Mehran University of Engineering and Technology, Jamshoro
Department of Software Engineering

ORIGINAL SUBMITTED SYLLABUS

Title of Subject	**:**	**Empirical Software Engineering**
Code	**:**	**SE804**
Discipline	**:**	Software Engineering
Effective	**:**	24 PhDSE Batch and onwards
Assessment	**:**	10% Sessional 30% Mid Semester 60% Final Examination
Credit Hours	**:**	3 + 0 **Marks :** 100
Minimum Contact Hours:		42

Objectives of the course:
This course will prepare students for advanced research by examining how to plan, conduct and report on empirical investigations. This course will provide an overview of the different empirical research methods that can be used to research different aspects of software engineering The course introduces quantitative and qualitative methods in software engineering with accompanying statistical methods used for analysis.

Course outline:

- **Introduction**
  General concepts and principles, empirical research methods, empirical research techniques, a conceptual map of empirical software engineering, types of empirical software engineering

- **Measurement, data collection and analysis**
  Types of measures, data collection methods, data analysis tools, goal question metrics, GQM methodology, goals, qualitative and quantitative methods in software engineering, Methods for analyzing quantitative and qualitative data in software engineering.

- **Empirical strategies**
  Controlled experiments, case studies, survey types, selecting an empirical strategy, and process of an empirical study

- **Data measurement and descriptive statistics**
  Mean, median, mode, variance, standard deviation, impact of scaling and shifting

- **Data analysis and inference statistics**
  Hypothesis testing, Significance level, and p-value, type-I and type-II error, Performing hypothesis testing, t-test and t-distribution, proportion testing, important p-z pairs.

- **Empirical software engineering: From discipline to inter-discipline**

Scientific movements and practices, Theory, research, and evaluation as practice, Pragmatic cycle for empirical research, Challenges in empirical software engineering, Turning empirical software engineering into an inter-discipline,

BOOKS RECOMMENDED

1. Lee, R Software Engineering research, management and applications, Springer, Latest Edition.
2. Shull, F.; Singer J.; Sjoberg, D.I.K. (eds); Guide to Advanced Empirical Software Engineering, Springer, Latest Edition.
3. Derek M. Jones, Empirical Software Engineering using R, Latest Edition.

Reference Papers:

1. Fernández, Daniel Méndez, and Jan-Hendrik Passoth. "Empirical software engineering: From discipline to interdiscipline." *Journal of Systems and Software* 148 (2019): 170-179.
2. Molléri, Jefferson Seide, Kai Petersen, and Emilia Mendes. "CERSE-Catalog for empirical research in software engineering: A Systematic mapping study." *Information and Software Technology* 105 (2019): 117-149.
3. Kitchenham, Barbara, et al. "Robust statistical methods for empirical software engineering." *Empirical Software Engineering* 22.2 (2017): 579-630.
4. Krein, Jonathan L. "Replication and Knowledge Production in Empirical Software Engineering Research.", PhD thesis, 2014.
5. Georgios I. Gousios, Tools and methods for large scale empirical software engineering research, PhD thesis., 2012.

Approval:

Board of Studies:	**Resolution No. 2.2**	**Dated: 21-07-2023**
Board of Faculty:	**Resolution No. 21.10**	**Dated: 07-12-2023**
AS&RB	**Resolution No.**	
Academic Council:	**Resolution No.**	