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| **Adama Science and Technology University** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | School: **Electrical Engineering and Computing** | | | | | | | | | | | | | | | | | | | Department: **Computer Science and Engineering** | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | Course Category | | | | | | | Basic Mandatory | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Course Name | | | | | | | **Introduction to Emerging Technologies** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Course Code: | | | | | | | CSEg1104 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | Synopsis: | | | | | | | This course will enable students to explore current breakthrough technologies in the areas of Artificial Intelligence, Internet of Things and Augmented Reality, Data Science and other technologies that have emerged over the past few years. Besides helping learners become literate in emerging technologies, the course will prepare them to use technology in their respective professional preparations. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | Name(s) of Academic Staff: | | | | | | |  | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | Semester and Year offered: | | | | | | | Semester: | | | | | | | | | | | I | | | | | | | | Year: | | | | | I | | | | | |  | | | | | | |
| 6 | Credit Hour: | | | | | | | 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | Prerequisite/ Co-requisite: (if any) | | | | | | | None | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | Course Learning Outcome ( CLO): At the end of the course the student will be able to do: | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CLO1 | | Identify different emerging technologies | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CLO2 | | Recognize various emerging technologies and tools. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CLO3 | | Discuss ethical and professional issues of emerging technologies | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CLO4 | | Differentiate different emerging technologies. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | Mapping of the course Learning Outcomes to the program Learning Outcomes, Teaching Methods and Assessment: | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Course Learning Outcomes (CLO) | | | | | Program Learning Outcomes (PO) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PO1 | PO2 | | PO3 | PO4 | | | PO5 | | | | | PO6 | | | | PO7 | | | | PO8 | | | Teaching Methods | | | | | | | | Assessment | | | | | | | |
| Test | | Quiz | | Assignment | | Mid | Final |
| L | | T | | | P | O | |
| CLO1 | | | | | √ |  | |  |  | | |  | | | | |  | | | |  | | | |  | | | √ | |  | | |  | √ | | √ | |  | | √ | | 🗸 | 🗸 |
| CLO2 | | | | | √ |  | |  |  | | |  | | | | |  | | | |  | | | |  | | | √ | |  | | |  | √ | |  | | √ | |  | | √ | 🗸 |
| CLO3 | | | | |  |  | |  |  | | |  | | | | | √ | | | |  | | | |  | | | √ | |  | | |  | √ | | √ | |  | | √ | | 🗸 | 🗸 |
| CLO4 | | | | | √ |  | |  |  | | |  | | | | |  | | | |  | | | |  | | | √ | |  | | |  | √ | | √ | |  | | √ | |  | 🗸 |
| Indicate the relevance between the CLO and PO by ticking “√”on the appropriate relevant box | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | Transferable Skills (if applicable)  (Skills learned in the course of study which can be useful and utilized in other settings) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | | | |  | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | | | |  | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3…etc. | | | |  | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11 | | Distribution of Student Learning Time (SLT) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Course Content Outline | | | | | | | | | CLO | | | | Teaching and Learning Activities | | | | | | | | | | | | | | | | | | | | | | | | | | | Total (SLT) | | |
| Guided learning (F2F) | | | | | | | | | | | | | Guided Learning (NF2F) | | | | | | | | Independent Learning (NF2F) | | | | | |
| L | | | | | | T | | P | | O | | |  | | | | | | | |  | | | | | |  | | |
| **Chapter 1: Introduction to Emerging Technologies** | | | | | | | | | CLO1 | | | |  | | | | | |  | |  | |  | | |  | | | | | | | |  | | | | | | 9hr | | |
| Evolution of technologies  Introduction to Industrial revolution   * + Historical background (IR 1.0, IR 2.0, IR 3.0)   + Fourth industrial revolution (IR 4.0) | | | | | | | | |  | | | | | |  | |  | |  | | |  | | | | | | | |  | | | | | |
| Role of data for Emerging technologies | | | | | | | | |  | | | | | |  | |  | |  | | |  | | | | | | | |  | | | | | |
| Enabling devices and networks for emerging technologies (programmable devices) | | | | | | | | |  | | | | | |  | |  | |  | | |  | | | | | | | |  | | | | | |
| Human to Machine Interaction | | | | | | | | |  | | | |  | | | | | |  | |  | |  | | |  | | | | | | | |  | | | | | |
| Future trends in emerging technologies | | | | | | | | |  | | | | | |  | |  | |  | | |  | | | | | | | |  | | | | | |
| **Chapter 2 : Introduction to Data Science** | | | | | | | | | CLO2 | | | |  | | | | | |  | |  | |  | | |  | | | | | | | |  | | | | | | 9hr | | |
| Overview for Data Science   * Definition of data and information * Data types and representation | | | | | | | | |  | | | | | |  | |  | |  | | |  | | | | | | | |  | | | | | |
| Data Value Chain   * Data Acquisition * Data Analysis * Data Curating * Data Storage * Data Usage | | | | | | | | |  | | | | | |  | |  | |  | | |  | | | | | | | |  | | | | | |
| * 1. Basic concepts of Big data | | | | | | | | |  | | | | | |  | |  | |  | | |  | | | | | | | |  | | | | | |
| **Chapter 3: Artificial Intelligence(AI)** | | | | | | | | | CLO2 | | | |  | | | | | |  | |  | |  | | |  | | | | | | | |  | | | | | | 10hr | | |
| * 1. Introduction to AI * What is AI * History of AI * Levels of AI * Types of AI | | | | | | | | |  | | | | | |  | |  | |  | | |  | | | | | | | |  | | | | | |
| * 1. Applications of AI * Agriculture * Health * Business (Emerging market) * Education | | | | | | | | |  | | | | | |  | |  | |  | | |  | | | | | | | |  | | | | | |
| * 1. AI tools and platforms (eg: scratch/object tracking) | | | | | | | | |  | | | | | |  | |  | |  | | |  | | | | | | | |  | | | | | |
| * 1. Sample application with hands on activity (simulation based) | | | | | | | | |  | | | | | |  | |  | |  | | |  | | | | | | | |
| **Chapter 4: Internet of Things(IoT)** | | | | | | | | | CLO2 | | | |  | | | | | |  | |  | |  | | |  | | | | | | | |  | | | | | | 9hr | | |
| * 1. Overview of IOT * What is IOT? * History of IOT * Advantages of IOT * Challenges of IOT | | | | | | | | |  | | | | | |  | |  | |  | | |  | | | | | | | |  | | | | | |
| * 1. How IOT works * Architecture of IOT * Devices and network | | | | | | | | |  | | | | | |  | |  | |  | | |  | | | | | | | |  | | | | | |
| * 1. Applications of IOT * Smart home * Smart grid * Smart city * Wearable devices * Smart farming | | | | | | | | |  | | | | | |  | |  | |  | | |  | | | | | | | |  | | | | | |
| * 1. IOT tools and platforms (eg: KAA IoT /Device Hive/Zetta/Things Board…) | | | | | | | | |  | | | |  | | | | | |  | |  | |  | | |  | | | | | | | |  | | | | | |
| * 1. Sample application with hands on activity (eg IOT based smart farming) | | | | | | | | |  | | | | | |  | |  | |  | | |  | | | | | | | |  | | | | | |
| **Chapter 5: Augmented Reality (AR)** | | | | | | | | | CLO2 | | | |  | | | | | |  | |  | |  | | |  | | | | | | | |  | | | | | | 10hr | | |
| * 1. Introduction to AR | | | | | | | | |  | | | | | |  | |  | |  | | |  | | | | | | | |  | | | | | |
| * 1. Virtual reality (VR) , Augmented Reality(AR) vs mixed reality (MR) | | | | | | | | |  | | | | | |  | |  | |  | | |  | | | | | | | |  | | | | | |
| * 1. Architecture of AR systems. | | | | | | | | |  | | | | | |  | |  | |  | | |  | | | | | | | |  | | | | | |
| * 1. Application of AR systems (education, medical, assistance, entertainment) workshop oriented hands demo | | | | | | | | |  | | | | | |  | |  | |  | | |  | | | | | | | |  | | | | | |
| **Chapter 6 :Ethics and professionalism of emerging technologies** | | | | | | | | | CLO3 | | | |  | | | | | |  | |  | |  | | |  | | | | | | | |  | | | | | | 6hr | | |
| * 1. Technology and ethics | | | | | | | | |  | | | | | |  | |  | |  | | |  | | | | | | | |  | | | | | |
| * 1. Digital privacy | | | | | | | | |  | | | | | |  | |  | |  | | |  | | | | | | | |  | | | | | |
| * 1. Accountability and trust   2. Treats and challenges | | | | | | | | |  | | | | | |  | |  | |  | | |  | | | | | | | |  | | | | | |
| **Chapter 7 Other emerging technologies** | | | | | | | | | CLO4 | | | |  | | | | | |  | |  | |  | | |  | | | | | | | |  | | | | | | 15hr | | |
| * 1. Nanotechnology | | | | | | | | |  | | | | | |  | |  | |  | | |  | | | | | | | |  | | | | | |
| * 1. Biotechnology | | | | | | | | |  | | | | | |  | |  | |  | | |  | | | | | | | |  | | | | | |
| * 1. Block chain technology | | | | | | | | |  | | | | | |  | |  | |  | | |  | | | | | | | |  | | | | | |
| * 1. Cloud and quantum computing | | | | | | | | |  | | | | | |  | |  | |  | | |  | | | | | | | |  | | | | | |
| * 1. Autonomic computing | | | | | | | | |  | | | | | |  | |  | |  | | |  | | | | | | | |  | | | | | |
| * 1. Computer vision | | | | | | | | |  | | | | | |  | |  | |  | | |  | | | | | | | |  | | | | | |
| * 1. Embedded systems | | | | | | | | |  | | | | | |  | |  | |  | | |  | | | | | | | |  | | | | | |
| * 1. Cyber security | | | | | | | | |  | | | | | |  | |  | |  | | |  | | | | | | | |  | | | | | |
| * 1. Additive manufacturing (3D Printing) | | | | | | | | |  | | | |  | | | | | |  | |  | |  | | |  | | | | | | | |  | | | | | |
| Total | | | | | | | | |  | | | |  | | | | | |  | |  | |  | | |  | | | | | 68hr | | | | | | | | | | | |
| **Assessment** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Continuous Assessment | | | | | | | | | | | | | | | % Total-60(%) | | | | | | | F2F | | | | | | NF2F | | | | | | | | | | SLT | | | | |
| 1 | | **Assignment I** | | | | | | | | | | | | | (10%) | | | | | | | 2hr | | | | | | 6hr | | | | | | | | | | 8hr | | | | |
| 2 | | **Assignment II** | | | | | | | | | | | | | (10%) | | | | | | | 2hr | | | | | | 6hr | | | | | | | | | | 8hr | | | | |
| 4 | | **Test** | | | | | | | | | | | | | (10%) | | | | | | | 1hr | | | | | | 6hr | | | | | | | | | | 7hr | | | | |
| 5 | | **Quiz** | | | | | | | | | | | | | 5% | | | | | | | 1hr | | | | | | 3hr | | | | | | | | | | 4hr | | | | |
| 6 | | **Mid Exam** | | | | | | | | | | | | | 25% | | | | | | | 2hr | | | | | | 8hr | | | | | | | | | | 10hr | | | | |
| **Total** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | **37hr** | | | | |
| Final Exam | | | | | | | | | | | | | | Percentage 50 (%) | | | | | | | | F2F | | | | | | NF2F | | | | | | | | | | SLT | | | | |
| **Final Exam** | | | | | | | | | | | | | | 40% | | | | | | | | 3hr | | | | | | 12hr | | | | | | | | | | 15hr | | | | |
| **Grand Total SLT** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | **120hr** | | | | |
|  | L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non Face to Face  Note: indicates the CLO based on the CLO’s numbering in item 9. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room …etc.) | | | | | | | | | | | 1 | | Choose an item. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | | Choose an item. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | | Choose an item. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | | Choose an item. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | | Choose an item. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 13 | Text book and reference:  (note: ensure the latest edition /publication) | | | | | | | | | | | 1 | | * Follett, J. (2014). Designing for Emerging Technologies: UX for Genomics, Robotics, and the Internet of Things: O'Reilly Media. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | | * Jung, T., &Dieck, M. C. t. (Eds.). (2018). Augmented Reality and Virtual Reality: Empowering Human, Place and Business | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |