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|  | **UNIVERSITAS NEGERI PADANG****FACULTY OF ENGINEERING****ELECTRONIC DEPARTMENT****INFORMATIC EDUCATION STUDY PROGRAM** | **Document Code** |
| **SEMESTER LEARNING PLAN (SLP)** |
| **COURSES** | **CODE** | **Course Group** | **Credit Point(s)** | **SEMESTER** | **Date Of Creation** |
| **Teknik Komputasi****(Computational Engineering)** | TIK.61.1301 | Compulsory Courses of the Study Program | 2 credits (theory) | 3 | July 2017 |
| **AUTHORIZATION** | **Lecturer** | **Course Coordinator** | **Coordinator of Study Program** |
| **Zulwisli, S.Pd., M.Eng.****NIP. 19680205 200212 100 1** | **Thamrin, MT****NIP. 19770101 200812 100 1** | **Ahmaddul Hadi, M.Kom****NIP. 19761 209 200 501 100 3** |
| **Learning Outcomes (LO)** | **PLO** |  |
| PLO-S1 | Have faith in God Almighty and able to show a religious attitude. |
| PLO-S9 | Demonstrate an attitude of responsibility for work in their field of expertise independently |
| PLO-P6 | Understand the basic concepts of mathematics, electrical and electronic science in the field of computers |
| PLO-KU5 | able to make decisions appropriately in the context of problem solving in their area of ​​expertise, based on the results of information and data analysis. |
| PLO-KK6 | Ability to master the basic Python programming, Gauss computation method and LU Decomposition method computation |
| **CO** |  |
| CO-1 | Understand the concept of computational matrix with Python programming language |
| CO-2 | Understand the concept of a computational program using the Gauss elimination method |
| CO-3 | Understand the concept of a Gauss computation program into inversion problems |
| CO-4 | Understand the computational program LU Decomposition Method |
| CO-5 | Understand the iteration method computation program |
| **Courses Description** | Computational engineering is s a branch of computer science and mathematics that discusses whether and how a problem can be solved in a computational model, using algorithms. |
| **Courses Matter** | 1. Python programming language
2. Gauss elimination computation
3. Gauss computation into inversion problem
4. LU Decomposition
5. Computing method iteration
 |
| **References** | **Main:** |  |
| 1. Supriyanto Suparno(2009). Komputasi untuk Sains dan Teknik, Departemen Fisika- FMIPA, Universitas Indonesia. (Ebook)
 |
| **Supporters:** |  |
| 1. Danang Mursita (2010), Aljabar Linear, Rekayasa Sains, Bandung
2. Mary Attenborough (2003), Mathematics for Electrical Engineering and computing
 |
| **Media** | **Software:** | **Hardware :** |
| MS Office 2019 | LCD & Projector |
| **Lecturer** | Zulwisli, S.Pd., M.Eng. |
| **Prerequisites** | - |
| **Weeks-** |  **Sub-CO****(Expected Final Ability in each learning stage)** | **Assessment Indicator**  | **Assessment Criteria** | **Learning Method, Students’ Learning Experience****[Time Allocation]** | **Learning Material****[Topic from Reference]** | **Rating Weight (%)** |
| **(1)** | **(2)** | **(3)** | **(4)** | **(5)** | **(6)** | **(7)** |
| 1-4 | Able to create, demonstrate and communicate matrix computation program with Python programming language | 1. The accuracy of explaining the definition of the matrix
2. The accuracy of explaining and describing the matrix declaration
3. The accuracy of explaining and describing the Matrix
4. The accuracy of explaining and describing the transpose matrix
5. The accuracy of describing and describing the square matrix
6. The accuracy of explaining and describing the symmetric matrix
7. The accuracy of describing and describing the diagonal matrix
8. The accuracy of explaining and describing the identity matrix
9. Accuracy in explaining and describing the upper triangular matrix
10. The accuracy of explaining and describing lower triangular matrix
11. The accuracy of explaining and describing the tri diagonal matrix
 | **Criteria:**1. Assessment quiz
2. Presentation
3. Assessment assignments
 | * Lectures:

 Presentation **[TM: 2x (2x50 ")]*** Task-1: Solve a problem about the Python matrix computation program

**[BT + BM: (2 + 2) x (2x60 ”)]** | 1. Introduction to matrices
2. Matrix declaration in Python
3. Types of matrices
4. Transpose matrix
5. Longitude matrix of the kar
6. Symmetrical matrix
7. Diagonal matrix
8. Identity matrix
9. Upper-tri angular matrix
10. Lower-tri angular matrix
11. Tri diagonal matrix
12. Dominant diagonal element
13. Positive matrix - de ﬁ nite
14. Vector-row and vector-column
15. Mate matika operation
16. Switch positions
17. Addition matrix
18. Matrix sum computation
19. Multiplication matrix
20. Multiplication matrix computing
21. Multiplication of matrices and vector-columns
22. Computation of multiplication matrices and vector columns

 **[1] p .: 123-132]** | **20%** |
| 5 | Able to create, demonstrate and communicate the elimination method computation program Gauss | 1. Accuracy in explaining the Gauss Elimination Method
2. Accuracy describes systems of linear equations
3. Accuracy describes the simplification technique
4. Accuracy in explaining triangularization and backward substitution
5. Accuracy in explaining Gauss Matrix and Elimination in Python
 | **Criteria:**1. Assessment quiz
2. Assessment assignments
 | * **Lectures:**

Presentation**[TM: 1x (2x50 ")]*** **Task-2:** Solving the Gauss Elimination problem

**[BT + BM: (1 + 1) x (2x60 ”)]*** **Task-3:** Computing problem solving

**BT + BM: (1 + 1) x (2x60 ”)** | 1. Gauss Elimination Method
2. Linear system of equations
3. Simplification technique
4. Triangularization and backward substitution
5. Gauss Matrix and Elimination in Python

**[1] p. : 495 - 524]** | **10%** |
| 6 | Able to create, demonstrate and communicate the elimination method computation programGauss for inversion problems | 1. The Appropriateness of Gauss Elimination Application to Inversion Problems
2. Accuracy explains Line Model Inversion
3. Accuracy explains Parabolic Model Inversion
4. Accuracy explains Field Model Inversion
 | **Criteria:**1. Assessment quiz
2. Assessment assignments
 | * **Lectures:**

Presentation**[TM: 1x (2x50 ")]*** **Task-2:** Inversion problem solving

**[BT + BM: (1 + 1) x (2x60 ”)]** | 1. Gauss Elimination Application to Inversion Problems
2. Line Model Inversion
3. Parabolic Inversion
4. Field Model Inversion
 | **10%** |
| 7 | Able to create, demonstrate and communicate the computational program LU Decomposition Method  | 1. Accuracy describes matrix factorization
2. The accuracy of describing the change in vector material
 | **Criteria:**1. Assessment quiz
2. Assessment assignments
 | * **Lectures:**

Presentation**[TM: 1x (2x50 ")]*** **Task-2:** Solving the computational problem of the LU decomposition method

**[BT + BM: (1 + 1) x (2x60 ”)]** | 1. Matrix factorization
2. Peru vector material
 | **10%** |
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| **8** | **Mid-Term Mid-Term Exam: Formative evaluation that is intended to improve the learning process based on the assessment that has been carried out** |  |
| 9-10 | Able to create, demonstrate and communicate the advantages of Jacobi vectors, norms, iterations | 1. Accuracy explained Vector-column excess
2. Accuracy explained Understanding Norm
3. Accuracy explained Calculation of the norm-difference
4. Accuracy explained Jacobi iteration
5. Accuracy explained Gauss – Seidel iteration
6. Accuracy explained Iteration with Relak Sasi
7. Accuracy explained Relation Relation Iteration Algorithm
 | **Criteria:**1. Assessment quiz
2. Assessment assignments
 | * Lectures:

Presentation **[TM: 2x (2x50 ")]** Task-6: Operations and complex number forms  **[BT + BM: (2 + 2) x (2x60 ”)]** | 1. Vector-column excess
2. Understanding Norm
3. Calculation of the norm-difference
4. Jacobi iteration
5. Gauss – Seidel iteration
6. Iteration with Relak Sasi
7. Relation Relation Iteration Algorithm **[1] p. 245 - 322**
 | **15%** |
| 11 | Able to create, demonstrate and communicate interpolation computation programs | 1. Accuracy explained Lagrange Interpolation
2. Accuracy explained Cubic Spline Interpolation
 | **Criteria:**1. Assessment quiz
2. Assessment assignments
 | * Lectures:

Presentation **[TM: 2x (2x50 ")]****Task-6**: Solve problems about derivatives **BT + BM (2 + 2) x (2x60 ”)]** | 1. Lagrange Interpolation
2. Cubic Spline Interpolation
 | **15%** |
| 12-14 | Able to create, demonstrate and communicate computational programs in numerical ferrentials | 1. Accuracy explained Euler's method.
2. Accuracy explained The Runge Ku tta method
3. Accuracy explained Application: Charging the capacitor
4. Accuracy explained Finite Difference Method
5. Accuracy explained Partial Differential Equations
6. Accuracy explained Elliptic PDP
7. Accuracy explained PDP parabolic
8. Accuracy explained Forward-difference method. Method
9. Accuracy explained Backward-difference
10. Accuracy explained Cr ank-Ni colson method
11. Accuracy explained Hyperbolic PDP
 | **Criteria:**1. Assessment quiz
2. Assessment assignments
 | * **Lecture**

 **[TM: 3x (2x50 ")]*** **Duty-7**: Problem solving about trees **[BT + BM: (3 + 3) x (2x60 ”)]**
 | 1. Euler's method.
2. The Runge Ku tta method
3. Application: Charging the capacitor
4. Finite Difference Method
5. Partial Differential Equations
6. Elliptic PDP
7. PDP parabolic
8. Forward-difference method. Method
9. Backward-difference
10. Cr ank-Ni colson method
11. Hyperbolic PDP
 | **20%** |
| 15 | Able to make, trapezioda, simson and composite methods | 1. Accuracy explained Trapezoide Method
2. The accuracy of explaining the Simpson Method
3. Accuracy of explaining the Composite-Simpson Method
4. Accuracy describes Adaptive Quardrature
5. Accuracy explained Gaussian Quadrature
 |  | * Lectures:

 Presentation **[TM: 1x (2x50 ")]*** Task-1: Solve numerical differential computing problems

**[BT + BM: (1 + 1) x (1x60 ”)]** | 1. Trapezoide Method 2. The Simpson method 3. Composite-Simpson method 4. Adaptive Quardrature 5. Gaussian Quadrature | **10%** |
| **16** | **UAS / Semester Final Examination: Evaluation which is intended to determine the final achievement of student learning outcomes** |  |