



# *CSE- 410*

# *Software Development*

## **Lab: 01**

**Fahad Ahmed**

Lecturer, Dept. of CSE

E-mail: [fahadahmed@uap-bd.edu](mailto:fahadahmed@uap-bd.edu)

# Course Synopsis

Students have to develop on **real life oriented projects** that means **solve a complex engineering problem** in this course. Web technologies (ASP. Net, PHP, Ajax, Java Script, Joomla, and so on) and Database (DB2, Oracle, SQL Server, MySQL, and so on) are preferred for the development. **Open Source projects** are also preferred as Open source code is typically created through a collaborative effort in which programmers improve upon the code and share the changes within the community. Moreover, **documentation** is a major concern for the project to ensure the **Software Quality Assurance (SQA)**. Hence at the end of semester **students submit their projects including the documentation.**

Project group  
maximum 3 members\*\*

# Assessment

Assessment Type	% weight
Project Evaluation (Assessment)	70%
❖ Continuous Evaluation in Lab	30%
❖ Presentation	20%
❖ Viva	20%
Report (Doc + Video) and CEP Mapping	30%
<b>Total</b>	<b>100%</b>

# CO-PO

CO No.	CO Statements: Upon successful completion of the course, students should be able to:	Corresponding POs
CO1	Apply the S/W Engineering knowledge to provide a working solution on a real world problem	1-Engineering Knowledge
CO2	Identify, formulate, and analyze a real world problem based on requirement analysis.	2-Problem Analysis
CO3	Design/Develop a working solution on a real world problem using s/w designing tools.	3-Design/ development of solutions
CO4	Use modern development tools which are popular among s/w developers.	5-Modern Tool Usage
CO5	Identify societal, health, safety, legal and cultural issues related to the project.	6-The Engineer and Society

# CO-PO

CO No.	CO Statements: Upon successful completion of the course, students should be able to:	Corresponding POs
CO6	Practice professional ethics and responsibilities and norms of engineering practice.	8-Ethics
CO7	Work as a team and fulfil individual responsibility.	9-Individual and Team work
CO8	Communicate effectively through presentation and write effective reports and documentations on the project.	10-Communication
CO9	Apply project management principles using Version Control System, and produce cost value analysis.	11-Project Management and Finance
CO10	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of requirement changes and introduction of modern development tools	12-Lifelong learning

# Weighting COs with Assessment methods

Assessment Type	% weight	CO1	CO2	CO3	CO4	CO5	CO6	CO7	CO8	CO9	CO10
Presentation	20%		10			5			5		
Report and CEP Mapping	30%		5	5		3	5		2	5	5
Viva	20%					2	5	5	3		5
Continuous Project Evaluation (Assessment)	30%	5		10	5			5		5	
Total	100 %	5	15	15	5	10	10	10	10	10	10

# PO Attainment

Final Year Project

Final Year  
Thesis-Project

Final Year Courses

Third Year Courses

Second Year Courses

First Year Courses



International Engineering Alliance (IEA) consists of 3 educational accords

- Washington Accord (WA) for engineers
- Sydney Accord (SA) for technologists
- Dublin Accord (DA) for Technicians

*According to* **Washington Accord**

- **Knowledge Profile (K)**
- **Level of Problem Solving(P)**
- **Attributes(A)**

# Complex Engineering Problems

## How to Demonstrate through Projects?

- According to the Washington Accord (IEA2015), complex engineering problems are problems that:
    - Cannot be resolved without **in-depth engineering knowledge**.
    - Involve wide-ranging or **conflicting** technical, engineering and other issues.
    - Have **no obvious solution** and require abstract thinking and originality in analysis to formulate suitable models.
    - Involve **infrequently encountered** issues.
    - **Outside problems** encompassed by standards and codes of practice for professional engineering.
    - Involve **diverse groups of stakeholders** with widely varying needs.
    - High level problems including **many component** parts or sub-problems.
- Knowledge Profile (K1 – K8)
  - Complex Problem Solving (P1 – P7)
  - Complex Engineering Activities (A1 – A5)

# Complex Engineering Problems : Knowledge Profile (K)

<b>K – short name</b>
K1 – natural sciences
K2 – mathematics
K3 – engineering fundamentals
K4 – specialist knowledge
K5 – engineering design
K6 – engineering practice
K7 – comprehension
K8 – research literature

# Complex Engineering Problems

Table 4.1: Knowledge Profile

Attribute	
K1	A systematic, theory-based understanding of the natural sciences applicable to the discipline
K2	Conceptually based mathematics, numerical analysis, statistics and the formal aspects of computer and information science to support analysis and modeling applicable to the discipline
K3	A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline
K4	Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline
K5	Knowledge that supports engineering design in a practice area
K6	Knowledge of engineering practice (technology) in the practice areas in the engineering discipline
K7	Comprehension of the role of engineering in society and identified issues in engineering practice in the discipline: ethics and the engineer's professional responsibility to public safety; the impacts of engineering activity; economic, social, cultural, environmental and sustainability
K8	Engagement with selected knowledge in the research literature of the discipline



# Complex Engineering Problem Solving (P)

<b>Attribute</b>	<b>Complex Engineering Problems have characteristic P1 and some or all of P2 to P7:</b>
<b>Depth of knowledge required</b>	<b>P1:</b> Cannot be resolved without in-depth engineering knowledge at the level of one or more of K3, K4, K5, K6 or K8 which allows a fundamentals-based, first principles analytical approach
<b>Range of conflicting requirements</b>	<b>P2:</b> Involve wide-ranging or conflicting technical, engineering and other issues
<b>Depth of analysis required</b>	<b>P3:</b> Have no obvious solution and require abstract thinking, originality in analysis to formulate suitable models
<b>Familiarity of issues</b>	<b>P4:</b> Involve infrequently encountered issues
<b>Extent of applicable codes</b>	<b>P5:</b> Are outside problems encompassed by standards and codes of practice for professional engineering
<b>Extent of stakeholder involvement and conflicting requirements</b>	<b>P6:</b> Involve diverse groups of stakeholders with widely varying needs
<b>Interdependence</b>	<b>P7:</b> Are high level problems including many component parts or sub-problems

# Complex Engineering Activities (A)

<b>Attribute</b>	<b>Complex activities means (engineering) activities or projects that have some or all of the following characteristics:</b>
<b>Range of resources</b>	<b>A1:</b> Involve the use of diverse resources (and for this purpose resources include people, money, equipment, materials, information and technologies)
<b>Level of interaction</b>	<b>A2:</b> Require resolution of significant problems arising from interactions between wide-ranging or conflicting technical, engineering or other issues
<b>Innovation</b>	<b>A3:</b> Involve creative use of engineering principles and research based knowledge in novel ways
<b>Consequences for society and the environment</b>	<b>A4:</b> Have significant consequences in a range of contexts, characterized by difficulty of prediction and mitigation
<b>Familiarity</b>	<b>A5:</b> Can extend beyond previous experiences by applying principles-based approaches

# Complex Engineering Problems

Program Outcomes												Knowledge Profile								Complex Engineering Problem Solving							Complex Engineering Activities									
PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l	K1	K2	K3	K4	K5	K6	K7	K8	P1	P2	P3	P4	P5	P6	P7	A1	A2	A3	A4	A5					
Needs K1-K4		K5	K8	K6	K7	K7	Ethics	Individual work and teamwork	Communication (needs A's)	Project management and finance	Life-long learning	Science	Math	Engineering fundamentals	Engineering specialization	Design	Technology	Society	Research	Knowledge K3-K6, K8	Wide ranging/conflicting requirements	No obvious solution	Infrequent issues	Outside problems	Diverse groups	Many components	Related to PO j									
Needs complex engineering problem solution (P1 + more P)						Range of resources						Level of interaction	Innovation	Consequences	Familiarity																					
Engineering knowledge																																				
Problem analysis																																				
Design of solutions																																				
Investigation																																				
Modern tool usage																																				
The engineer and society																																				
Environment & sustain.																																				



# Complex Engineering Problems

How Ks are addressed through the project and mapping among Ks, COs, and POs

Ks	Attributes	How Ks are addressed through the project	COs	POs

How Ps are addressed through the project and mapping among Ps, COs, and POs

Ps	Attributes	How Ps are addressed through the project	COs	POs



# Project Idea

This are not complex engineering problem (CEP),  
try to make it into CEP

1. <https://nevonprojects.com/year-projects-for-computer-engineering/>
2. <https://1000projects.org/>

# Complex Engineering Problem

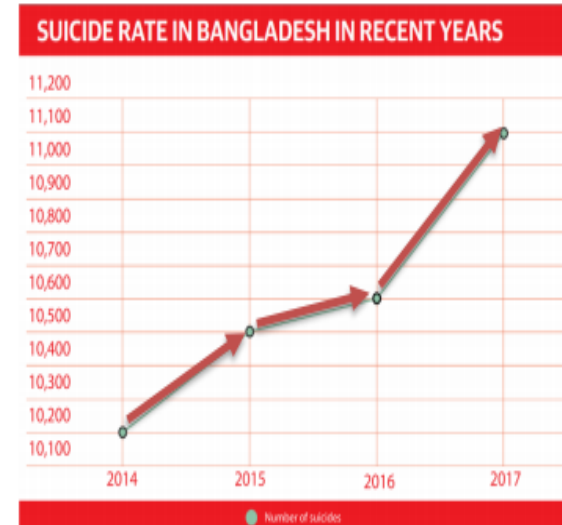
**Motivation:** In Bangladesh, depression is found in 2.6-5.5% among men and 6.0-11.8% among women, which causes the increased suicide rate. Early notification of depression can reduce the disease burden.

**Objective:** A machine-learning based model will be developed to predict the early depression of the patients from their activities in social media.

- The model will be trained first using data collected from random users.
- A web- or app-based front end will be developed to use the model.

**Critical challenges:** Various social media data will not be used as Facebook is the mainstream social media in Bangladesh. Willingness of users to participate while correctness of the model depends on availability of large data set. Maintaining privacy of the users' data.

**Conflicting requirements:** Develop a practical machine learning model with proper regularization with low variance while limited social media data (only from Facebook) will be used.



# Complex Engineering Problem

## Addressing Complex Engineering Problems (Ps) through this project

We explore how a few P's are addressed through this project

- **P1:** Project requires study of existing models with similar goals (K8) data collection from social media (K3, K4), knowledge of design of machine-learning based model (K3, K4), web-based front end (K6) and integration of different components (K5, K6).
- **P2:** Conflicting technical requirements: machine learning model with proper regularization and low variance while limited social media data will be available.
- **P3:** No obvious formulation as a machine-learning problem due to the availability and variations of social media data. Depth of analysis needed to select a specific algorithm from many alternatives.
- **P4:** Computer science and engineering graduates are not typically exposed to issues related to mental health or depression.
- **P7:** Project involves a number of interdependent sub-systems (components), such as, data collection, training module, detection module, front-end application development, etc.

### Knowledge Profiles (K)

**K – short name**

K1 – natural sciences

K2 – mathematics

K3 – engineering fundamentals

K4 – specialist knowledge

K5 – engineering design

K6 – engineering practice

K7 – comprehension

K8 – research literature

Attribute	P1 and some or all of P2 to P7:
Depth of knowledge required	P1: one or more of K3, K4, K5, K6 or K8
Range of conflicting requirements	P2: wide-ranging or conflicting technical, engineering and other issues
Depth of analysis required	P3: no obvious solution
Familiarity of issues	P4: Involve infrequently encountered issues
Extent of applicable codes	P5: outside problems encompassed by standards and codes of practice
Extent of stake-holder involvement and conflicting requirements	P6: diverse groups of stakeholders with widely varying needs
Interdependence	P7: many component parts or sub-problems

## Design a simple Bangla Speech Recognition system.

Such a system can be incorporated with a wheelchair to make it voice controlled and thus enables a physically handicapped person to move freely without the help of a constant caregiver. Moreover, the ability to give commands in Bangla will make the system more user-friendly in the context of Bangladesh.

The system should be speaker-independent, i.e. it is required that the Bangla speech recognition system should work satisfactorily irrespective of sex, age-group, or dialect of the speaker.

Students are required to explore different methodologies to investigate the problem through design of experiment and data analysis and select or develop an optimal methodology for design of the system.

## CO's that the open-ended design lab will address

No.	CO	PO
CO5	Investigate signal processing related complex issues through exploration of different methods, design of experiment and data analysis.	PO(d): Investigation
CO6	Design a specific Bangla Speech Recognition system using the selected algorithm to meet the requirements	PO(c): Design/Development of Solutions



# Complex Engineering Problem

Which P's are addressed?

P1: Depth of knowledge

P2: Conflicting requirements

P3: Depth of analysis

P4: Familiarity of issues

P5: Extent of applicable codes

P6: Extent of stakeholders

P7: Interdependence

- **P1:** Requires knowledge of DSP (K4), design of speech processing system (K5), use of DSP tools (K6) and engagement in research literature (K8)
- **P3:** Numerous algorithms can be adopted. Choice of the selected algorithm requires in-detail analysis
- **P5:** Requires going beyond the use of standardized features of common English audio commands to design speech recognition application in Bangla

PI's of the rubric for assessment of CO5 and CO6 through Lab-report

Methodically investigates different algorithms and/or methodologies and organizes evidence/data to demonstrate patterns and highlight differences and/or similarities (CO5)	P1, P3
Selects an optimal algorithm and/or methodology with proper justification (CO5)	P3, P5
Designs a Bangla speech recognition system to meet the requirements subject to the constraints (CO6)	P1, P5
Identifies limitations and implications of the proposed solution (CO6)	P1

DATE: \_\_\_\_\_

# Project Proposal (Next lab)

1. Project Title
2. Project Member's
3. Motivation
4. Problem Definition
5. Objective, Solution & Project Outputs
6. Impact on Society
7. Critical challenges
8. Conflicting requirement (Optional)
9. How P and K s are addressed through the project and mapping
10. Project Management (Time-table) and Cost analysis



Thanks to All