

**1.Course Identity**

|                                                                     |                                                                                                                                                      |                                                                   |                                                            |
|---------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|------------------------------------------------------------|
| <b>Course name<br/>(Nama mata kuliah)</b>                           | Programming and Algorithm                                                                                                                            |                                                                   |                                                            |
| <b>Faculty<br/>(Fakultas)</b>                                       | Mathematics and Natural Science                                                                                                                      | <b>Study Program<br/>(Program Studi)</b>                          | Statistics                                                 |
| <b>Code<br/>(Kode)</b>                                              | SST-105                                                                                                                                              | <b>Credit poin Sks<br/>(Bobot Sks)</b>                            | 2                                                          |
| <b>Group<br/>(Grup)</b>                                             | Study Program                                                                                                                                        | <b>Enrollment obligatory<br/>(Sifat pengambilan)</b>              | mandatory/ optional*                                       |
| <b>Semester(s) in which<br/>the course is taught<br/>(Semester)</b> | I                                                                                                                                                    | <b>Availability<br/>(Ketersediaan)</b>                            | Limited                                                    |
| <b>Learning method<br/>(Bentuk pembelajaran)</b>                    | blended learning/online learning*                                                                                                                    | <b>Media<br/>(Media)</b>                                          | Zoom, Google Classroom, Digital files (slides, sheet, etc) |
| <b>Course category<br/>(Rumpun mata kuliah/blok)</b>                | <del>university compulsory course/</del> SSP compulsory course/ <del>practicum/</del> compulsory of scientific interest/ <del>elective course*</del> | <b>Requirements<br/>(Prasyarat)</b>                               | -                                                          |
| <b>Lecture<br/>(Dosen pengampu)</b>                                 | Rahmadi Yotenka, M.Sc.<br>Sekti Kartika Dini, S.Si., M.Si.                                                                                           | <b>Semester/<br/>Academic year<br/>(Semester/ Tahun Akademik)</b> | Odd Semester 2020/2021                                     |

\*) cross the unnecessary ones

**2a. PROGRAM LEARNING OUTCOME (CAPAIAN PEMBELAJARAN LULUSAN)**

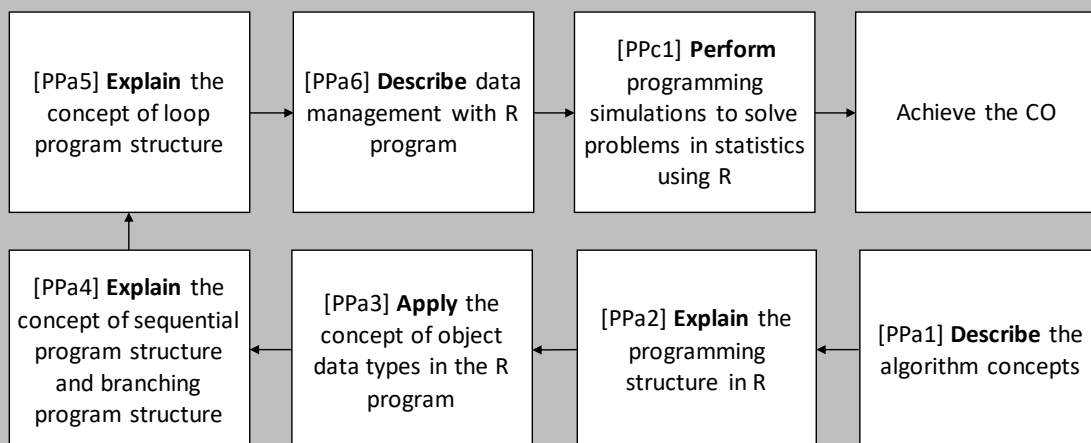
| <b>LO Code (Kode CPL)</b> | <b>LO Description (Rumusan CPL)</b>                                                                                                                                              |
|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PPa<br>(Intelligence)     | Mastering the concepts of probability theory and statistics, mathematics, calculus, elementary linear algebra, statistical analysis methods, and elementary computer programming |
| PPc<br>(Software)         | Mastering at least two statistical software, including software based on open source                                                                                             |

**2b. COURSE OUTCOME (CAPAIAN PEMBELAJARAN MATA KULIAH)**

| <b>Supported PLO Code<br/>(Kode CPL yang didukung)</b> | <b>CO Code<br/>(Kode CPMK)</b> | <b>CO Descriptions and Indicators<br/>(Rumusan CPMK dan Indikator)</b>                                                          | <b>Learning Experience<br/>(Pengalaman Pembelajaran)</b>                                                                                                             | <b>Assessment<br/>(Asesmen/penilaian)</b> | <b>Weight<br/>(Bobot)</b> |
|--------------------------------------------------------|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|---------------------------|
| PPa                                                    | PPa1                           | Students are able to <b>describe</b> algorithm concepts, presentation of the algorithm and the basic structure of the algorithm | 1. Students <b>explain</b> the definition of algorithms, benefits and rules for making algorithms, presentation of algorithms, and the basic structure of algorithms | Assignment                                | 5                         |
|                                                        | PPa2                           | Students are able to <b>explain</b> programming languages in R, data structures and                                             | 1. Students <b>explain</b> the differences in a programming language in R from others                                                                                | Assignment                                | 5                         |

|     |      |                                                                                                                 |                                                                                                                                                                                |                          |    |
|-----|------|-----------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|----|
|     |      | operators in R, and programming stages in R                                                                     | 2. Students <b>compose</b> the algorithms and computer programs for program input and output                                                                                   |                          |    |
|     | PPa3 | Students are able to <b>apply</b> the concept of object data types in the R program                             | 1. Students <b>create</b> algorithms and programs for vector, matrice, frame data, and list                                                                                    | Assignment               | 10 |
|     | PPa4 | Students are able to <b>explain</b> the concept of sequential program structure and branching program structure | 1. Students <b>compose</b> algorithms and computer programs for sequential data flow<br>2. Students <b>compose</b> algorithms and computer programs for branching data streams | Assignment, Midterm Exam | 10 |
|     | PPa5 | Students are able to <b>explain</b> the concept of loop program structure                                       | 1. Students <b>compose</b> algorithms and computer programs for looping data streams                                                                                           | Assignment, Midterm Exam | 20 |
|     | PPa6 | Students are able to <b>describe</b> data management with R program                                             | 1. Students <b>create</b> algorithms and computer programs for entry data, sorting and data retrieval                                                                          | Quiz, Final Exam         | 15 |
| PPc | PPc1 | Students are able to <b>perform</b> programming <b>simulations</b> to solve problems in statistics using R      | 1. Students <b>make</b> descriptive statistics program and statistical graphs program using R<br>2. Students <b>apply</b> statistical distributions with R program             | Assignment, Final Exam   | 35 |

### 3. Program Learning Outcome Analysis Map (*Peta Analisis Capaian Pembelajaran*)



### 4. Reference (*Referensi*)

1. Wachid, F., 1996, Dasar-Dasar Algoritma dan Pemrograman, Andi Offset, Yogyakarta
2. Pranata, A., 2005, Algoritma Dan Pemrograman, Graha Ilmu, Yogyakarta
3. Zuur, A., Leno, E., and Meesters, E., 2009, A Beginner's Guide to R, Springer, New York
4. Dalgaard, P., 2008, Introductory Statistics with R: Second Edition, Springer, Denmark

### 5. Detail of Learning Activities (*Rincian Aktivitas Pembelajaran*)

| Sessio<br>n (sesi) | LOC/Sub-<br>LOC/Criterio<br>n | Study Material<br>( <i>Bahan Kajian</i> ) | Activity Design and Duration<br>( <i>Rancangan Aktivitas dan Durasi</i> ) | Mode | Learning Media/<br>Reference<br>( <i>Media Pembelajaran/<br/>Referensi</i> ) |
|--------------------|-------------------------------|-------------------------------------------|---------------------------------------------------------------------------|------|------------------------------------------------------------------------------|
|--------------------|-------------------------------|-------------------------------------------|---------------------------------------------------------------------------|------|------------------------------------------------------------------------------|

|    | (CPMK/Sub-CPMK/Kriteria) |                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                        |     |                                                                                   |
|----|--------------------------|--------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----------------------------------------------------------------------------------|
| 1. | PPa1                     | Basic Concepts of Algorithms and programming Algorithm | <ul style="list-style-type: none"> <li>- Lecture explains the definition of algorithm, algorithm presentation, and algorithm structure (duration 40-50 minutes);</li> <li>- Students make algorithms in the form of flowcharts for arithmetic and statistical cases (30 minutes)</li> </ul>                                                                                                                                            | FF  | Slides : Introduction to Algorithms and programming Algorithm                     |
| 2. | PPa2                     | Basic Concepts of Algorithms and programming Algorithm | <ul style="list-style-type: none"> <li>- Lecture explains the programming languages in R and provides some examples of data structures and operators in R, and programming stages in R (30 minutes);</li> <li>- Students explain with examples the advantages and disadvantages of programming languages in R from others. Then students apply with examples of data structures and operators in R (duration 50-60 minutes)</li> </ul> | FF  | Slides : Introduction to Algorithms and programming Algorithm<br><br>Assignment 1 |
| 3. | PPa3                     | Vector, Matrice, Frame Data, and List Programming      | <ul style="list-style-type: none"> <li>- Lecture explain the characteristics of object data types in the R program (vector, matrice, frame data, and list) (duration 40-50 minutes)</li> <li>- Students perform vector and matrix program simulations for arithmetic and statistical cases (30 minutes)</li> </ul>                                                                                                                     | FF  | Slides : Introduction to R programming                                            |
| 4. | PPa3                     | Vector, Matrice, Frame Data, and List Programming      | <ul style="list-style-type: none"> <li>- Lecture provide examples of case studies of frame data and list programs (30 minutes)</li> <li>- Students perform frame data and list program simulations for arithmetic and statistical cases (duration 50-60 minutes)</li> </ul>                                                                                                                                                            | FFO | Slides : Introduction to R programming<br><br>Assignment 2                        |
| 5. | PPa4                     | Sequential programming techniques                      | <ul style="list-style-type: none"> <li>- Lecture gives an introduction of sequential program structure (30 minutes)</li> <li>- Lecture provides an example of sequential program structure using R (duration 15-20 minutes)</li> <li>- Students create algorithms and sequential program structure for arithmetic and statistical cases using R (duration 40-50 minutes)</li> </ul>                                                    | FFO | Slides: sequential program structure with R<br><br>Assignment 3                   |
| 6. | PPa4                     | Branching programming technique                        | <ul style="list-style-type: none"> <li>- Lecture gives an introduction of branching program structure (30 minutes)</li> <li>- Lecture provides an example of branching program structure using R (duration 15-20 minutes)</li> <li>- Students create algorithms and branching program structure for arithmetic and statistical cases using R (duration 40-50 minutes)</li> </ul>                                                       | FF  | Slides: branching program structure with R<br><br>Assignment 4                    |
| 7. | PPa5                     | Loop programming technique                             | <ul style="list-style-type: none"> <li>- Lecture gives an introduction of loop program structure (30 minutes)</li> <li>- Lecture provides an example of loop program structure using R (duration 15-20 minutes)</li> </ul>                                                                                                                                                                                                             | FF  | Slides: loop program structure with R<br><br>Assignment 5                         |

|     |      |                                                                       |                                                                                                                                                                                                                                                                                            |     |                                                               |
|-----|------|-----------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|---------------------------------------------------------------|
|     |      |                                                                       | - Students create algorithms and loop program structure for arithmetic and statistical cases using R (duration 40-50 minutes)                                                                                                                                                              |     |                                                               |
| 8.  |      | Midterm Exam                                                          |                                                                                                                                                                                                                                                                                            |     |                                                               |
| 9.  | PPa6 | Data management with R                                                | <ul style="list-style-type: none"> <li>- Lecture explains the concept of data management with R GUI and R CLI (entry data, sorting and data retrieval) (duration 30-40 minutes)</li> <li>- Students practice using R GUI and R CLI for data management (duration 40-50 minutes)</li> </ul> | FF  | Slides: Work with R GUI and R CLI for data management         |
| 10. | PPa6 | Data management with R                                                | <ul style="list-style-type: none"> <li>- Lecture provides case studies for statistical data that require data management with R (60 minutes)</li> <li>- Students take quiz based on case studies given by lecture (30 minutes)</li> </ul>                                                  | FFO | Slides: Work with R GUI and R CLI for data management<br>Quiz |
| 11. | PPc1 | Descriptive statistics program and statistical graphs program using R | <ul style="list-style-type: none"> <li>- Lecture provides case studies for statistical data that require descriptive analysis with R (60 minutes)</li> <li>- Students practice using R for descriptive statistics (30 minutes)</li> </ul>                                                  | FF  | Slides: Descriptive statistics with R                         |
| 12. | PPc1 | Descriptive statistics program and statistical graphs program using R | <ul style="list-style-type: none"> <li>- Students make statistical graphs based on case studies given by lecture (90 minutes)</li> </ul>                                                                                                                                                   | FFO | Slides: Statistical graphs program with R<br>Assignment 6     |
| 13. | PPc1 | Statistical distributions with R program                              | <ul style="list-style-type: none"> <li>- Lecture explains the basic concepts of the statistical distribution program with (60 minutes)</li> <li>- Students practice using R for statistical distribution program (30 minutes)</li> </ul>                                                   | FFO | Slides: Statistical distributions with R                      |
| 14. | PPc1 | Statistical distributions with R program                              | <ul style="list-style-type: none"> <li>- Students make statistical distribution program based on case studies given by lecture (90 minutes)</li> </ul>                                                                                                                                     | FF  | Slides: Statistical distributions with R<br>Assignment 7      |
| 15. |      | Final Exam                                                            |                                                                                                                                                                                                                                                                                            |     |                                                               |

Information:

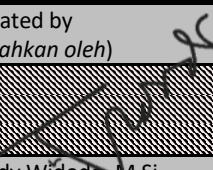
For mode, enter one of the following codes

- FF = activities that require **face-to-face** meetings in class (*aktivitas yang memerlukan tatap muka (TM) langsung di kelas*);
- FFO = activities that require **face to face online** (*aktivitas yang memerlukan tatap muka secara daring (tatap maya/TMD)*);
- SAA = standalone asynchronous online activity (*aktivitas daring asinkron mandiri/ASM*);
- CAA = collaborative asynchronous online activities (*aktivitas daring asinkron kolaborasi/ASK*);

Learning / reference media can be in the form of (1) self-produced results, (2) curated results: media sourced from the internet or other sources chosen by the lecturer, and / or (3) students' own exploration results.

| 6. Assessment and Evaluation System ( <i>Sistem Penilaian dan Evaluasi</i> ) |                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Assessment System (<i>Sistem Penilaian</i>)</b>                           | <p>The grading system uses one of these two systems:</p> <ul style="list-style-type: none"> <li>• PAP (<i>Penilaian Acuan Patokan/</i> Benchmark Reference Assessment) is an assessment using the University / Faculty / Study Program's standard values.</li> <li>• PAN (<i>Penilaian Acuan Normal/</i> Normal Reference Assessment) is an assessment based on relative class passing standards, for example based on a normal distribution.</li> </ul> |

|                                                      |                                                                                                                                                                                                                                                                      |
|------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Evaluation System</b><br><b>(Sistem Evaluasi)</b> | Evaluation is a decision taken after students finish lectures.<br>Each student must achieve a minimum grade / predicate of C for the overall average score. If it has not fulfilled it, then the student is obliged to carry out an examination / repair assignment. |
|------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                                                                                   |                                                                                   |                                                                                     |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Date:                                                                             | Date:                                                                             | Date:                                                                               |
| Validated by<br>(Disyahkan oleh)                                                  | Examined by<br>(Diperiksa oleh)                                                   | Prepared by<br>(Disiapkan oleh)                                                     |
|  |  |  |
| Dr. Edy Widodo, M.Si.                                                             | Muhammad Muhajir, M.Sc.                                                           | Rahmadi Yotenka, M.Sc.                                                              |