



**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**

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**CLUSTER 6: ERNAKULAM – I**

**CURRICULUM**

**FOR**

**M. Tech. DEGREE PROGRAMME**

**IN**

**COMPUTER SCIENCE AND ENGINEERING**

**(DATA SCIENCES)**

*(Interdisciplinary Course)*

**(2022 ADMISSION ONWARDS)**

**Offered by**

**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**



## CURRICULUM FOR M. Tech. DEGREE PROGRAMME IN COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCES)

### SEMESTER 1 (CREDITS: 18)

| Slot                                | Course Code | Course Title                              | Core/<br>Elective  | L-T-P         | Marks<br>CIA      | End Semester<br>Exam (ESE) |                   | Credits |
|-------------------------------------|-------------|-------------------------------------------|--------------------|---------------|-------------------|----------------------------|-------------------|---------|
|                                     |             |                                           |                    |               |                   | Marks                      | Duration<br>(hrs) |         |
| A                                   | 221TCS100   | Advanced Machine Learning                 | Discipline Core 1  | 3-0-0         | 40                | 60                         | 2.5               | 3       |
| B                                   | 221TCS003   | Mathematical Foundations for Data Science | Program Core 1     | 3-0-0         | 40                | 60                         | 2.5               | 3       |
| C                                   | 221TCS004   | Introduction to AI and NLP                | Program Core 2     | 3-0-0         | 40                | 60                         | 2.5               | 3       |
| D                                   | 221ECSxxx   |                                           | Program Elective 1 | 3-0-0         | 40                | 60                         | 2.5               | 3       |
| E                                   | 221ECSxxx   |                                           | Program Elective 2 | 3-0-0         | 40                | 60                         | 2.5               | 3       |
| S                                   | 221RGE100   | Research Methodology & IPR                |                    | 2-0-0         | 40                | 60                         | –                 | 2       |
| T                                   | 221LCS001   | Advanced Machine Learning Lab             | Laboratory 1       | 0-0-2         | 100               | –                          | –                 | 1       |
| <b>Teaching Assistance: 6 hours</b> |             |                                           |                    | <b>19 Hrs</b> | <b>18 Credits</b> |                            |                   |         |

| Slot D - Semester I - Program Elective PEC-1 |                                       |
|----------------------------------------------|---------------------------------------|
| 221ECS012                                    | Data Analytics                        |
| 221ECS013                                    | R for Data Science                    |
| <b>221ECS014</b>                             | <b>Data Visualization with Python</b> |
| 221ECS015                                    | Reinforcement Learning                |
| 221ECS016                                    | Computational Linguistics             |
| 221ECS004                                    | Computational Intelligence            |

| Slot E - Semester I - Program Elective PEC-2 |                                   |
|----------------------------------------------|-----------------------------------|
| 221ECS017                                    | Advanced Database                 |
| 221ECS018                                    | Concepts in Cloud Computing       |
| 221ECS019                                    | Statistics for Data Scientists    |
| <b>221ECS020</b>                             | <b>Ethics for Data Scientists</b> |
| 221ECS021                                    | Speech Processing                 |
| 221ECS022                                    | Information Theory                |

**SEMESTER 2 (CREDITS: 18)**

| Exam Slot | Course No            | Course Title                            | Core/ Elective                       | L-T-P | Internal Marks | End Semester Exam |                | Credits |
|-----------|----------------------|-----------------------------------------|--------------------------------------|-------|----------------|-------------------|----------------|---------|
|           |                      |                                         |                                      |       |                | Marks             | Duration (hrs) |         |
| A         | 222TCS100            | Advanced Data Structures and Algorithms | Discipline Core 2                    | 3-0-0 | 40             | 60                | 2.5            | 3       |
| B         | 222TCS002            | Deep Learning                           | Program Core 2                       | 3-0-0 | 40             | 60                | 2.5            | 3       |
| C         | 222ECSXXX            |                                         | Program Elective 3                   | 3-0-0 | 40             | 60                | 2.5            | 3       |
| D         | 222ECSXXX            |                                         | Program Elective 4                   | 3-0-0 | 40             | 60                | 2.5            | 3       |
| E         | 222EEXXX / 222ECSXXX |                                         | Industry/ Interdisciplinary Elective | 3-0-0 | 40             | 60                | 2.5            | 3       |
| S         | 222PCS100            | Mini Project                            | Project                              | 0-0-4 | 100            | –                 | –              | 2       |
| T         | 222LCS001            | Deep Learning Lab                       | Lab                                  | 0-0-2 | 100            | –                 | –              | 1       |

**Teaching Assistance: 6 hours****21 Hrs****18 Credits****Slot C - Semester II - Program Elective PEC-3**

|                  |                                               |
|------------------|-----------------------------------------------|
| <b>222ECS003</b> | <b>Computer Vision</b>                        |
| 222ECS012        | Blockchain Technologies                       |
| 222ECS013        | Image and Video Analytics                     |
| 222ECS014        | Internet of Things                            |
| 222ECS016        | Knowledge Based System Design                 |
| 222ECS055        | Data Analysis and Visualization with Power BI |

**Slot D - Semester II - Program Elective PEC-4**

|                  |                                    |
|------------------|------------------------------------|
| <b>222ECS017</b> | <b>Soft Computing</b>              |
| 222ECS018        | High Performance Computing         |
| 222ECS019        | Cryptography and Network Security  |
| 222ECS020        | Big Data Analytics on Genomic Data |
| 222ECS021        | Pattern Recognition                |
| 222ECS022        | Advanced Computational Linguistics |
| 222ECS059        | Simulation for Data Science        |

**Slot E - Semester II - Interdisciplinary Elective**

|           |                                  |
|-----------|----------------------------------|
| 222ECS056 | Introduction to Machine Learning |
| 222ECS057 | Data Structures                  |
| 222ECS058 | Software Project Management      |

**Slot E - Semester II - Industry Elective**

|                  |                                                                |
|------------------|----------------------------------------------------------------|
| <b>222EEX100</b> | <b>Introduction to Big Data Analytics and Data Engineering</b> |
|------------------|----------------------------------------------------------------|

**SEMESTER 3 (CREDITS: 16)**

| Exam Slot | Course No    | Course Title             | Core/ Elective                                                                                      | L-T-P  | Internal Marks | End Semester Exam |                | Credits |
|-----------|--------------|--------------------------|-----------------------------------------------------------------------------------------------------|--------|----------------|-------------------|----------------|---------|
|           |              |                          |                                                                                                     |        |                | Marks             | Duration (hrs) |         |
| A*        | —            | MOOC                     | To be completed successfully before the commencement of fourth semester (starting from semester 1). |        |                |                   |                | 2       |
| B         | Audit Course |                          | Audit Course                                                                                        | 3-0-0  | 40             | 60                | 3              | –       |
| C         | Internship   | Internship               | Internship                                                                                          | –      | 50             | 50                | –              | 3       |
| D         | TRACK 1      | Dissertation Phase 1     | Core Project                                                                                        | 0-0-17 | 100            | –                 | –              | 11      |
|           | TRACK 2      | Research Project Phase 1 |                                                                                                     |        |                |                   |                |         |

**Teaching Assistance: 6 hours****20 Hrs****16 Credits**

| Slot B - Semester III - Audit Course |                                   |
|--------------------------------------|-----------------------------------|
| 223AGE100                            | Academic Writing                  |
| 223AGE001                            | Advanced Engineering Materials    |
| 223AGE001                            | Advanced Engineering Materials    |
| <b>223AGE003</b>                     | <b>Data Science for Engineers</b> |
| 223AGE004                            | Design Thinking                   |
| 223AGE005                            | Functional Programming in Haskell |
| 223AGE006                            | French Language (A1 Level)        |
| 223AGE007                            | German Language (A1 Level)        |
| 223AGE008                            | Japanese Language (N5 Level)      |
| 223AGE009                            | Principles of Automation          |
| 223AGE010                            | Reuse And Recycle Technology      |
| 223AGE011                            | System Modelling                  |
| 223AGE012                            | Expert Systems                    |

**SEMESTER 4 (CREDITS: 16)**

| Exam Slot | Course No      | Course Title              | Core/ Elective | L-T-P  | Internal Marks | End Semester Exam |                | Credits |
|-----------|----------------|---------------------------|----------------|--------|----------------|-------------------|----------------|---------|
|           |                |                           |                |        |                | Marks             | Duration (hrs) |         |
| A         | <b>TRACK 1</b> | Dissertation Phase II     | Core Project   | 0-0-24 | 100            | 100               | –              | 16      |
|           | <b>TRACK 2</b> | Research Project Phase II |                |        |                |                   |                |         |

**Teaching Assistance: 5 hours****24 Hrs****16 Credits****Total Credits for the Course: 68 credits**

**TRACK 1 / TRACK 2**

In second year, the students can choose either of the two tracks: TRACK 1 or TRACK 2.

Track 1 is conventional M.Tech programme and Track 2 is M.Tech programme designed for students with scientific vigor for research and scientific knowledge. An aspirant in track 2 needs to have a flavour for research and passion for the topic. The candidates should also be good with performing in-depth research and colluding the conclusions of research led by them. Such students are expected to have the following skills: Technical Skills, Research Skills, Communication Skills, Critical Thinking Skills, and Problem Solving Skills.

**The eligibility for Track 2:**

- » Shall have qualified in the GATE or have a SGPA above 8.5 during the first semester, and
- » Qualify an interview during the end of second semester by an expert committee constituted by the respective Institutions

In research project track, the research work shall be accepted or published in a journal (indexed in SCI/Unpaid SCOPUS).

**COURSE ELIGIBILITY:**

As per Department of Technical Education (DTE) Annexure V

Eligibility and Main paper Code of GATE for M Tech Programs offered by APJ Abdul Kalam Technological University.

| Sl No | Stream | Program      | ELIGIBILITY (B Tech / BE / BSc (Engineering) / Masters degree in the following disciplines or related disciplines recognised as eligible by the University for pursuing PG (MTech/M Arch) programme)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Main Paper in GATE 2022 | Nomenclature in APH2022 |
|-------|--------|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|-------------------------|
| 40    | CS     | Data Science | Computer Science and Engineering, Artificial Intelligence, Artificial Intelligence and Data Science, Artificial Intelligence and Machine Learning, Computer Science and Business Systems, Computer Science and Design, Computer Science and Engineering ( Cyber Security), Computer Science and Engineering (Artificial Intelligence and Machine Learning), Computer Science and Engineering (Artificial Intelligence), Computer Science and Engineering (Data Science), Computer Science and Engineering (Digital Forensics and Cyber Security), Information Technology, Electronics and Communication, Electrical and Electronics Engineering, Applied Electronics and Instrumentation, Electrical and Computer Engineering, Electronics and Computer Engineering MCA, MSc Computer Science, M Sc in Mathematics /statistics with Valid Gate Score | CS, EE, EC              | Data Sciences           |

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