |
|---|---|---|---|
| **Year 1** | | | |
| Block 1: Sept - Feb | MBA571 | Leadership, Ethics & A Good Society | 3 |
| | MBA511 | Financial Reporting and Control | 3 |
| | MBA541 | Marketing Management | 3 |
| | MBA551 | Managerial Economics | 3 |
| | MBA561 | Process Innovation and Technology | 3 |
| | **Block 1 Total Credits** | | **15** |
| Block 2: Feb -July | MBA 572 | Cultural intelligence in leadership | 3 |
| | MBA582 | Business Analytics & Empirical Methods | 3 |
| | MBA534 | Psychology of Work and Human Behaviour | 3 |
| | MBA532 | Managing People, Culture and Performance | 3 |
| | MBA512 | Managerial Finance | 3 |
| | **Block 2 Total Credits** | | **15** |
| **Year 2** | | | |
| Block 3: Aug- Jan | MBA673 | Sustainable Leadership & Ethical Business | 3 |
| | MBA601 | Cross-Border Business | 3 |
| | MBA645 | Resource Incentive and Market Failures | 3 |
| | MBA661 | Supply Chain Strategies for African Markets | 3 |
| | MBA635 | Business Communication and Negotiation | 3 |
| | **Block 3 Total Credits** | | **15** |
| Block 4: Feb- Aug | MBA674 | Completing the Circle – Leadership 360 | 3 |
| | MBA636 | Competitive Strategy | 3 |
| | MBA648 | New Venture Development | 3 |
| | Depends on choice of elective | Elective 1 | 3 |
| | Depends on choice of elective | Elective 2 | 3 |
| | MBA602 | Global & Regional Immersion Program | 3 |
| | MBA600 | Capstone | 6 |
| | **Block 4 Total Credits** | | **24** |
| | **Total Program Credit** | | **69** |
| Elective Options | MBA692 | Entrepreneurial Leadership | 3 |
| | MBA642 | Technology strategy | 3 |
| | MBA614 | Financial Technology | 3 |
| | MBA646 | Innovation for Business Sustainability | 3 |
| | MBA638 | Decision Intelligence | 3 |

## 9.2 Course Descriptions of the Ashesi MBA Program

### 9.2.1 Block 1

#### *9.2.1.1 MBA571 Module 1: Leadership, Ethics & A Good Society*

Leadership, Ethics & A Good Society forms the foundational module within a 4-pronged Leadership seminar series designed to challenge MBA students to unlearn their current knowledge and myths of leadership. Offering an opportunity to relearn the mindsets and competencies necessary for personal and organizational transformation, students are equipped to lead from within, navigating complexity with courage, cultural intelligence, and ethical clarity.

#### *9.2.1.2 MBA511 Financial Reporting and Control*

This course explores financial reporting principles, management control systems, and regulatory frameworks essential for strategic decision-making. It equips students with the skills for presenting, analyzing, and interpreting internal and external financial reports while ensuring compliance with institutional requirements and international best practices. Key themes in financial reporting and control covered in this course are, foundations of financial

reporting, financial analysis, and management control systems. The course also integrates contemporary issues such as corporate governance, ethical considerations, and sustainability reporting frameworks to ensure responsible financial stewardship. Students will develop proficiency in financial expertise and analytical thinking, corporate governance and ethical judgement, strategic problem solving and strong communication skills. Through lectures, case analysis, experiential projects, fireside chats with industry experts and spreadsheet modelling practicums, students will be equipped with the analytical tools and strategic insights required to assess financial performance, enhance corporate accountability, and support effective managerial decision-making.

#### *9.2.1.3 MBA541 Marketing Management*

This course examines how businesses generate value for customers through marketing. Focusing on the link between buyer behavior and value creation, students will build a basic understanding of how marketing strategy depends on communication, and pricing—and how they function within analytical frameworks used by marketing managers. Through strategic analysis of marketing opportunities and communication of marketing decisions, students will strengthen their ability to think critically and apply marketing concepts in real-world settings. The curriculum blends theory and practical application to help students understand how different markets operate and how to effectively reach and influence target audiences. Hands-on activities, case studies, and group projects will help develop practical skills in areas like branding, digital communication, and market analysis. While the main focus is on analytical and strategic thinking, students will also participate in exercises that promote customer-focused and data-driven decision-making.

#### *9.2.1.4 MBA551 Managerial Economics*

The Managerial Economics course at Ashesi University provides a strong foundation in economic theory and analytical models, with a focus on their practical application to managerial decision-making. The course integrates core economic principles with PROSIT (Problem Situation) techniques, real-world business case studies, and engaging "Fireside Chats" with industry experts. Students will develop critical skills to help manage businesses sustainably, including effective market analysis, pricing strategies, and negotiation techniques—especially vital in the post-COVID-19 economic landscape marked by volatility and uncertainty. These capabilities are particularly relevant in African markets, where market failures and information asymmetries are common. The course also emphasizes the experiential learning necessary for cultivating effective managerial leadership. Key topics include market analysis, game theory and competitive strategy, decision-making under risk and uncertainty, the economics of information, sustainable investment strategies, optimal pricing, and business negotiation techniques.

#### *9.2.1.5 MBA561 Process Innovation and Technology*

This course is designed to give students an understanding of the critical intersection between technology and operations management. Students will explore how technology drives operational excellence, innovation, and competitive advantage in today's fast-paced business. It focuses on managing and continuously improving the processes required to create and deliver a service or product to the end customer in a way that aligns with the business environment. The course begins by examining the scope and responsibilities of operations management across different organizational contexts. Using models such as the transformation model, they analyze the inputs, processes, and outputs that define operational systems and interface with other functions and the external environment. The course then builds into the formulation and alignment of operations strategy, emphasizing environmental analysis, identification of core competencies, and strategic decision-making. A significant focus is placed on the continuous improvement of processes using Lean thinking, Total Quality Management (TQM), and related diagnostic tools. Students will engage in mapping analyzing, and redesigning processes to reduce waste, improve efficiency, and enhance service or product delivery. In parallel, the course emphasizes the evaluation and adoption of process and information technologies to support operations. Students will explore emerging tools and their ability to support decision-making, increase productivity, and address system limitations and human resource considerations. Throughout the course, students will be challenged to integrate ethical, regulatory, and sustainability considerations into operations and technology decisions. The course culminates in a hands-on, integrative assessment in which students recommend process and strategy improvements tailored to real-world operational challenges.

### 9.2.2 Block 2

#### *9.2.2.1 MBA 572 Module 2: Cultural Intelligence in Leadership*

Building on the first pillar from Block 1, this module focuses on helping students to identify key components of cultural intelligence and how they impact leadership. It teaches the analysis of cultural differences and how they

influence communication styles, decision-making processes, and leadership effectiveness. By the end of this module, students will develop skills to assess and improve individual cultural awareness and adaptability in the African and international settings and apply strategies to lead diverse teams effectively by leveraging cultural intelligence to foster inclusion, collaboration, and innovation. Students are groomed to be able to formulate action plans to enhance cultural intelligence within personal leadership practices and organizational culture.

#### *9.2.2.2 MBA582 Business Analytics and Empirical Methods*

In a world increasingly driven by data and complexity, leaders must be skilled in both empirical research and data driven decision-making. This course provides a comprehensive exploration of empirical research methods, business analytics techniques, and modern problem-solving frameworks such as design thinking and systems thinking. Students will learn how to frame researchable problems, design and conduct empirical investigations, analyze data both qualitatively and quantitatively, and apply analytics to support decision-making. Teaching will be based on real-world case studies and a problem-based learning approach, preparing participants to tackle complex business challenges with analytical rigor and creative insight. By the end of the course, students will be equipped to develop real-world research outputs such as consulting reports, market plans, feasibility studies, or business plans. This course generally be delivered through lectures, case analysis, fire side chat, simulations and spreadsheet analysis.

#### *9.2.2.3 MBA534 Psychology of Work and Human Behavior*

In today's volatile business environment—defined by BANI conditions (Brittle, Anxious, Nonlinear, and Incomprehensible)—leaders are required to navigate increasingly complex human dynamics and uncertainties. They face mounting challenges such as promoting employee well-being, practicing ethical leadership, driving innovation, and managing behavioral shifts within diverse teams. This MBA course adopts a strategic and forward-thinking approach to understanding human behavior in the workplace. Grounded in behavioral science, it explores how leadership, team dynamics, power structures, and positive organizational cultures contribute to building high performing, engaged, and innovative work environments. By integrating global theories with African business realities, the course critically examines the complexities of managing change across government, nonprofit, and corporate sectors. It equips students with evidence-based insights and practical consulting skills to drive meaningful organizational transformation. By the end of this course, students will have the skills to move beyond conventional management practices and harness the power of human psychology to build thriving, resilient organizations.

#### *9.2.2.4 MBA532 Managing People, Culture and Performance*

Sustaining a competitive advantage in today's fast-paced business world requires more than financial resources, but rather, it demands effective people management. Top companies recognize that their people and workplace culture are their greatest strategic strengths. This course in Managing People, Culture and Performance takes a practical view that incorporates the contributions of the behavioral sciences with showing how to implement all aspects of the Strategic Human Resources function in the "real world." It unwraps how aligning people strategies with organizational goals supports ethical, inclusive and high performing workplaces, using real world case studies, foundational theories and stakeholder focused models. By the end of the course, students will gain tools to manage people effectively, be able to foster trust, and shape organizational culture. Also, students will be able to balance employee interest with business needs to create sustainable performance and people centered growth in organizations. To this end, the overall aim of this course is to equip students with skills that foster exceptional performance in their role as a professional HR. This course's key objective is to make students realize that SHRM is more than traditional HRM practices. Rather, it is a central and strategic organizational activity of increasing complexity and importance.

#### *9.2.2.5 MBA512 Managerial Finance*

In this increasingly complex business environment, senior executives in business and public sector organizations require knowledge of financial management. The course offers a broad overview of finance from the perspective of the financial manager. Starting with the premise that the goal of management is to increase the value of the firm, we will discuss the key decisions – investment and financing - that contribute to shareholder value. The investment side will include analysis of the capital budgeting decision. The financing aspect will focus on equities, bonds, and raising capital in general. Specifically, this course will cover: (i) financial markets, (ii) financial concepts such as time value of money, valuation and yields of financial securities, financial statement analysis, sources of long-term financing to a firm, and an overview of the risk return trade-offs, and (iii) some basic decision-making frameworks, including capital budgeting. This course is an introductory Finance course and provides the necessary foundation for further studies in Finance.

### 9.2.3 Block 3

#### *9.2.3.1 MBA673 Sustainable Leadership & Ethical Business*

This third module in the Leadership series focuses on the importance of sustainable and ethical practices on organizational reputation, stakeholder relationships, and long-term success. Students by the end of this module will be able to evaluate various frameworks and models for ethical decision-making and sustainable leadership in the African (or within diverse organization) context. Students will be equipped to develop strategies to embed sustainability and ethical considerations into organizational culture, operations, and strategic planning. The course prepares students to create actionable plans for implementing sustainable and ethical initiatives at personal, team, and organizational levels as well as demonstrate awareness of African/global sustainability issues and the role of organizations in promoting social responsibility and environmental stewardship.

#### *9.2.3.2 MBA601 Cross-Border Business*

This course examines what it takes for firms to expand beyond their home country into regional and global markets. Students explore market entry strategies, cross-cultural management, regulatory and trade environments, regional integration (with emphasis on Africa and emerging markets), and operational challenges such as supply chains, partnerships, and risk management. The course equips students to assess when, where, and how to scale businesses internationally in a sustainable and responsible manner.

#### *9.2.3.3 MBA601 Cross-Border Business*

This course examines what it takes for firms to expand beyond their home country into regional and global markets. Students explore market entry strategies, cross-cultural management, regulatory and trade environments, regional integration (with emphasis on Africa and emerging markets), and operational challenges such as supply chains, partnerships, and risk management. The course equips students to assess when, where, and how to scale businesses internationally in a sustainable and responsible manner.

#### *9.2.3.4 MBA645 Resource Incentive and Market Failures*

This module is designed to equip students with a deep understanding of microeconomic principles and their practical applications in today's complex markets. It focuses on renewable and non-renewable resources in an African context, integrating theoretical frameworks, case studies, quantitative analysis and policy design. We delve into the intricacies of how resources are allocated within various market structures, and the pivotal role that incentives play in influencing the behaviour of individuals and firms. The course integrates economic theory, PROSIT (Problem Situation) techniques, pragmatic real-world business case studies and "Fireside chats" with industry experts. By examining various real-world scenarios, students will gain insights into the conditions under which markets operate efficiently and identify circumstances that can and do lead to market failures. Furthermore, the use of case studies will help students appreciate how economic principles apply in real life. This module aims to provide an understanding of the fundamental principles of microeconomics and market dynamics, market failures and their impact on the efficient allocation of resources and finally, effective incentives and policy interventions aimed at correcting market failures and improving market outcomes.

#### *9.2.3.5 MBA661 Supply Chain Strategies for African Markets*

Africa's supply chains are undergoing significant transformation due to globalization, digitalization, and regional economic integration. This course provides an in-depth examination of supply chain strategies tailored to Africa's unique challenges and opportunities. Using a case-based learning approach combined with the PROSIT (Problem Situation) framework, students will engage with real-world problems, design solutions, assess their impact, and transfer insights into broader contexts. Students will be introduced to the fundamental concepts, processes, and practices of supply chain management while incorporating regional insights into Africa's unique challenges and opportunities. Students will not only learn to explore the dynamics of supply chains in Africa, including the challenges and opportunities, but they will gain an understanding of the role of African supply chains within the global context. The course will also explore the nature of supply chain innovations and digitalization in Africa, the process of financing and managing risks in African supply chains; and teach students develop the sustainability and ethical strategies for African supply chains.

#### *9.2.3.6 MBA635 Business Communication and Negotiation*

Whether dealing with colleagues, clients, or partners, effective communication and negotiation are central to achieving desired outcomes. This interactive course is designed to equip MBA students, particularly those preparing

for executive and leadership roles, with the strategic tools needed to communicate and negotiate effectively within diverse and dynamic environments. Blending the art and science of negotiation with practical business communication strategies, the course explores how to influence and persuade, resolve conflicts, and build consensus at both individual (micro) and organizational (macro) levels. Students will be challenged to think strategically about how, what, and when they communicate, and how to tailor their approaches to specific audiences and objectives. With a strong emphasis on the African context, the course considers the cultural, relational, and institutional factors that shape communication and negotiation styles on the continent. Issues such as deference to authority, familial obligations, and communal decision-making are discussed as key considerations in African business settings. Through real-world case studies, role-playing exercises, and group simulations, students will refine their ability to structure and deliver persuasive business communications, navigate complex stakeholder dynamics, apply ethical judgment in negotiation contexts, and achieve desired outcomes through principled negotiation techniques.

### 9.2.4 Block 4

#### *9.2.4.1 MBA674 Completing the Circle – Leadership 360*

This module wraps up the Leadership seminar series. This module encourages students to reflect on personal leadership styles and values and craft a personal leadership philosophy to guide and shape their leadership journeys. Throughout the course, students integrate ethical principles into leadership practice and evaluate the impact of their leadership on the direct and indirect stakeholders they engage. Students are required to map out a personal and organizational action plan for extending their leadership influence through Personal Leadership Projects.

#### *9.2.4.2 MBA636 Competitive Strategy*

The need to create new businesses and grow existing ones to be globally competitive, sustainable and offer gainful jobs for the teeming young African population cannot be overemphasized. Realizing such aspirations on an impactful scale across Africa will require a growing number of entrepreneurs and business leaders who have an excellent grasp of the business environment, an insightful and good understanding of factors that influence business performance and the requisite competencies to make choices that transform and sustainably grow businesses. The Competitive Strategy course is designed to provide students with a comprehensive understanding of the principles, theories, and practical applications of strategic management concepts, principles and tools in complex business environments. The course explores advanced concepts in analyzing business environments, strategy formulation, implementation, and evaluation, with a focus on achieving sustainable competitive advantage. The overall aim of the course is to help students develop and enhance their competencies in making and executing strategic decisions to enable them to create and manage sustainable businesses.

#### *9.2.4.3 MBA648 New Venture Development*

New Venture Development introduces MBA students to the mindsets, skills and frameworks required to successfully launch new ventures. This course is relevant for helping students understand and apply the best practices for going from an idea to launching a venture. The competencies covered in this course are applicable to current or aspiring entrepreneurs and professionals building new products/services within existing organizations. The concepts are designed to be broadly applicable to thinking of for-profit ventures, non-profits, public-private partnerships, and other models for value creation. The course is interactive, deeply experiential and highlights the unique opportunities and challenges of new venture creation in the African context, while maintaining a global outlook that prepares students to thrive on the world stage. At the start of this course, "new venture" will be properly framed to include the development of new initiatives – products and services within existing organizations, i.e., intrapreneurship. Students will propose ideas for new ventures or new products/services for their actual employers. Founding teams of 4/5 would be formed around an equal number of entrepreneurial and intrapreneurial venture ideas. Students will make progress on their ventures over the course of the module with the final deliverable expected to be a business plan that follows the validation of key assumptions.

### 9.2.5 MBA Electives

#### *9.2.5.1 Innovation for Business Sustainability*

This course aims to build leadership and strategic capability in driving innovation that supports long-term, sustainable business growth. It shifts mindsets, deepens knowledge, and strengthens the practical use of global sustainability frameworks (e.g., Environmental, Social, Governance (ESG), Triple Bottom Line (TBL)) as tools for innovation and sustainability decision-making. Through interactive discussions and real-world cases, students are equipped to champion sustainable innovation in entrepreneurial, intrapreneurial, and extrapreneurial contexts. In

this course, students will develop a deep understanding of how sustainability frameworks can be leveraged as strategic tools for innovation and organizational transformation. Students will learn to integrate sustainability considerations into strategic decision-making to strengthen organizational competitiveness and resilience. By the end of this course, students will have the skill of applying sustainability frameworks to design innovative strategies that deliver long-term business growth, positive societal impact, and environmental stewardship in organizations.

#### *9.2.5.2 MBA692 Entrepreneurial Leadership*

This course equips students with the skills, mindset, and tools to lead growth initiatives by integrating entrepreneurial thinking into core business functions. Students learn to manage cross-functional teams, execute scalable strategies, and deploy digital and financial innovations with an entrepreneurial mindset, all through the lens of the African business context. The emphasis is on applying entrepreneurial thinking to the successful execution of key business functions in different types of firms. The program is designed to be highly experiential, including real-world case studies, simulations, and guest speaker sessions with top African entrepreneurs and corporate innovators.

#### *9.2.5.3 MBA642 Technology strategy*

Technology Strategy focuses on how emerging and disruptive technologies reshape industries, business models, and competitive advantage. Students analyze how leaders can leverage digital transformation, platform strategies, AI, and innovation ecosystems to remain competitive, while managing risks such as disruption, cybersecurity, and organizational inertia. The course emphasizes strategic decision-making rather than technical design, preparing managers to align technology investments with long-term business goals.

#### *9.2.5.4 MBA638 Decision Intelligence*

This course develops managers' ability to use data and analytics to improve strategic and operational decision-making. Students learn how to frame business problems, apply data analytics tools, interpret insights, and translate analysis into actionable decisions. Emphasis is placed on judgment, ethics, and uncertainty—ensuring that data supports, rather than replaces, managerial thinking. The course bridges analytics, strategy, and leadership.

#### *9.2.5.5 MBA614 Financial Technology*

The FinTech course explores the intersection of finance, technology, and innovation. Students examine digital payments, mobile money, blockchain, lending platforms, insurtech, and regulatory technology, with a strong focus on emerging African markets. The course evaluates how technology is transforming financial services, financial inclusion, and business decision-making, while also addressing regulatory, risk, and governance implications.

#### *9.2.5.6 MBA602 Global & Regional Immersion Program*

The immersion program provides experiential learning through direct exposure to industries, organizations, and cultures outside the traditional classroom. Students engage with firms, entrepreneurs, policymakers, and institutions across regional and global contexts, gaining first-hand insight into how businesses operate in different environments. The program strengthens global mindset, cultural intelligence, and practical problem-solving skills.

#### *9.2.5.7 MBA600 Capstone*

The Capstone Project is the culminating experience of the Ashesi MBA, designed to integrate learning across strategy, entrepreneurship, analytics, finance, technology, leadership, and ethics. Recognizing the diverse career paths of MBA participants, the capstone may take multiple applied forms, including an entrepreneurial business plan, market entry or marketing strategy, venture scale-up plan, or a consulting project for an organization. Students work on real-world challenges either within their own ventures, early-stage or growth-oriented enterprises, or established organizations using rigorous analysis and evidence-based decision-making. Regardless of format, all capstone projects are expected to demonstrate strategic coherence, analytical depth, financial viability, execution feasibility, and ethical awareness. The capstone confirms students' readiness to lead, scale, and transform organizations in dynamic and uncertain environments, with particular relevance to African and emerging-market contexts.

# 10 Course Catalogue for MSc. and MPhil in Intelligent Computing Programs

## 10.1 Overview of the MSc. and MPhil in Intelligent Computing Systems Program

### 10.1.1 Summary of Requirements for MSc. Intelligent Computing Systems Program

| Requirement | MSc. in Intelligent Computing Systems | MPhil in Intelligent Computing Systems |
|---|---|---|
| **Foundation requirement** | • A seminar (1 credit hour) in "Foundations of Intelligent Systems"<br>• A seminar (1 credit hour) in "Leadership & Ethics" | • A seminar (1 credit hour) in "Foundations of Intelligent Systems"<br>• A seminar (1 credit hour) in "Leadership & Ethics" |
| **Breadth Requirement** | • 2 courses (6 credit hours) from the "Software Engineering and Systems" group<br>• 2 courses (6 credit hours) from the "Artificial Intelligence" group<br>• 2 courses (6 credit hours) from the "Computer Security" group | • 2 courses (6 credit hours) from the "Software Engineering and Systems" group<br>• 2 courses (6 credit hours) from the "Artificial Intelligence" group<br>• 2 courses (6 credit hours) from the "Computer Security" group |
| **Focus Area Requirement** | • At least 2 additional courses (6 credit hours) from one group (either the "Software Engineering and Systems" group, the "Artificial Intelligence" group or the "Security" group) | • At least 2 additional courses (6 credit hours) from one group (either the "Software Engineering and Systems" group, the "Artificial Intelligence" group or the "Security" group) |
| **Integration Requirement** | • 1 course (3 credit hours) in "Building Secure Intelligent Systems" [a team-based project-based course that integrates the three areas of focus] | • 1 course (3 credit hours) in "Building Secure Intelligent Systems" [a team-based project-based course that integrates the three areas of focus] |
| **Professional Practice Requirement** | • A seminar (1 credit hour) in "Technology and Ethics"<br>• A seminar (1 credit hour) in "Technology and Law"<br>• A seminar (1 credit hour) in "Project Management"<br>• A seminar (1 credit hour) in "Accessibility and Universal Design" | • A seminar (1 credit hour) in "Technology and Ethics"<br>• A seminar (1 credit hour) in "Technology and Law"<br>• A seminar (1 credit hour) in "Project Management"<br>• A seminar (1 credit hour) in "Accessibility and Universal Design" |
| **Independent Project / Practical Training** | • 2 course units (6 credit hours) of industry practicum / independent project | • 4 course units (12 credit hours) of Thesis Research<br>• Optional industry practicum / independent project or 2 additional course units (6 credit hours) of Thesis Research |
| **TOTAL** | **39 credit hours** | **51 credit hours** |

### 10.1.2 Core Courses

#### *10.1.2.1 Seminars*

All of these seminars must be taken.

| Code | Course Name | Lecture Hour | Practical/ Discussion | Credit |
|---|---|---|---|---|
| **ICS510** | Foundations of Intelligent Systems Seminar | 1 | - | 1 |
| **ICS521** | Leadership & Ethics Seminar | 1 | - | 1 |
| **ICS522** | Technology & Ethics Seminar | 1 | - | 1 |
| **ICS523** | Technology & Law Seminar | 1 | - | 1 |
| **ICS524** | Project Management Seminar | 1 | - | 1 |
| **ICS525** | Accessibility & Universal Design Seminar | 1 | - | 1 |

#### *10.1.2.2 Software Engineering & Systems Group*

Two courses from this group must be taken to meet the breadth requirement.

| Code | Course Name | Lecture Hour | Practical/ Discussion | Credit |
|---|---|---|---|---|
| ICS530 | Software Engineering Essentials * | 2 | 2 | 3 |
| ICS532 | Agile Software Engineering Methods | 2 | 2 | 3 |
| ICS533 | Software Measurement & Testing | 2 | 2 | 3 |
| ICS534 | Cloud Computing | 2 | 2 | 3 |
| ICS535 | Embedded Systems | 2 | 2 | 3 |
| ICS536 | Blockchain & Crypto currencies | 2 | 2 | 3 |

* Students who have taken an undergraduate course in Software Engineering should not take the Software Engineering Essentials course but select from the more advanced courses in this group.

#### *10.1.2.3 Artificial Intelligence Group*

Two courses from this group must be taken to meet the breadth requirement.

| Code | Course Name | Lecture Hour | Practical/ Discussion | Credit |
|---|---|---|---|---|
| **ICS550** | Artificial Intelligence Essentials* | 2 | 2 | 3 |
| **ICS551** | Machine Learning Essentials* | 2 | 2 | 3 |
| **ICS552** | Applied Data Science | 2 | 2 | 3 |
| **ICS553** | Deep Learning | 2 | 2 | 3 |
| **ICS554** | Natural Language Processing | 2 | 2 | 3 |
| **ICS555** | Computer Vision | 2 | 2 | 3 |
| **ICS556** | Autonomous Robotics | 2 | 2 | 3 |
| **ICS557** | Internet of Things | 2 | 2 | 3 |

* Students who have taken an undergraduate course in Artificial Intelligence should not take the Artificial Intelligence Essentials course but select from the more advanced courses in this group. Similarly, students who have taken an undergraduate course in Machine Learning should not take the Machine Learning Essentials course but select from the more advanced courses in this group.

#### *10.1.2.4 Security Group*

Two courses from this group must be taken to meet the breadth requirement.

| Code | Course Name | Lecture Hour | Practical/ Discussion | Credit |
|---|---|---|---|---|
| **ICS570** | Computer Security Essentials* | 2 | 2 | 3 |
| **ICS572** | Software Security | 2 | 2 | 3 |
| **ICS573** | Cybersecurity | 2 | 2 | 3 |
| **ICS574** | Security Management | 2 | 2 | 3 |
| **ICS575** | Security Engineering | 2 | 2 | 3 |
| **ICS576** | Privacy Preserving Systems | 2 | 2 | 3 |

* Students who have taken an undergraduate course in Computer Security should not take the Computer Security Essentials course but select from the more advanced courses in this group.

#### *10.1.2.5 Integration requirement and practical training*

Both of these courses must be taken.

| Code | Course Name | Lecture Hour | Practical/ Discussion | Credit |
|---|---|---|---|---|
| ICS591 | Building Secure Intelligent Systems | 2 | 2 | 3 |
| ICS592 | Industry Practicum | - | - | 3 |

### 10.1.3 Elective Courses

#### *10.1.3.1 Software Engineering & Systems Group*

| Code | Course Name | Lecture Hour | Practical/ Discussion | Credit |
|---|---|---|---|---|
| **ICS532** | Agile Software Engineering Methods | 2 | 2 | 3 |
| **ICS533** | Software Measurement & Testing | 2 | 2 | 3 |
| **ICS534** | Cloud Computing | 2 | 2 | 3 |
| **ICS535** | Embedded Systems | 2 | 2 | 3 |
| **ICS536** | Blockchain & Crypto currencies | 2 | 2 | 3 |

### *10.1.3.2 Artificial Intelligence group*

| Code | Course Name | Lecture Hour | Practical/ Discussion | Credit |
|---|---|---|---|---|
| **ICS552** | Applied Data Science | 2 | 2 | 3 |
| **ICS553** | Deep Learning | 2 | 2 | 3 |
| **ICS554** | Natural Language Processing | 2 | 2 | 3 |
| **ICS555** | Computer Vision | 2 | 2 | 3 |
| **ICS556** | Autonomous Robotics | 2 | 2 | 3 |
| **ICS557** | Internet of Things | 2 | 2 | 3 |
| **ICS558** | Data Intensive Computing Systems | 2 | 2 | 3 |

### *10.1.3.3 Security Group*

| Code | Course Name | Lecture Hour | Practical/ Discussion | Credit |
|---|---|---|---|---|
| **ICS572** | Software Security | 2 | 2 | 3 |
| **ICS573** | Cybersecurity | 2 | 2 | 3 |
| **ICS574** | Security Management | 2 | 2 | 3 |
| **ICS575** | Security Engineering | 2 | 2 | 3 |
| **ICS576** | Privacy Preserving Systems | 2 | 2 | 3 |

## 10.1.4 Progression Plan for MSc. Intelligent Computing Systems

### *10.1.4.1 Progression Plan for Full-time Students*

| *Year* | *Semester* | *Courses (FULL-TIME SCHEDULE)* | *Lecture Hrs* | *Practical Hrs* | *Credit* | *Total Semester Credit* |
|---|---|---|---|---|---|---|
| ***Y1*** | ***Prelude*** *2 weeks Early Aug (In-person)* | *Foundations of Intelligent Systems Seminar* | *1* | *-* | *1* | *1* |
| ***Y1*** | ***September Semester*** *Aug – Dec (Online)* | *Breadth requirement course (see "degree requirements" above)* | *2* | *2* | *3* | *13* |
| | | *Breadth requirement course (see "degree requirements" above)* | *2* | *2* | *3* | |
| | | *Breadth requirement course (see "degree requirements" above)* | *2* | *2* | *3* | |
| | | *Breadth requirement course (see "degree requirements" above)* | *2* | *2* | *3* | |
| | | *Leadership & Ethics Seminar* | *1* | *-* | *1* | |
| | ***January Semester*** *Jan – May (Online)* | *Breadth requirement course (see "degree requirements" above)* | *2* | *2* | *3* | *13* |
| | | *Breadth requirement course (see "degree requirements" above)* | *2* | *2* | *3* | |
| | | *Focus area requirement course (see "degree requirements" above)* | *2* | *2* | *3* | |
| | | *Focus area requirement course (see "degree requirements" above)* | *2* | *2* | *3* | |
| | | *Technology & Ethics Seminar* | *1* | *-* | *1* | |
| | ***May Semester*** *(In-person)* | *Industry Practicum* | *-* | *-* | *3* | *3* |

| | | | | | | |
|---|---|---|---|---|---|---|
| ***Y2*** | ***Interlude*** *2 weeks Early Aug (In-person)* | *Project Management Seminar* | *1* | *-* | *1* | *1* |
| ***Y2*** | ***September Semester*** *Aug – Dec (Online)* | *Industry Practicum* | *-* | *-* | *3* | *8* |
| | | *Building Secure Intelligent Systems* | *2* | *2* | *3* | |
| | | *Technology & Law Seminar* | *1* | *-* | *1* | |
| | | *Accessibility & Universal Design Seminar* | *1* | *-* | *1* | |

### *10.1.4.2 Progression Plan for Part-time Students*

| Year | Semester | Courses (PART TIME SCHEDULE) | Lecture Hrs | Practical Hrs | Credit | Total Sem Credit |
|---|---|---|---|---|---|---|
| Y1 | **Prelude** 2 weeks Early Aug (In-person) | Foundations of Intelligent Systems Seminar | 1 | - | 1 | 1 |
| | **September Semester** Aug – Dec (Online) | Breadth requirement course (see "degree requirements" above) | 2 | 2 | 3 | 7 |
| | | Breadth requirement course (see "degree requirements" above) | 2 | 2 | 3 | |
| | | Leadership & Ethics Seminar | 1 | - | 1 | |
| | **January Semester** Jan – May (Online) | Breadth requirement course (see "degree requirements" above) | 2 | 2 | 3 | 7 |
| | | Breadth requirement course (see "degree requirements" above) | 2 | 2 | 3 | |
| | | Technology & Ethics Seminar | 1 | - | 1 | |
| | **May Semester** May – Jul (Online) | Breadth requirement course (see "degree requirements" above) | 2 | 2 | 3 | 3 |
| Y2 | **Interlude** 2 weeks Early Aug (In-person) | Project Management Seminar | 1 | - | 1 | 1 |
| | **September Semester** Aug – Dec (Online) | Breadth requirement course (see "degree requirements" above) | 2 | 2 | 3 | 7 |
| | | Building Secure Intelligent Systems | 2 | 2 | 3 | |
| | | Technology & Law Seminar | 1 | - | 1 | |
| | **January Semester** Jan – May (Online) | Focus area requirement course (see "degree requirements" above) | 2 | 2 | 3 | 7 |
| | | Focus area requirement course (see "degree requirements" above) | 2 | 2 | 3 | |
| | | Accessibility & Universal Design Seminar | 1 | - | 1 | |

## 10.1.5 Progression Plan for MPhil Intelligent Computing Systems

| Year | Semester | Courses (FULL-TIME SCHEDULE) | Lecture Hours | Practical Hours | Credit | Total Sem Credit |
|---|---|---|---|---|---|---|
| **Y1** | **Prelude Aug (2 wks) (In-person)** | Introduction to Intelligent Systems Seminar | 1 | - | 1 | 1 |
| **Y1** | **September Semester Aug – Dec (Online)** | Breadth requirement course (see "degree requirements" above) | 2 | 2 | 3 | 13 |
| | | Breadth requirement course (see "degree requirements" above) | 2 | 2 | 3 | |
| | | Breadth requirement course (see "degree requirements" above) | 2 | 2 | 3 | |
| | | Breadth requirement course (see "degree requirements" above) | 2 | 2 | 3 | |
| | | Leadership & Ethics Seminar | 1 | - | 1 | |
| | **January Semester Jan – May (Online)** | Breadth requirement course (see "degree requirements" above) | 2 | 2 | 3 | 13 |
| | | Breadth requirement course (see "degree requirements" above) | 2 | 2 | 3 | |
| | | Focus area requirement course (see "degree requirements" above) | 2 | 2 | 3 | |
| | | Thesis Research / Industry Practicum | 2 | 2 | 3 | |
| | | Technology & Ethics Seminar | 1 | - | 1 | |
| | **Summer (In-person)** | Thesis Research / Industry Practicum | 2 | 2 | 3 | 3 |
| **Y2** | **Interlude Aug (2 wks) (In-person)** | Project Management Seminar | 2 | 2 | 1 | 1 |
| **Y2** | **September Semester Aug – Dec (Online)** | 2 units Thesis Research | - | - | 6 | 10 |
| | | Building Secure Intelligent Systems | 2 | 2 | 3 | |
| | | Technology & Law Seminar | 1 | - | 1 | |
| | **January Semester Jan – May (Online)** | 2 units Thesis Research | - | - | 6 | 10 |
| | | Focus area requirement course (see "degree requirements" above) | 2 | 2 | 3 | |
| | | Accessibility & Universal Design Seminar | 1 | - | 1 | |

## 10.1.6 Course Descriptions of the MSc. and MPhil in Intelligent Computing Systems Programs

### *10.1.6.1 ICS 510 Foundations of Intelligent Systems Seminar*

This seminar explores the concept of an Intelligent System as a system that connects users to artificial intelligence, to achieve meaningful objectives. Topics covered include elements of an intelligent system, examples of intelligent systems, problems that need intelligent systems, the approach to developing an intelligent system, and implications of intelligent systems for various domains. This seminar is designed to serve as a foundation for the overall programme.

#### *10.1.6.2 ICS 521 Leadership & Ethics Seminar*

This seminar explores such questions as "What is good leadership? "What are the attributes of a Great Leader? and "What does a good leader do or not do? In this seminar, students will do readings of various historical and contemporary public, business and technology leaders and explore the ethical dimensions of leadership. Furthermore, the seminar considers key concepts in ethics such as consequentialism, deontology, and virtue ethics, and how such concepts might change our understanding of what it means to do good unto others.

#### *10.1.6.3 ICS 522 Technology & Ethics Seminar*

This seminar-based course will discuss and examine the ethical considerations of emerging technologies and your contribution as a developer of these technologies and a person in a position to influence policy or social responsibility. Participants will discuss some ethical frameworks and philosophies, different technologies and their potential applications and impact. It will further discuss the codes of conduct, regulations and policies that govern these technologies. Emphasis will be placed on critical inquiry through different viewpoints and independent thinking to make meaningful connection with concepts and its impact on people and society.

#### *10.1.6.4 ICS 523 Technology & Law Seminar*

The seminar will focus on legal and regulatory aspects of Information Systems and related technologies. The aim of the seminar is to explore the intersection of technology and the legal framework governing its use. The seminar provides students with an understanding of the legal implications and challenges arising from advancements in technology, and how laws and regulations are evolving to address these issues. The course aims to foster critical thinking and discussion on the legal and ethical dimensions of technology, preparing students to navigate complex legal landscapes in the digital era. It will cover topics of concern to individuals as well as business and government, including protection of intellectual property in a digital environment, electronic contracts, computer and information security, cybercrime and the implications of advancements in technology on Law and vice versa. Participants will learn approaches to analyze the impact and application of traditional legal principles in a new technological environment.

#### *10.1.6.5 ICS 524 Project Management Seminar*

This seminar discusses the most important concepts in project management. Participants will learn how to be responsible for projects and project strategies within an organization. It will expose them to the various methods of planning, meeting deadlines, managing budgets, and achieving the objectives set by an organization. Topics addressed include Leadership, Project Management Tools, Commercial Economics, Risk and Value, Decision Making, Accounting for Projects, Resource Management and Business Ethics.

#### *10.1.6.6 ICS 525 Accessibility and Universal Design Seminar*

This seminar discusses some of the fundamental principles of accessibility and prepares students for further study in accessibility and inclusive design. Students will have an opportunity to explore topics on understanding disability and assistive technology, the legal landscape of accessibility, universal design, and accessible digital materials.

#### *10.1.6.7 ICS 530 Software Engineering Essentials*

This course explores a collection of methods which embody an "engineering" approach to the development of computer software. Software engineering is an inherently practical subject and applying the concepts being taught is a vital component of developing expertise in this area. Hence, students will have an opportunity to gain theoretical and practical exposure to topics on software processes, requirements engineering, system modelling, architectural design, system implementation, system testing, dependability and security, project management, software evolution, and software reuse.

#### *10.1.6.8 ICS 531 Advanced Programming*

This course exposes students to and gives them experience applying advanced programming techniques in solving complex problems. The Python programming language will be used, and topics covered include advanced Python syntax, the use of parallel computation and GPU acceleration and how to exploit frameworks such as Hadoop and Spark.

#### *10.1.6.9 ICS 532 Agile Software Engineering Methods*

Today, software is becoming ever more complex, developed with a very short time to market, and required to cope with changing requirements. This scenario calls for increased levels of flexibility and agility, both in the technologies used and the processes followed for engineering software. This course provides a sound background on the methods and techniques that can meet these challenges. Topics covered are Agile software processes (related to Extreme Programming (XP), SCRUM, Adaptive Software Development (ASD), Dynamic System Development Method (DSDM), Crystal, Feature Driven Development (FDD), Incremental Funding Method (IFM), Agile Modeling (AM)), DevOps, and Site Reliability Engineering (SRE).

#### *10.1.6.10 ICS 533 Software Measurement & Testing*

Software is present in almost every part of our lives and continues to change the world. Of importance to users is that software is correct, secure, reliable and efficient. The scale and complexity of most software ensures that achieving these qualities is non-trivial. This course exposes students to methods for static and dynamic software testing, software security, quality and dependability, reliability measurement and engineering, performance measurement and engineering, software problem analysis and fault isolation; and software engineering tools.

#### *10.1.6.11 ICS 534 Cloud Computing*

Computing on the cloud has emerged as a leading paradigm for cost-effective, scalable, well-managed computing. Users pay for services provided in a broadly shared, power efficient datacenter, enabling dynamic computing needs to be met without paying for more than is needed. Actual machines may be virtualized into machine-like services, or more abstract programming platforms, or application-specific services, with the cloud computing infrastructure managing sharing, scheduling, reliability, availability, elasticity, privacy, provisioning, and geographic replication. This course exposes students to topics such as cloud providers, Software as a Service (SaaS), Platform as a Service (PaaS), Infrastructure as a Service (IaaS), Virtual Private Cloud (VPC), elastic load balancing and auto scaling, identity management and security in the cloud, Database as a Service (DBaaS), MapReduce and Hadoop, RESTful Web Services, Messaging in the Cloud, and Continuous Integration (CI) and Continuous Development (CD).

#### *10.1.6.12 ICS 535 Embedded Systems*

The focus of this course is on the design of embedded systems using formal models and methods as well as computer-based synthesis methods. The lecture is complemented by laboratory sessions where students program in C, and base their design on an embedded operating system.

#### *10.1.6.13 ICS 536 Blockchain & Cryptocurrencies*

The course will equip students with the computational, mathematical, business and financial views of Blockchain and financial technologies. The course will explore topics including principles of money, banking and finance, open and decentralized financial systems, introduction to blockchain and digital currency, blockchain systems and architectures, digital currency programming, smart contract programming, permissioned blockchains programming, cryptographic systems security, law and regulation in blockchain, and blockchain and entrepreneurship management.

#### *10.1.6.14 ICS 550 Artificial Intelligence Essentials*

This course explores the concept of Artificial Intelligence (AI), its foundational principles, use cases and applications. It delves into AI concepts and terms such as agents, classical AI, machine learning, deep learning and neural networks. It also discusses various issues and concerns surrounding AI such as ethics and bias, and the future of work. Through hands-on projects with Python, students explore the theoretical underpinnings of topics in Artificial Intelligence such as graph search algorithms, classification, optimization, reinforcement learning, and machine learning. Students will gain experience using libraries for machine learning and will emerge with strong understanding of artificial intelligence principles that serve as a foundation for the other courses in the Artificial Intelligence group.

#### *10.1.6.15 ICS 551 Machine Learning Essentials*

This course will provide students with a general theoretical and practical understanding of machine learning. The course will cover the following topics: Learning Algorithms (Tasks, Performance, Experience), Linear Regression, Capacity, Overfitting and Underfitting, Regularization, Hyperparameters and Validation Sets, Estimators, Bias and Variance, Maximum Likelihood Estimation, Bayesian Statistics, Support Vector Machines, Nearest Neighbor

Regression, Decision Trees, K-means Clustering, Principal Component Analysis, Stochastic Gradient Descent Deep Learning.

#### *10.1.6.16 ICS 552 Applied Data Science*

This course is designed for students interested in using a powerful data science toolkit to collect, clean, pre-process, visualize datasets and fit models. It will provide most of the knowledge needed to apply statistical and machine learning algorithms to projects by combining hands-on practice with the essential theory. In this class, students work on data science projects that involve collecting data or finding data sources, exploratory data analysis and interactive visualization, statistical analysis, predictive analytics, model selection and validation. Course work also involves readings and case studies on ethical practice in data science.

#### *10.1.6.17 ICS 553 Deep Learning*

This course will provide students with an in-depth understanding of deep learning. Topics covered include Deep Feedforward Networks, Regularization for Deep Learning, Optimization for Training Deep Models, Convolutional Networks, Sequence Modeling: Recurrent and Recursive Nets, Practical Methodology, Deep Learning Applications, Deep Generative Models, Structured Probabilistic Methods for Deep Learning, Transformers and Attention.

#### *10.1.6.18 ICS 554 Advanced Natural Language Processing*

This course will provide an advanced treatment of Natural Language Processing with a focus on state-of-the-art methods involving neural networks, transformers and large language models. The following topics will be covered: Language modeling, Neural language models & backpropagation, Attention mechanisms, Transformers, Using large language models, Aligning large language models to human preferences, Evaluating language generation, and prompt engineering, Security risks with LLMs, Scaling laws and probe tasks, Multilingual LMs, ethics & NLP.

#### *10.1.6.19 ICS 555 Computer Vision*

This course explores computer vision, a subfield of artificial intelligence dealing with how computers gain high-level understanding from digital images or videos. Topics covered include the fundamentals of image formation, camera imaging geometry, feature detection and matching, stereo, motion estimation and tracking, image classification and scene understanding, depth from stereo and motion, camera calibration, object tracking, boundary detection, generative models, object recognition, deep learning with computer vision. The focus will be on theory as well as on practice and implementation, using both classical machine learning and deep learning approaches.

#### *10.1.6.20 ICS 556 Autonomous Robotics*

This course gives a theoretical as well as practical hands-on exploration of Autonomous Robotics as a field that focuses on the development of robots that can operate without human intervention. Topics covered include locomotion, manipulation, kinematics, planning, sensing, vision, uncertainty and error propagation, localization, robot learning.

#### *10.1.6.21 ICS 557 Internet of Things*

This course addresses IoT technologies by looking at common enabling technologies covering all 3 architectural layers of an IoT deployment, from the sensory, communication and application areas. Sensors and actuators, connectivity options, protocols for managing IoT, will be examined. IoT usage in Manufacturing along with decision-making based on collected data will all be explored. Considerations for analyzing collected data. This course includes a project.

#### *10.1.6.22 ICS 570 Computer Security Essentials*

The course forms the foundation of the track to prepare professionals to assume cybersecurity and information assurance roles in corporations, agencies, and organizations. The course aims to provide students with a comprehensive understanding of the fundamental principles and practices of computer security. It equips students with the knowledge and skills necessary to identify, assess, and mitigate security risks in various computing environments. By exploring key concepts, methodologies, and technologies, students gain a solid foundation in computer security that enables them to protect information systems and data from unauthorized access, malicious activities, and potential threats. The course then offers various hand-on topics to well prepare the student for the professional workspace, each having well defined job prospects.

#### *10.1.6.23 ICS 572 Software Security*

This course focuses on software security fundamentals, secure coding guidelines and principles, and advanced software security concepts. Students learn to assess and understand threats, learn how to design and implement secure software systems, and get hands-on experience with security pitfalls. Software running on current systems is exploited by attackers despite many deployed defence mechanisms and best practices for developing new software. In this course students will learn about current security threats, attack vectors, and defence mechanisms on current systems. The students will work with real world problems and technical challenges of security mechanisms (both in the design and implementation of programming languages, compilers, and runtime systems).

#### *10.1.6.24 ICS 573 Cybersecurity*

This course is an in-depth exploration of Cybersecurity. It covers topics such as risk management, cryptography, secure software development, cybercrime investigations, and advanced threats. Students will learn how to design, implement, and evaluate secure systems, as well as how to respond to cyber-attacks. The course also covers the latest developments in the field, including emerging technologies and trends.

#### *10.1.6.25 ICS 574 Security Management*

The course aims to provide students with a comprehensive understanding of the principles, strategies, and practices involved in effectively managing security in various organizational contexts. The course focuses on equipping students with the knowledge and skills necessary to identify, assess, and mitigate security risks, develop security policies and procedures, and implement security measures to protect people, assets, and information. Topics include intrusion detection systems, vulnerability analysis, anomaly detection, computer forensics, application logging, auditing and data management, risk management, contingency planning and incident handling, digital immune systems, and alarms and responses. The course will study in detail principles and tools related to these topics. The course will also cover security standards, evaluation and certification process; security planning, ethical and legal issues in information; privacy, traceability and cyber evidence.

#### *10.1.6.26 ICS 575 Security Engineering*

This course introduces students to the concepts of security engineering, thereby increasing the ability to deploy secure information systems that are resistant to failure or compromise. The aim of this course is to provide students with a comprehensive understanding of the principles, methodologies, and practices involved in designing, building, and maintaining secure systems. The course focuses on equipping students with the knowledge and skills necessary to integrate security into the entire system development lifecycle, from requirements analysis to deployment, to ensure the confidentiality, integrity, and availability of systems and data.

#### *10.1.6.27 ICS 576 Privacy Preserving Systems*

This course introduces students with the knowledge to tackle the design of privacy-preserving ICT systems. Students will learn about existing technologies to protect privacy, and how to evaluate the protection they provide. The aim of this course is to provide students with a comprehensive understanding of the principles, techniques, and technologies involved in designing and developing systems that protect individual privacy while allowing for efficient data processing and analysis. The course focuses on equipping students with the knowledge and skills necessary to implement privacy-preserving mechanisms and comply with privacy regulations in various domains, such as healthcare, finance, and social media.

#### *10.1.6.28 ICS 591 Building Secure Intelligent Systems*

In this course, students will work in teams to design and implement real intelligent systems for particular problem domains ranging from agriculture to healthcare and others. Teams will be intentionally formed to have students from each of the three focus areas of software and systems engineering, artificial intelligence, and security. These interdisciplinary teams will combine their expertise to create secure fully functioning intelligent systems. Topics covered will include systems design, data engineering, implementation, evaluation and coordinating of intelligent computing systems.

#### *10.1.6.29 ICS 592 Industry Practicum*

This unit requires students to work on a project related to Intelligent Computing Systems with an industry partner, committing at least 250 hours of work over a period of 2-4 months.

# 11 Appendix A: Progression Plans

## 11.1 Law with Public Policy Program Progression Plan (Class of 2026, 2027 & Alumni)

| Semester | Law with Public Policy | Theory (Lecture Hours) | Practice (Lab/ Discuss) | Credit Hours | Semester Credit Hours |
|---|---|---|---|---|---|
| Year 1 | | | | | |
| **September Semester** | MATH 101 College Algebra or MATH 141 Calculus 1 or MATH 121 Pre-calculus | 3 | 1 | 4 | |
| | ENGL 112 Written and Oral Communication | 3 | 1 | 4 | |
| | BUSA 161A Foundations of Design and Entrepreneurship I | 3 | 1 | 4 | |
| | CS 111 Introduction to Computing and Information Systems | 3 | 1 | 4 | |
| | AS 111 Ashesi Success | | | | 16 |
| **January Semester** | SOAN 111 Leadership Seminar 1 | 1.5 | 1 | 2 | |
| | ENGL 113 Text and Meaning | 3 | 1 | 4 | |
| | BUSA 161B Foundations of Design and Entrepreneurship II | 3 | 1 | 4 | |
| | LLB112 Ghana Legal System & Methods | 3 | 1 | 4 | |
| | LLB114 Legal Writing | | | 2 | |
| | LLB150 Introduction to Public Policy | | | 3 | 19 |
| **Year 2** | | | | | |
| **September Semester** | SOAN211 Leadership Seminar 2 | 1.5 | 1 | 2 | |
| | LLB217 Torts | 3 | 1 | 4 | |
| | LLB213 Constitutional Law I | 3 | 1 | 4 | |
| | LLB215 Contract Law I | 3 | | 3 | |
| | LLB255 Economic Analysis for Public Policy | | | 4 | 17 |
| **January Semester** | SOAN 311 Leadership Seminar 3 | 1.5 | 1 | 2 | |
| | LLB214 Constitutional Law II | 3 | 1 | 4 | |
| | LLB216 Contract Law II | 3 | | 3 | |
| | Africana elective | 3 | 1 | 4 | |
| | LLB218 Politics of Policymaking | 3 | | 3 | |
| | LLB250 Philosophical Foundations of Public Policy | | | 3 | 19 |
| **May Semester** | Internship (Public Policy) | | | | |
| **Year 3** | | | | | |
| **September Semester** | LLB321 Criminal Law I | 3 | 1 | 4 | |
| | LLB323 Immovable Property Law I | 3 | | 3 | |
| | LLB351 Designing Public Policy | 3 | | 3 | |
| | Law / Non-Major Elective | | | 3 | |
| | MATH221 Statistics with Probability | 3 | 1 | 4 | |
| | LLB325: Public International Law | 1.5 | 1 | 2 | 19 |
| **January Semester** | LLB322 Criminal Law II | 3 | 1 | 4 | |
| | LLB324 Immovable Property II | 3 | | 3 | |
| | Law / Non-major Elective | 3 | | 3 | |
| | SOAN411 Leadership Seminar 4 | 3 | 1 | 4 | |
| | LLB352 Implementing Public Policy | 3 | | 3 | 17 |
| **May Semester** | Internship (Law) | | | | |
| **Year 4** | | | | | |
| **September Semester** | LLB429 Legislative drafting | 3 | | 3 | |
| | LLB427 Commercial Law | 3 | | 3 | |
| | LLB425 Equity & Trusts | 3 | 1 | 4 | |
| | Africana elective | 3 | 1 | 4 | |
| | LLB401 Capstone (Thesis) | 3 | 1 | 4 | 18 |
| **January Semester** | LLB430 Succession | 3 | 1 | 4 | |
| | LLB428 Jurisprudence | 3 | 1 | 4 | |
| | LLB426 Company Law | 3 | | 3 | 18 |

| Semester | Law with Public Policy | Theory (Lecture Hours) | Practice (Lab/ Discuss) | Credit Hours | Semester Credit Hours |
|---|---|---|---|---|---|
| | LLB454 Evaluating Public Policy | 3 | | 3 | |
| | LLB402 Capstone 2 (applied project) | 3 | 1 | 4 | |
| | **Electives** | | | | |
| | LLB334 Law of Taxation | | | | |
| | LLB332 Intellectual Property | | | | |
| | LLB331 Gender & the law | | | | |
| | LLB333 International Trade Law | | | | |
| | LLB335 Alternative Dispute Resolution | | | | |
| | Total Credit Hours | | | | 143 |

## 11.2 Business Administration Program Progression Plan (Class of 2024 & 2025)

| Semester | Business Administration | Theory (Lecture Hours) | Practice (Lab/ Discuss) | Credit Hours | Semester Credit Hours |
|---|---|---|---|---|---|
| **Year 1** | | | | | |
| **September Semester** | Ashesi Success | 1.5 | N/A | N/A | |
| | CS 111 Introduction to Computing | 3 | 1.5 | 4 | |
| | MATH 142 Calculus 1 or Pre-calculus 1 | 4.5 | 1.5 | 4 | |
| | ENGL 112 Written and Oral Communication | 3 | 1 | 4 | |
| | BUSA 161A Foundation of Design & Entrepreneurship 1 | 3 | 1 | 4 | 16 |
| **January Semester** | ENGL 113 Text and Meaning | 3 | 1 | 4 | |
| | SOAN 111 Leadership Seminar 1* | 1.5 | 0 | 2 | |
| | BUSA 161B Foundation of Design & Entrepreneurship 2 | 3 | 1 | 4 | |
| | MATH 142B Calculus 2 or Pre-Calculus 2 | 4.5 | 1.5 | 4 | |
| | BUSA 132 Organizational Behaviour | 3 | 1 | 4 | 18 |
| **May Semester** | Applied Calculus (for Pre-Calculus 1 and 2 students) | 3 | 1.5 | 4 | 4 |
| **Year 2** | | | | | |
| **September Semester** | ECON 101 Microeconomics | 3 | 1 | 4 | |
| | STAT 151 Statistics with Probability | 3 | 1.5 | 4 | |
| | SOAN 211 Leadership Seminar 2* | 1.5 | 0 | 2 | |
| | Non-major Elective | 3 | 1 | 4 | |
| | BUSA 210 Financial Accounting | 3 | 1 | 4 | 18 |
| **January Semester** | BUSA 341 Marketing | 3 | 1 | 4 | |
| | SOAN 311 Leadership Seminar 3* | 1.5 | 0 | 2 | |
| | BUSA 220 Introduction to Finance | 3 | 1 | 4 | |
| | MATH143 Quantitative Methods | 3 | 1.5 | 4 | |
| | ECON 102 Macroeconomics | 3 | 1 | 4 | 18 |
| **Year 3** | | | | | |
| **September Semester** | BUSA 350 International Trade and Policy | 3 | 1 | 4 | |
| | BUSA 304 Operations Management | 3 | 1 | 4 | |
| | BUSA 321 Investments | 3 | 1 | 4 | |
| | SOAN 411 Leadership Seminar 4 or Elective† | 3 | 1 | 4 | 16 |
| **Semester 2** | BUSA 311 Managerial Accounting | 3 | 1 | 4 | |
| | SOAN 325 Research Methods | 3 | 1 | 4 | |
| | Elective† | 3 | 1 | 4 | |
| | SOAN 411 Leadership Seminar 4 or Elective† | 3 | 1 | 4 | 16 |
| **Year 4** | | | | | |
| **September Semester** | BUSA 422 Corporate Finance | 3 | 1 | 4 | |
| | BUSA 402 Business Law | 3 | 1 | 4 | |
| | Elective† | 3 | 1 | 4 | |
| | Thesis 1 or Applied Project 1 or Entrepreneurship 1 | 1.5 | 1.5 | 4 | 16 |
| **Semester 2** | BUSA 405 Competitive Strategy | 3 | 1 | 4 | |
| | Elective† | 3 | 1 | 4 | |
| | Elective† | 3 | 1 | 4 | |
| | Thesis 2 or Applied Project or Entrepreneurship 2 | 3 | 1 | 4 | 16 |
| **Total Credit Hours** | | | | | **134 or 138** |

## 11.3 Business Administration Program Progression Plan - Jan 2022 (Class of 2026)

| Semester | Business Administration | Theory (Lecture Hours) | Practice (Lab/ Discuss) | Credit Hours | Semester Credit Hours |
|---|---|---|---|---|---|
| **Year 1** | | | | | |
| **September Semester** | Ashesi Success | 1.5 | N/A | N/A | |
| | CS 111 Introduction to Computing | 3 | 1.5 | 4 | |
| | MATH 142 Calculus 1 or Pre-calculus 1 | 4.5 | 1.5 | 4 | |
| | ENGL 112 Written and Oral Communication | 3 | 1 | 4 | |
| | BUSA 161A Foundation of Design & Entrepreneurship 1 | 3 | 1 | 4 | 16 |
| **January Semester** | ENGL 113 Text and Meaning | 3 | 1 | 4 | |
| | SOAN 111 Leadership Seminar 1* | 1.5 | 0 | 2 | |
| | BUSA 161B Foundation of Design & Entrepreneurship 2 | 3 | 1 | 4 | |
| | MATH 142B Calculus 2 or Pre-Calculus 2 | 4.5 | 1.5 | 4 | 14 |
| **May Semester** | Applied Calculus (for Pre-Calculus 1 and 2 students) | 3 | 1.5 | 4 | 4 |
| **Year 2** | | | | | |
| **September Semester** | ECON 201 Principles of Microeconomics | 3 | 1 | 4 | |
| | STAT 151 Statistics with Probability | 3 | 1.5 | 4 | |
| | SOAN 211 Leadership Seminar 2* | 1.5 | 0 | 2 | |
| | Non-major Elective | 3 | 1 | 4 | |
| | BUSA 210 Financial Accounting | 3 | 1 | 4 | 18 |
| **January Semester** | BUSA 332 Organizational Behaviour | 3 | 1 | 4 | |
| | SOAN 311 Leadership Seminar 3* | 1.5 | 0 | 2 | |
| | BUSA 220 Introduction to Finance | 3 | 1 | 4 | |
| | MATH143 Quantitative Methods | 3 | 1.5 | 4 | |
| | ECON 202 Principles of Macroeconomics | 3 | 1 | 4 | 18 |
| **Year 3** | | | | | |
| **September Semester** | BUSA 350 International Trade and Policy | 3 | 1 | 4 | |
| | BUSA 304 Operations Management | 3 | 1 | 4 | |
| | BUSA 422 Corporate Finance | 3 | 1 | 4 | |
| | BUSA 341 Marketing | 3 | 1 | 4 | |
| | SOAN 411 Leadership Seminar 4 or Elective† | 3 | 1 | 4 | 20 |
| **January Semester** | SOAN 325 Research Methods | 3 | 1 | 4 | |
| | BUSA 311 Managerial Accounting | 3 | 1 | 4 | |
| | Elective† | 3 | 1 | 4 | |
| | BUSA 402 Business Law | 3 | 1 | 4 | |
| | SOAN 411 Leadership Seminar 4 or Elective† | 3 | 1 | 4 | 20 |
| **Year 4** | | | | | |
| **September Semester** | BUSA 405 Competitive Strategy | 3 | 1 | 4 | |
| | BUSA 321 Investments | 3 | 1 | 4 | |
| | Elective† | 3 | 1 | 4 | |
| | Thesis 1 or Applied Project/ Business Elective or Entrepreneurship 1 | 1.5 | 1.5 | 4 | 16 |
| **January Semester** | Business Communication and Negotiations | 3 | 1 | 4 | |
| | Elective† | 3 | 1 | 4 | |
| | Elective† | 3 | 1 | 4 | |
| | Thesis 2 or Applied Project or Entrepreneurship 2 | 3 | 1 | 4 | 16 |
| **Total Credit Hours** | | | | | **138 or 142** |

## 11.4 Economics Program Progression Plan - Jan 2024 (Class of 2026 & 2027)

| Semester | Economics | Theory (Lecture Hours) | Practice (Lab/ Discuss) | Credit Hours | Semester Credit Hours |
|---|---|---|---|---|---|
| **Year 1** | | | | | |
| **September Semester** | Ashesi Success | 1.5 | N/A | N/A | |
| | CS 111 Introduction to Computing | 3 | 1.5 | 4 | |
| | MATH 142 Calculus 1 or Pre-calculus 1 | 4.5 | 1.5 | 4 | |
| | ENGL 112 Written and Oral Communication | 3 | 1 | 4 | |
| | BUSA 161A Foundation of Design & Entrepreneurship 1 | 3 | 1 | 4 | 16 |
| **January Semester** | ENGL 113 Text and Meaning | 3 | 1 | 4 | |
| | SOAN 111 Leadership Seminar 1* | 1.5 | 0 | 2 | |
| | BUSA 161B Foundation of Design & Entrepreneurship 2 | 3 | 1 | 4 | |
| | MATH 142B Calculus 2 or Pre-Calculus 2 | 4.5 | 1.5 | 4 | 14 |
| **May Semester** | Applied Calculus (only for students who did Pre-Calculus 1 and 2) | 3 | 1.5 | 4 | 4 |
| **Year 2** | | | | | |
| **September Semester** | ECON 201 Principles of Microeconomics | 3 | 1 | 4 | |
| | ECON 221 Statistics with Probability | 3 | 1.5 | 4 | |
| | SOAN 211 Leadership Seminar 2* | 1.5 | 0 | 2 | |
| | Non-Major Elective | 3 | 1 | 4 | |
| | ECON 231 Mathematics for Economists | 3 | 1 | 4 | 18 |
| **January Semester** | ECON 241 Introduction to Environmental Economics | 3 | 1 | 4 | |
| | SOAN 311 Leadership Seminar 3* | 1.5 | 0 | 2 | |
| | ECON 211 The Economy of Ghana | 3 | 1 | 4 | |
| | Non-Major Elective | 3 | 1 | 4 | |
| | ECON 202 Principles of Macroeconomics | 3 | 1 | 4 | 18 |
| **Year 3** | | | | | |
| **September Semester** | ECON 301 Intermediate Microeconomic Theory I | 3 | 1 | 4 | |
| | ECON 303 Intermediate Macroeconomic Theory I | 3 | 1 | 4 | |
| | ECON 451 Development Economics | 3 | 1 | 4 | |
| | Non-Major Elective | 3 | 1 | 4 | |
| | SOAN 411 Leadership Seminar 4 or Elective† | 3 | 1 | 4 | 20 |
| **January Semester** | SOAN 325 Research Methods | 3 | 1 | 4 | |
| | ECON 301 Intermediate Microeconomic Theory II | 3 | 1 | 4 | |
| | ECON 303 Intermediate Macroeconomic Theory II | 3 | 1 | 4 | |
| | BUSA 402 Business Law | 3 | 1 | 4 | |
| | ECON 321 Econometrics I | 3 | 1.5 | 4 | 20 |
| **Year 4** | | | | | |
| **September Semester** | ECON 401 Advanced Microeconomic Theory | 3 | 1 | 4 | |
| | ECON 422 Econometrics II | 3 | 1.5 | 4 | |
| | Economics Major Elective | 3 | 1 | 4 | |
| | Thesis 1 or Applied Project/ Business Elective or Entrepreneurship 1 | 1.5 | 1.5 | 4 | 16 |
| **January Semester** | ECON 402 Advanced Macroeconomic Theory | 3 | 1 | 4 | |
| | Economics Major Elective | 3 | 1 | 4 | |
| | Economics Major Elective | 3 | 1 | 4 | |
| | Thesis 2 or Applied Project or Entrepreneurship 2 | 3 | 1 | 4 | 16 |
| **Total Credit Hours** | | | | | 138 or 142 |

## 11.5 Management Information Systems Program Progression Plan – Sept 2024 (Class of 2025 and later)

| Semester | Management Information Systems | Theory (Lecture Hours) | Practice (Lab/ Discuss) | Credit Hours | Semester Credit Hours |
|---|---|---|---|---|---|
| **Year 1** | | | | | |
| **September Semester** | Ashesi Success | 1.5 | N/A | N/A | |
| | CS 111 Introduction to Computing | 3 | 1.5 | 4 | |
| | MATH 142 Calculus 1 or Pre-calculus 1 | 4.5 | 1.5 | 4 | |
| | ENGL 112 Written and Oral Communication | 3 | 1 | 4 | |
| | BUSA 161A Foundation of Design & Entrepreneurship 1 | 3 | 1 | 4 | 16 |
| **January Semester** | ENGL 113 Text and Meaning | 3 | 1 | 4 | |
| | SOAN 111 Leadership Seminar 1* | 1.5 | 0 | 2 | |
| | BUSA 161B Foundation of Design & Entrepreneurship 2 | 3 | 1 | 4 | |
| | Computer Programming for CS | 3 | 1 | 4 | |
| | MATH 142B Calculus 2 or Pre-Calculus 2 | 4.5 | 1.5 | 4 | 18 |
| **May Semester** | Applied Calculus (only for students who did Pre-Calculus 1 and 2) | 3 | 1.5 | 4 | 4 |
| **Year 2** | | | | | |
| **September Semester** | ECON 101 Microeconomics | 3 | 1 | 4 | |
| | STAT 151 Statistics with Probability | 3 | 1.5 | 4 | |
| | SOAN 211 Leadership Seminar 2* | 1.5 | 0 | 2 | |
| | Object Oriented Programming | 3 | 1 | 4 | |
| | Discrete Structures and Theory | 3 | 1 | 4 | 18 |
| **January Semester** | Non-Major Elective or Data Structures | 3 | 1 | 4 | |
| | SOAN 311 Leadership Seminar 3* | 1.5 | 0 | 2 | |
| | Database Systems | 3 | 1 | 4 | |
| | MATH143 Quantitative Methods | 3 | 1.5 | 4 | |
| | Introduction to Artificial Intelligence | 3 | 1 | 4 | 18 |
| **Year 3** | | | | | |
| **September Semester** | Web Technologies | 3 | 1 | 4 | |
| | Systems Analysis & Design | 3 | 1 | 4 | |
| | Finance for Non-Finance Managers | 3 | 1 | 4 | |
| | SOAN 411 Leadership Seminar 4 or Elective† | 3 | 1 | 4 | 16 |
| **January Semester** | SOAN 325 Research Methods | 3 | 1 | 4 | |
| | IT Infrastructure and Systems Administration | 3 | 1 | 4 | |
| | IS Project Management | 3 | 1 | 4 | |
| | SOAN 411 Leadership Seminar 4 or Elective† | 3 | 1 | 4 | 16 |
| **Year 4** | | | | | |
| **September Semester** | E-Commerce | 3 | 1 | 4 | |
| | Information and Systems Security | 3 | 1 | 4 | |
| | Elective† | 3 | 1 | 4 | |
| | Thesis 1 or Applied Project/ Business Elective or Entrepreneurship 1 | 1.5 | 1.5 | 4 | 16 |
| **January Semester** | BUSA 405 Competitive Strategy | 3 | 1 | 4 | |
| | Elective† | 3 | 1 | 4 | |
| | Elective† | 3 | 1 | 4 | |
| | Thesis 2 or Applied Project or Entrepreneurship 2 | 3 | 1 | 4 | 16 |
| Total Credit Hours | | | | | 138 |

## 11.6 Computer Science Program Progression Plan – Sept 2024 (Class of 2025 and later)

| Semester | Computer Science | Theory (Lecture Hours) | Practice (Lab/ Discuss) | Credit Hours | Semester Credit Hours |
|---|---|---|---|---|---|
| **Year 1** | | | | | |
| **September Semester** | Ashesi Success | 1.5 | N/A | N/A | |
| | CS 111 Introduction to Computing | 3 | 1.5 | 4 | |
| | MATH 142 Calculus 1 or Pre-calculus 1 | 4.5 | 1.5 | 4 | |
| | ENGL 112 Written and Oral Communication | 3 | 1 | 4 | |
| | BUSA 161A Foundation of Design & Entrepreneurship 1 | 3 | 1 | 4 | 16 |
| **January Semester** | ENGL 113 Text and Meaning | 3 | 1 | 4 | |
| | SOAN 111 Leadership Seminar 1* | 1.5 | 0 | 2 | |
| | BUSA 161B Foundation of Design & Entrepreneurship 2 | 3 | 1 | 4 | |
| | Computer Programming for CS | 3 | 1 | 4 | |
| | MATH 142B Calculus 2 or Pre-Calculus 2 | 4.5 | 1.5 | 4 | 18 |
| **May Semester** | Applied Calculus (only for students who did Pre-Calculus 1 and 2) | 3 | 1.5 | 4 | 4 |
| **Year 2** | | | | | |
| **September Semester** | Principles of Economics | 3 | 1 | 4 | |
| | STAT 151 Statistics with Probability | 3 | 1.5 | 4 | |
| | SOAN 211 Leadership Seminar 2* | 1.5 | 0 | 2 | |
| | Discrete Structures & Theory | 3 | 1 | 4 | |
| | Object Oriented Programming | 3 | 1 | 4 | 18 |
| **January Semester** | Linear Algebra | 3 | 1 | 4 | |
| | SOAN 311 Leadership Seminar 3* | 1.5 | 0 | 2 | |
| | Data Structures & Algorithms | 3 | 1 | 4 | |
| | Database Systems | 3 | 1.5 | 4 | |
| | Introduction to Artificial Intelligence | 3 | 1 | 4 | 18 |
| **Year 3** | | | | | |
| **September Semester** | Web Technologies | 3 | 1 | 4 | |
| | Algorithm Design & Analysis | 3 | 1 | 4 | |
| | Intermediate Computer Programming | 3 | 1 | 4 | |
| | Systems Fundamentals* | 1.5 | 1 | 2 | |
| | SOAN 411 Leadership Seminar 4 or Elective† | 3 | 1 | 4 | 18 |
| **January Semester** | SOAN 325 Research Methods | 3 | 1 | 4 | |
| | Software Engineering | 3 | 1 | 4 | |
| | Computer Organization & Architecture | 3 | 1 | 4 | |
| | Introduction to Modelling and Simulation* | 1.5 | 1 | 2 | |
| | SOAN 411 Leadership Seminar 4 or Elective† | 3 | 1 | 4 | 18 |
| **Year 4** | | | | | |
| **September Semester** | Operating Systems | 3 | 1 | 4 | |
| | Finance for Non-Finance Managers | 3 | 1 | 4 | |
| | Elective† | 3 | 1 | 4 | |
| | Thesis 1 or Applied Project/ Business Elective or Entrepreneurship 1 | 1.5 | 1.5 | 4 | 16 |
| **January Semester** | Networks & Data Communication | 3 | 1 | 4 | |
| | Elective† | 3 | 1 | 4 | |
| | Elective† | 3 | 1 | 4 | |
| | Thesis 2 or Applied Project or Entrepreneurship 2 | 3 | 1 | 4 | 16 |
| Total Credit Hours | | | | | 142 |

## 11.7 Computer Engineering Program Progression Plan – Jan 2022 (Class of 2026)

| Semester | Computer Engineering | Theory (Lecture Hours) | Practice (Lab/ Discuss) | Credit Hours | Semester Credit Hours |
|---|---|---|---|---|---|
| **Year 1** | | | | | |
| **September Semester** | Ashesi Success + Leadership 1* | 1.5 | 0 | 2 | |
| | Introduction to Engineering | 3 | 2 | 4 | |
| | Calculus for Engineering | 3 | 2 | 4 | |
| | ENGL 112 Written and Oral Communication | 3 | 2 | 4 | |
| | BUSA 161A Foundation of Design & Entrepreneurship 1 | 3 | 1 | 4 | 18 |
| **January Semester** | Computer Programming for Engineering | 3 | 2 | 4 | |
| | SOAN 111 Leadership Seminar 2* | 2 | 0 | 2 | |
| | BUSA 161B Foundation of Design & Entrepreneurship 2 | 3 | 1 | 4 | |
| | Engineering Mechanics | 4.5 | 2 | 4 | |
| | Multivariable Calculus & Linear Algebra | 3 | 2 | 4 | 18 |
| **Year 2** | | | | | |
| **September Semester** | Physics: Electromagnetism | 3 | 2 | 4 | |
| | Discrete Math | 3 | 2 | 4 | |
| | SOAN 211 Leadership Seminar 3* | 1.5 | 0 | 2 | |
| | Statistics for Engineering | 1.5 | 0 | 4 | |
| | Object Oriented Programming (Java) | 3 | 2 | 4 | 18 |
| **January Semester** | ENGL 113 Text and Meaning | 3 | 2 | 4 | |
| | Circuits and Electronics | 3 | 2 | 4 | |
| | Applied Programming for Engineers | 2 | 1 | 2 | |
| | Materials Science & Chemistry | 3 | 2 | 4 | |
| | Differential Equations & Numerical Methods | 3 | 2 | 4 | 18 |
| **Year 3** | | | | | |
| **September Semester** | Computer Organization & Architecture | 3 | 2 | 4 | |
| | System Dynamics | 3 | 2 | 4 | |
| | Signals & Systems | 3 | 2 | 4 | |
| | Instrumentation for Engineering* | 2 | 1 | 2 | |
| | SOAN 411 Leadership Seminar 4 for Eng + Yr3 Group Proj & Seminar | 4.5 | 1 | 4 | 18 |
| **January Semester** | Control Systems | 3 | 2 | 4 | |
| | Data Structures & Algorithms | 3 | 2 | 4 | |
| | Elective† | 3 | 2 | 4 | |
| | Networks & Data Communications | 3 | 2 | 4 | |
| | Digital Systems Design | 3 | 2 | 4 | 20 |
| **Year 4** | | | | | |
| **September Semester** | Operating Systems | 3 | 2 | 4 | |
| | Principles of Economics | 3 | 2 | 4 | |
| | Elective† | 3 | 2 | 4 | |
| | Embedded Systems | 3 | 2 | 4 | |
| | Elective† | 3 | 2 | 4 | 20 |
| **January Semester** | Project Management and Professional Practice | 3 | 2 | 4 | |
| | Elective† | 3 | 2 | 4 | |
| | African Studies Elective | 3 | 2 | 4 | |
| | Applied Project | 1.5 | 6 | 4 | 16 |
| **Total Credit Hours** | | | | | **146** |

## 11.8 Electrical and Electronic Engineering Program Progression Plan - Jan 2022 (Class of 2026)

| Semester | Electrical and Electronic Engineering | Theory (Lecture Hours) | Practice (Lab/ Discuss) | Credit Hours | Semester Credit Hours |
|---|---|---|---|---|---|
| **Year 1** | | | | | |
| **September Semester** | Ashesi Success + Leadership 1* | 1.5 | 0 | 2 | |
| | Introduction to Engineering | 3 | 2 | 4 | |
| | Calculus for Engineering | 3 | 2 | 4 | |
| | ENGL 112 Written and Oral Communication | 3 | 2 | 4 | |
| | BUSA 161A Foundation of Design & Entrepreneurship 1 | 3 | 1 | 4 | 18 |
| **January Semester** | Computer Programming for Engineering | 3 | 2 | 4 | |
| | SOAN 111 Leadership Seminar 2* | 2 | 0 | 2 | |
| | BUSA 161B Foundation of Design & Entrepreneurship 2 | 3 | 1 | 4 | |
| | Engineering Mechanics | 4.5 | 2 | 4 | |
| | Multivariable Calculus & Linear Algebra | 3 | 2 | 4 | 18 |
| **Year 2** | | | | | |
| **September Semester** | Physics: Electromagnetism | 3 | 2 | 4 | |
| | CAD/CAM | 3 | 2 | 4 | |
| | SOAN 211 Leadership Seminar 3* | 3 | 1 | 2 | |
| | Statistics for Engineering | 1.5 | 0 | 4 | |
| | Thermodynamics | 3 | 2 | 4 | 18 |
| **January Semester** | ENGL 113 Text and Meaning | 3 | 2 | 4 | |
| | Circuits and Electronics | 3 | 2 | 4 | |
| | Applied Programming for Engineers | 2 | 1 | 2 | |
| | Materials Science & Chemistry | 3 | 2 | 4 | |
| | Differential Equations & Numerical Methods | 3 | 2 | 4 | 18 |
| **Year 3** | | | | | |
| **September Semester** | Electrical Machines | 3 | 2 | 4 | |
| | System Dynamics | 3 | 2 | 4 | |
| | Signals & Systems | 3 | 2 | 4 | |
| | Instrumentation for Engineering* | 2 | 1 | 2 | |
| | SOAN 411 Leadership Seminar 4 for Eng + Yr3 Group Proj & Seminar | 4.5 | 1 | 4 | 18 |
| **January Semester** | Control Systems | 3 | 2 | 4 | |
| | Communication Systems | 3 | 2 | 4 | |
| | Elective† | 3 | 2 | 4 | |
| | Electrical Machines & Power Electronics II | 3 | 2 | 4 | |
| | Digital Systems Design | 3 | 2 | 4 | 20 |
| **Year 4** | | | | | |
| **September Semester** | Power Engineering | 3 | 2 | 4 | |
| | Principles of Economics | 3 | 2 | 4 | |
| | Elective† | 3 | 2 | 4 | |
| | Embedded Systems | 3 | 2 | 4 | |
| | Elective† | 3 | 2 | 4 | 20 |
| **January Semester** | Elective† | 3 | 2 | 4 | |
| | Project Management and Professional Practice | 3 | 2 | 4 | |
| | African Studies Elective | 3 | 2 | 4 | |
| | Applied Project | 1.5 | 6 | 4 | 16 |
| **Total Credit Hours** | | | | | **146** |

## 11.9 Mechanical Engineering Program Progression Plan - Jan 2022 (Class of 2026)

| Semester | Mechanical Engineering | Theory (Lecture Hours) | Practice (Lab/ Discuss) | Credit Hours | Semester Credit Hours |
|---|---|---|---|---|---|
| **Year 1** | | | | | |
| September Semester | Ashesi Success + Leadership 1* | 1.5 | 0 | 2 | |
| | Introduction to Engineering | 3 | 2 | 4 | |
| | Calculus for Engineering | 3 | 2 | 4 | |
| | ENGL 112 Written and Oral Communication | 3 | 2 | 4 | |
| | BUSA 161A Foundation of Design & Entrepreneurship 1 | 3 | 1 | 4 | 18 |
| January Semester | Computer Programming for Engineering | 3 | 1 | 4 | |
| | SOAN 111 Leadership Seminar 2* | 2 | 0 | 2 | |
| | BUSA 161B Foundation of Design & Entrepreneurship 2 | 3 | 1 | 4 | |
| | Engineering Mechanics | 4.5 | 2 | 4 | |
| | Multivariable Calculus & Linear Algebra | 3 | 2 | 4 | 18 |
| **Year 2** | | | | | |
| September Semester | Physics: Electromagnetism | 3 | 2 | 4 | |
| | CAD/CAM | 3 | 2 | 4 | |
| | SOAN 211 Leadership Seminar 3* | 1.5 | 2 | 2 | |
| | Statistics for Engineering | 3 | 2 | 4 | |
| | Thermodynamics | 3 | 2 | 4 | 18 |
| January Semester | ENGL 113 Text and Meaning | 3 | 2 | 4 | |
| | Circuits and Electronics | 3 | 2 | 4 | |
| | Applied Programming for Engineers* | 2 | 1 | 2 | |
| | Materials Science & Chemistry | 3 | 2 | 4 | |
| | Differential Equations & Numerical Methods | 3 | 2 | 4 | 18 |
| **Year 3** | | | | | |
| September Semester | Electrical Machines | 3 | 2 | 4 | |
| | System Dynamics | 3 | 2 | 4 | |
| | Mechanics of Materials | 3 | 1 | 4 | |
| | Instrumentation for Engineering* | 2 | 1 | 2 | |
| | SOAN 411 Leadership Seminar 4 for Eng + Yr3 Group Proj & Seminar | 2 | 1 | 4 | 18 |
| January Semester | Control Systems | 3 | 2 | 4 | |
| | Manufacturing Processes | 3 | 2 | 4 | |
| | Elective† | 3 | 2 | 4 | |
| | Mechanical Machine Design | 3 | 2 | 4 | |
| | Fluid Mechanics | 3 | 2 | 4 | 20 |
| **Year 4** | | | | | |
| September Semester | Mechanics of Machines | 3 | 2 | 4 | |
| | Principles of Economics | 3 | 2 | 4 | |
| | Elective† | 3 | 2 | 4 | |
| | Heat Transfer | 3.5 | 1.5 | 4 | |
| | Elective† | 1.5 | 1.5 | 4 | 20 |
| January Semester | Elective† | 3 | 2 | 4 | |
| | Project Management and Professional Practice | 3 | 2 | 4 | |
| | African Studies Elective | 3 | 2 | 4 | |
| | Applied Project | 1.5 | 6 | 4 | 16 |
| **Total Credit Hours** | | | | | **146** |

## 11.10 Mechatronics Program Progression Plan - Jan 2024 (Class of 2027)

| Semester | Mechatronics | Theory (Lecture Hours) | Practice (Lab/ Discuss) | Credit Hours | Semester Credit Hours |
|---|---|---|---|---|---|
| **Year 1** | | | | | |
| **September Semester** | Ashesi Success | 1.5 | 0 | 2 | |
| | ENGR 112 Introduction to Engineering | 3 | 2 | 4 | |
| | MATH 161 Engineering Calculus | 3 | 2 | 4 | |
| | ENGL 112 Written and Oral Communication | 3 | 2 | 4 | |
| | BUSA 161 Foundation of Design Thinking & Entrepreneurship 1 | 3 | 2 | 4 | 18 |
| **January Semester** | CS 112 Computer Programming for Engineering | 3 | 2 | 4 | |
| | SOAN 111 Leadership Seminar 1* | 1.5 | 0 | 2 | |
| | BUSA 162 Foundation of Design Thinking & Entrepreneurship 2 | 3 | 2 | 4 | |
| | ME 101 Physics: Mechanics | 3 | 2 | 4 | |
| | MATH 211 Multivariable Calculus & Linear Algebra | 3 | 2 | 4 | 18 |
| **Year 2** | | | | | |
| **September Semester** | SC 113 Physics: Electromagnetism | 3 | 2 | 4 | |
| | MATH 152 Statistics for Engineering | 3 | 2 | 4 | |
| | SOAN 211 Leadership Seminar 2* | 1.5 | 0 | 2 | |
| | CS 453 Robotics | 3 | 2 | 4 | |
| | ME 442 CAD/CAM | 3 | 2 | 4 | 18 |
| | ENGL 113 Text and Meaning | 3 | 2 | 4 | |
| **January Semester** | SOAN 311 Leadership Seminar 3* | 3 | 1 | 4 | |
| | EE 222 Circuits and Electronics | 3 | 1 | 4 | |
| | CE 122 Applied Programming for Engineers | 1.5 | 1 | 2 | |
| | MATH 211 Differential Equations & Numerical Methods | 3 | 2 | 4 | 18 |
| **Year 3** | | | | | |
| **September Semester** | Electrical Machines | 3 | 2 | 4 | |
| | System Dynamics | 3 | 2 | 4 | |
| | Signals and Systems | 3 | 2 | 4 | |
| | Instrumentation for Engineering* | 1.5 | 1.5 | 2 | |
| | SOAN 411 Leadership Seminar 4 for Eng + Yr3 Group Proj & Seminar | 3 | 2 | 4 | 18 |
| **January Semester** | ENGR 312 Control Systems | 3 | 2 | 4 | |
| | CE 322 Digital Systems Design | 3 | 2 | 4 | |
| | Elective† | 3 | 2 | 4 | |
| | ME 301 Mechanical Machine Design | 3 | 2 | 4 | |
| | EE Elective | 3 | 2 | 4 | 20 |
| **Year 4** | | | | | |
| **September Semester** | ENGR 442 Mechatronics | 3 | 2 | 4 | |
| | Principles of Economics | 3 | 2 | 4 | |
| | MT Elective† | 3 | 2 | 4 | |
| | CE 451 Embedded Systems | 3 | 2 | 4 | |
| | Signal & Systems | 3 | 2 | 4 | 20 |
| | ENGR 442 Mechatronics | 3 | 2 | 4 | |
| **January Semester** | Elective† | 3 | 2 | 4 | |
| | Project Management and Professional Practice | 3 | 2 | 4 | |
| | African Studies Elective | 3 | 2 | 4 | |
| | ENGR 401 Senior Project and Seminar | 1.5 | 6 | 4 | 16 |
| | Total Credit Hours | | | | 146 |

## 11.11 Bioengineering Program Progression Plan - Jan 2024 (Class of 2027)

| Semester | Mechatronics | Theory (Lecture Hours) | Practice (Lab/ Discuss) | Credit Hours | Semester Credit Hours |
|---|---|---|---|---|---|
| **Year 1** | | | | | |
| **September Semester** | Ashesi Success + Leadership 1* | 1.5 | 0 | 2 | |
| | Introduction to Engineering | 3 | 2 | 4 | |
| | Calculus for Engineering | 3 | 2 | 4 | |
| | ENGL 112 Written and Oral Communication | 3 | 2 | 4 | |
| | BUSA 161A Foundation of Design & Entrepreneurship 1 | 3 | 1 | 4 | 18 |
| **January Semester** | Computer Programming for Engineering | 3 | 2 | 4 | |
| | SOAN 111 Leadership Seminar 2* | 2 | 0 | 2 | |
| | BUSA 161B Foundation of Design & Entrepreneurship 2 | 3 | 1 | 4 | |
| | Engineering Mechanics | 4.5 | 2 | 4 | |
| | Multivariable Calculus & Linear Algebra | 3 | 2 | 4 | 18 |
| **Year 2** | | | | | |
| **September Semester** | Physics: Electromagnetism | 3 | 2 | 4 | |
| | Molecular and Cell Biology | 3 | 2 | 4 | |
| | Statistics for Engineering | 1.5 | 0 | 2 | |
| | General Chemistry | 3 | 2 | 4 | |
| | Leadership Seminar 3* | 3 | 1 | 4 | 18 |
| **January Semester** | ENGL 113 Text and Meaning | 3 | 2 | 4 | |
| | Anatomy and Physiology for Engineers | 3 | 2 | 4 | |
| | Circuits and Electronics | 3 | 2 | 4 | |
| | Applied Programming for Engineers* | 2 | 1 | 2 | |
| | Differential Equations & Numerical Methods | 3 | 2 | 4 | 18 |
| **Year 3** | | | | | |
| **September Semester** | Modelling in Biological Engineering | 3 | 2 | 4 | |
| | System Dynamics | 3 | 2 | 4 | |
| | Biochemistry | 3 | 2 | 4 | |
| | Instrumentation for Engineering* | 2 | 1 | 2 | |
| | SOAN 411 Leadership Seminar 4 for Eng + | 3 | 2 | 4 | |
| | Yr3 Group Project & Seminar | 2 | 1 | 2 | 20 |
| **January Semester** | Transport Phenomena in Biological Systems | 3 | 2 | 4 | |
| | Synthetic Biological Engineering | 3 | 2 | 4 | |
| | Cellular and Tissue Biomechanics | 3 | 2 | 4 | |
| | Biomaterials | 3 | 2 | 4 | |
| | BioE Electives | 3 | 2 | 4 | 20 |
| **Year 4** | | | | | |
| **September Semester** | Systems Biology | 3 | 2 | 4 | |
| | BioE Elective | 3 | 2 | 4 | |
| | Principles of Economics | 3 | 2 | 4 | |
| | Science communication and Public Engagement | 3 | 2 | 4 | |
| | Non-Major Elective | 3 | 2 | 4 | 20 |
| **January Semester** | BioE Elective | 3 | 2 | 4 | |
| | Project Management and Professional Practice | 3 | 2 | 4 | |
| | African Studies Elective | 3 | 2 | 4 | |
| | Senior Project and Seminar | 1.5 | 6 | 4 | 16 |
| Total Credit Hours | | | | | 148 |

ASHESI

# 2025/2026