#### Course Title: Bio-System Modeling and Simulation

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| **University** | **Benha** |
| **Faculty** | **Faculty of Agriculture** |
| **COURSE SPECIFICATIONS:** | |
| Program on which the course is given | Agric. Biotechnology |
| Major or Minor element of Program |  |
| Departments offering the Program |  |
| Department offering the course | Agric. And Biosystems Engineering |
| Academic year / Level | Level1/2nd semester |
| Date of specification approval |  |

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| **A- BASIC INFORMATION** | |
| Title | **Bio-System System Modeling and Simulation** |
| Code | AE1103 |
| Credit Hours | 28 |
| Lecture | 2 Hours / week |
| Practical | 2 Hours / week |
| Total: | 28 Hours |

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| **B- PROFESSIONAL INFORMATION** |
| **1 – OVERALL AIMS OF COURSE** |
| Students will be taught basic concepts of system-analysis, modeling and computer simulation of agricultural and biological systems. Emphasis are on continuous simulation of dynamic models with examples that give students a broad exposure to dynamic models and biological systems applications. |

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| **2 – Intended Learning Outcomes of Course (ILOs)** |
| **A. Knowledge and Understanding:** |
| ***By the end of the course, students should:***   * Defining the systems and bio-systems, modelling and simulation. * Understanding the role modelling in bio-systems and its applications. * Knowing the models types and its applications |

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| B. Intellectual Skills: |
| ***Successful completion of this course will allow students to:***   * Solving the problems for the agriculture and Biosystems with modelling and simulation. * Understanding the differences between modeling and simulation. * Comparing between models types and its applications |

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| C. Professional and Practical Skills: |
| * Analysis of agriculture and Biosystems parameters. * Using modelling and simulation in solving biological systems. * Implementation of simulation tools with computer. |

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| D. General and Transferable Skills: |
| * Working in teams for solving agricultural and biosystems problems. * Using modern tools and applications in parameters analysis. |

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| 3. CONTENTS | | | |
| **Topic** | **No. of hours** | **Lectures** | **Practical** |
| Introduction to systems and their types, analysis, models and kinds, Statistical and mechanistic models. | 4 | 2 | 2 |
| Controllable and non-controllable variables. | 4 | 2 | 2 |
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| Parameters and model construction methodologies, | 6 | 3 | 3 |
| verification, and validation | 4 | 2 | 2 |
| model experimentation | 4 | 2 | 2 |
| Examples of biological models; crop, livestock, food safety and machinery. | 6 | 3 | 3 |
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| 4. TEACHING AND LEARNING METHODS |
| 1. The main subject areas are covered in the lectures (see syllabus Plan). 2. Several student seminar sessions give the opportunity for students to bring questions or discuss any aspects of the course with the tutor. 3. Students are given a topic to research in small groups which they report as an oral presentation. Collective feedback on the strengths and weaknesses of the presentations are provided. |

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| 5. STUDENT ASSESSMENT METHODS |
| ***Students will be evaluated by attendance, fulfillment and effort in exercises and presentations, and examination grades:***  1) practical exercises: to assess the ability of students to understand and perform small system analysis using the modeling and simulation techniques. |

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| 6. ASSESSMENT SCHEDULE | | |
| No | Assessment | **Week** |
| 1 | Periodical exam | 3, 7 |
| 2 | Practical exam | 12 |
| 3 | Oral exam | 13 |
| 4 | Final exam | 14 |

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| 7. WEIGHTING OF ASSESSMENT | | |
| No | Assessment | **%** |
| 1 | Periodical exam | 15% |
| 2 | Practical exam | 15% |
| 3 | Oral exam | 10 % |
| 4 | Final exam | 60 % |
| TOTAL | | 100 % |

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| 8. LIST OF REFERENCES |
| 1. **France, J. and Thornley, J.H.M.1984.** Mathematical Models in Agriculture. Centre for Agricultural Biosciences International (CABI), Oxford.UK.   <http://books.google.de/books?id=rlwBCRSHobcC&pg=PA1&dq=Mathematical+Models+in+Agriculture.&hl=en&sa=X&ei=PvQAU5KeOcLp4gTKqIGoAQ&ved=0CC4Q6AEwAA#v=onepage&q=Mathematical%20Models%20in%20Agriculture.&f=false>   1. **Dent, J. B. and Blackie, M. J. 1979.** Systems Simulation in Agriculture. Centre for Agricultural Biosciences International (CABI), Oxford.UK. |

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| 9. FACILITIES REQUIRED FOR TEACHING AND LEARNING |
| 1. boards – overhead projector – data-show projector – stationary.. etc. 2. Teaching room/hall. 3. Computers. |

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| **Course Coordinators:** | **Prof. Dr. Zakaria A. El Haddad**  **Prof. Dr. Samir A. Ali** |
| **Date: / / 2015** | |