# COURSE DESCRIPTION FORM

**INSTITUTION** National University of Computer and Emerging Sciences (NUCES-FAST)

**PROGRAM (S) TO BE EVALUATED** BS (CS)

## A. Course Description

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|---|---|
| **Course Code** | AI4XXX |
| **Course Title** | Applied Recommender System |
| **Credit Hours** | 3+0 |
| **Prerequisites by Course(s) and Topics** | - |
| **Assessment Instruments with Weights** (homework, quizzes, midterms, final, programming assignments, lab work, etc.) | Midterm I: 15 marks<br>Midterm II: 15 marks<br>Course Project: 10 marks<br>Assignments: 10 marks<br>Finals: 50 marks |
| **Course Coordinator** | Syed Zain Ul Hassan |
| **URL (if any)** | - |
| **Current Catalog Description** | - |
| **Textbook** (or **Laboratory Manual** for Laboratory Courses) | *Recommender systems handbook*, by F. Ricci, L Rokach, B. Shapira and P.B. Kantor, (Springer) |
| **Reference Material** | To be provided in the form of slides and tutorials.<br><br>**Resources link:** TBA |

| Course Goals | | |
|---|---|---|
| | **A. Course Learning Outcomes (CLOs)** | |

1. *Describe different techniques in making automatic personalized recommendations in various scenarios*
   **[Bloom's Taxonomy Level:** 3**, Learning Domain:** Cognitive**]**

2. *Solve mathematical optimization problems pertaining to recommender systems*
   **[Bloom's Taxonomy Level:** 3**, Learning Domain:** Cognitive**]**

3. *Discuss how a recommender system should be evaluated in terms of the system's performance and the user's satisfaction with the system*
   **[Bloom's Taxonomy Level:** 6**, Learning Domain:** Cognitive**]**

4. *Learn about advanced topics and current applications of recommender systems in realms like social networks and communities*
   **[Bloom's Taxonomy Level:** 6**, Learning Domain:** Cognitive**]**

| **B.  Program Learning Outcomes** | | |
|---|---|---|
| **1. Computing Knowledge** | Apply knowledge of mathematics, natural sciences, computing fundamentals, and a computing specialization to the solution of complex computing problems. | CLO-1 |
| **2. Problem Analysis** | Identify, formulate, research literature, and analyze complex computing problems, reaching substantiated conclusions using first principles of mathematics, natural sciences, and computing sciences. | CLO-2 |
| **3.Design/Develop Solutions** | Design solutions for complex computing problems and design systems, components, and processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations. | CLO-3 |
| **4. Investigation & Experimentation** | Conduct investigation of complex computing problems using research based knowledge and research based methods | CLO-4 |

| C. | Relation between CLOs and PLOs | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (CLO: Course Learning Outcome, PLOs: Program Learning Outcomes) | | | | | | | | | | | | | |

|  |  | **PLOs** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** |
| **C L O s** | 1 | ✓ |  |  |  |  |  |  |  |  |  |  |  |
|  | 2 |  | ✓ |  |  |  |  |  |  |  |  |  |  |
|  | 3 |  |  | ✓ |  |  |  |  |  |  |  |  |  |
|  | 4 |  |  |  | ✓ |  |  |  |  |  |  |  |  |

**Topics Covered in the Course, with Number of Lectures on Each Topic** (assume 15-week instruction and one-hour lectures)

**1. Topics to be covered:**

| List of Topics | No. of Weeks | Contact Hours | CLO |
|---|---|---|---|
| Introduction to Recommender System (RS), goals, applications and taxonomy of RS techniques | 1 | 3 | 1 |
| Recommendations using Collaborative Filtering, types of ranking, cold start problem and serendipity | 1 | 3 | 1 |
| Neighborhood based methods, similarity measures | 1 | 3 | 1 |
| Long-tail principle and curse of dimensionality | 1 | 3 | 2 |
| Rule-based and Naïve Bayes CF | 1 | 3 | 1 |
| **Mid-term I** | | | |
| Introduction and basic components of Content-based recommendation system | 1 | 4 | 1 |
| Content-based Filtering | 2 | 6 | 2 |
| Content-based vs CF recommendations | 1 | 3 | 1 |
| **Mid-term II** | | | |
| Knowledge-based recommendations, Constraint-based and case-based recommendation system | 1 | 3 | 1 |
| Matrix Factorization | 1 | 3 | 3 |
| Neural Recommender Systems | 1 | 3 | 4 |
| Generative Recommendations | 1 | 3 | 4 |

| | Evaluation measures for recommendation systems and performance issues | 1 | 3 | 3 | |
|---|---|---|---|---|---|
| | **Final Exam** | | | | |
| | **Total** | 14 | 43 | | |

| **Laboratory Projects/Experiments Done in the Course** | The lab work to be done in the course include hands-on exercises for the following topics: <br> • Simple CF Recommender System for products recommendation <br> • Feature selection <br> • Social media recommendation <br><br> One group project will be submitted by the students in the penultimate week of the semester. |
|---|---|
| **Programming Assignments Done in the Course** | Assignments related to collaborative filtering, similarity measures, knowledge-based recommendations and evaluation techniques |

| **Class Time Spent on** (in credit hours) | **Theory** | **Problem Analysis** | **Solution Design** | **Social and Ethical Issues** |
|---|---|---|---|---|
| | 15 | 15 | 13 | 0 |

| **Oral and Written Communications** | A project report detailing the problem, tools, methods used in the course project to be submitted by every student. |
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**Instructor Name:** Syed Zain Ul Hassan

**Instructor Signature:** _____

**Dated:** 31st January 2023