1. **Course Number and Course Title:**

   CMP 494-12 – Intelligent Recommendation Systems

2. **Credit Hours:**

   3 – 0 – 3

3. **Prerequisites and/or Co-Requisites:**

   Prerequisites: CMP 305 (Data Structures and Algorithms), MTH 221 (Linear Algebra), and STA 201 or STA 202 or QBA 201 or NGN 211.

4. **Name and Contact Information of Instructor:**

   Name: Dr. Alex Aklson
   Office: ESB 2172
   Email: aaklson@aus.edu
   Phone: (06) 515-4893
   Office Hours: As posted on iLearn or by appointment

5. **Course Description (Catalog Description):**

   Introduces the principles of recommendation systems, covering both theoretical foundations and practical implementations. Covers user-based, item-based, content-based, collaborative filtering, singular value decomposition (SVD) and matrix factorization algorithms. Explores explicit and implicit feedback mechanisms. Involves project-based applications of recommendation algorithms to diverse datasets and real-world scenarios.

6. **Textbook and other Supplemental Material:**

   Textbook:
   - C. Aggarwal, *Recommender Systems: The Textbook,* Springer, 2016.

   Other supplemental material:
   - F. Ricci, L. Rokach, B. Shapira, P.B. Kantor, *Recommender Systems Handbook,* 2nd ed., Springer, 2015.
   - T. Drabas, D. Lee, *Learning PySpark,* Apress, 2017.

7. **Course Learning Outcomes:**

   Upon completion of the course, students will be able to:
   1. Explain the fundamental principles of recommendation systems.
   2. Employ non-personalized recommendation techniques.
   3. Implement collaborative filtering and content-based filtering approaches for personalized recommendations.
   4. Apply advanced approaches such as matrix factorization and emerging deep learning methods to build recommendation systems.
   5. Evaluate the performance of various recommendation algorithms.
   6. Demonstrate a real-world recommendation system using industry-standard datasets.

8. **Teaching and Learning Methodologies:**

   Methods include lectures, problem-based learning, class discussions, and group work. Students learning is assessed via quizzes, exams, homework, and a course project.

9. Course Topics and Schedule:

Topic/Activity	Weeks
Introduction to recommendation systems	Week #1
Non-personalized recommendations	Week #2
Personalized recommendations	Week #3
User-based recommendations	Week #4
Item-based recommendations	Week #5
Content-based recommendations	Week #6
Advanced collaborative filtering	Week #7
Matrix factorization methods	Week #8
Hybrid recommendation systems	Week #9
Case studies and evaluation of recommendation systems	Week #10
Fairness, ethics, and responsible use of recommendation systems	Week #11
Scalability and performance considerations; Introduction to PySpark	Week #12
Implementing large-scale recommendations with PySpark	Week #13
Deep learning approaches to recommendation systems	Week #14
Project presentations	Week #15
Final exam	Week #16

10. Schedule of Laboratory and other Non-Lecture Sessions:

Laboratory: none.

Project: Students will work in groups of 3 or more students per group on building a recommendation system using real-world datasets. The project will focus on selected topics such as e-commerce or social media recommendation. Deliverables will include a report and a presentation. Deliverables will include a report and a presentation, both due in Week 15.

11. Out-of-Class Assignments with Due Dates:

Assignment	Due Date (tentative)
Homework 1 – Non-personalized recommendations	Week #3
Homework 2 – Personalized recommendations – collaborative filtering	Week #5
Homework 3 – Personalized recommendations - matrix factorization	Week #10
Homework 4 – Scalability, performance, and large-scale recommendations using PySpark	Week #14

12. Student Evaluation:

Assessment	Weight	Due Date (tentative)
Quizzes	10 %	Quizzes (4)
Homework	10 %	cf. section 11
Course Project	25 %	Week #15
Midterm Exam	25 %	Week #9
Final Exam	30 %	Week #16

13. Assessment Instruments:

Assessment	Course Learning Outcomes
Quizzes	O1–O7
Homework	O1–O7

Course Project	O2–O3, O5–O8
Midterm Exam	O1–O4
Final Exam	O1–O7

14. Contribution of Course to Program Outcomes:

BSCS Program Outcomes	**Emphasis in this course**	**Course Learning Outcomes**
(1) Analyze a complex computing problem and apply principles of computing and other relevant disciplines to identify solutions.	◑	O1–O2
(2) Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.	●	O1–O8
(3) Communicate effectively in a variety of professional contexts.		
(4) Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.		
(5) Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.	○	O8
(6) Apply computer science theory and software development fundamentals to produce computing-based solutions.	◑	O1–O8

Emphasis: ● High; ◑ Medium; ○ Low; Blank – Nothing Specific Expected

BSCoE Program Outcomes	**Emphasis in this course**	**Course Learning Outcomes**
(1) Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	◑	O1–O2
(2) Apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors	●	O1–O8
(3) Communicate effectively with a range of audiences		
(4) Recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts		
(5) Function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	○	O8
(6) Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	◑	O1–O8
(7) Acquire and apply new knowledge as needed, using appropriate learning strategies		

Emphasis: ● High; ◑ Medium; ○ Low; Blank – Nothing Specific Expected

15. Letter Grade Policy:

Total (T)	Letter Grade
$93 \leq T$	A
$90 \leq T < 93$	A-
$85 \leq T < 90$	B+
$80 \leq T < 85$	B
$75 \leq T < 80$	B-
$70 \leq T < 75$	C+
$65 \leq T < 70$	C
$60 \leq T < 65$	C-
$50 \leq T < 60$	D
$T < 50$	F