##### Annexure-II

##### Academic Curriculum for Master of Technology in

**WATER RESOURCES DEVELOPMENT (WRD)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Teaching Scheme** | **Contact Hours per Week** | **Exam. Duration (Hrs.)** | **Relative****Weightage (%)** |
| **S. No** | **SUBJECT CODE** | **COURSE TITLE** | **SUBJECT AREA** | **CREDITS** | **L** | **T** | **P** | **Theory** | **Practical** | **CWS** | **PRS** | **MTE** | **ETE** | **PRE** |
| **1st YEAR I SEMESTER (AUTUMN)**  |
| 1. | WRN-501 | System Design Techniques | PCC | 4 | 3 | 1 | 0 | 3 | - | 20-35 | - | 20-30 | 40-50 | - |
| 2. |  | Program Core Course 1  | PCC | 4 | 3 | 1 | - | 3 | - | 20-35 | - | 20-30 | 40-50 | - |
| 3. |  | Program Core Course 2  | PCC | 4 | 3 | 1 | - | 3 | - | 20-35 | - | 20-30 | 40-50 | - |
| 4. |  | Program Core Course 3  | PCC | 4 | 3 | 1 | - | 3 | - | 20-35 | - | 20-30 | 40-50 | - |
| 5. |  | Program Elective Course  | PEC | 4  | as per elective course |
| **Sub Total** | **20** |  |

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|  II SEMESTER (SPRING)  |
| 1. | WRN-505 | Preparation of Water Resources Project Report | PCC | 2 | - | - | 4 | - | - | - | 50 | - | - | 50 |
| 2. |  | Program Elective Course  | PEC | 4 | 3 | 1 | - | 3 | - | 20-35 | - | 20-30 | 40-50 | - |
| 3. |  | Program Elective Course  | PEC | 4 | 3 | 1 | - | 3 | - | 20-35 | - | 20-30 | 40-50 | - |
| 4. |  | Program Elective Course  | PEC | 4  | as per elective course  |
| 5. |  | Program Elective Course | PEC | 4 | as per elective course  |
| 6. | WRN-700 | Seminar | SEM | 2 | - | - | - | - | - | - | - | 100 | - | - |
| Sub Total | **20** |  |
| Note: *P.G. Diploma course in WRD shall be of ONE YEAR duration comprising of semesters I and II only, with a minimum credits of 40* |

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| **2nd YEAR III SEMESTER (AUTUMN) )** |
| 1. | WRN-701A | Thesis I | DIS | 12 | - | - | - | - | - | - | - | - | 100 | - |
| **Sub Total** | **12** |  |
| **\*** *to be continued and grade to be awarded in the next semester* |
|  **IV SEMESTER (SPRING)** |
| 1. | WRN-701B | Thesis II (continued from 3rd Semester)  | DIS | 18 | - | - | - | - | - | - | - |  | 100 | - |
| **Sub Total** | **18** |  |
| **Total** | **70** |  |

 **PROGRAMME CORE SUBJECTS**

 **For Civil Background**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1. | WRN-502 | Design of Water Resources Structures | PCC | 4 | 3 | 1 | - | 3 | - | 20-35 | - | 20-30 | 40-50 | - |
| 2. | WRN-503 | Water Resources Planning and Management  | PCC | 4 | 3 | 1 |  | 3 | - | 20-35 | - | 20-30 | 40-50 | - |
| 3. | WRN-504 | Applied Hydrology  | PCC | 4 | 3 | 1 | - | 3 | - | 20-35 | - | 20-30 | 40-50 | - |

 **For Electrical Background**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1. | WRN-531 | Hydro Generating Equipment | PCC | 4 | 3 | 1 | - | 3 | - | 20-35 | - | 20-30 | 40-50 |
| 2. | WRN-532 | Hydropower System Planning | PCC | 4 | 3 | 1 |  | 3 | - | 20-35 | - | 20-30 | 40-50 |
| 3. | WRN-533 | Power System Protection Application | PCC | 4 | 3 | 1 | - | 3 | - | 20-35 | - | 20-30 | 40-50 |

 **For Mechanical Background**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1. | WRN-532 | Hydropower System Planning | PCC | 4 | 3 | 1 |  | 3 | - | 20-35 | - | 20-30 | 40-50 |
| 2. | WRN-551 | Design of Hydro Mechanical Equipment | PCC | 4 | 3 | 1 | - | 3 | - | 20-35 | - | 20-30 | 40-50 |
| 3. | WRN-552 | Project Planning and Management  | PCC | 4 | 3 | 1 |  | 3 | - | 20-35 | - | 20-30 | 40-50 |

**Program Elective Courses (WRD**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | WRN-511 | Geotechnical Engineering | PEC | 4 | 3 | 1 | - | 3 | - | 20-35 | - | 20-30 | 40-50 | - |
|  | WRN-512 | Hydropower and Appurtenant Works  | PEC | 4 | 3 | 1 | - | 3 | - | 20-35 | - | 20-30 | 40-50 | - |
|  | WRN-513 | Earth and Rockfill Dams  | PEC | 4 | 3 | 1 | - | 3 | - | 20-35 | - | 20-30 | 40-50 | - |
|  | WRN-514 | Masonry and Concrete Dams  | PEC | 4 | 3 | 1 | - | 3 | - | 20-35 | - | 20-30 | 40-50 | - |
|  | WRN-515 | Irrigation Structures  | PEC | 4 | 3 | 1 | - | 3 | - | 20-35 | - | 20-30 | 40-50 | - |
|  | WRN-516 | Rural and Urban Water Supply | PEC | 4 | 3 | 1 | - | 3 | - | 20-35 | - | 20-30 | 40-50 | - |
|  | WRN-517 | River Engineering | PEC | 4 | 3 | 1 | - | 3 | - | 20-35 | - | 20-30 | 40-50 | - |
|  | WRN-518 | Finite Element Methods | PEC | 4 | 3 | 1 | - | 3 | - | 20-35 | - | 20-30 | 40-50 | - |
|  | WRN-519 | Water Resources System Reliability | PEC | 4 | 3 | 1 | - | 3 | - | 20-35 | - | 20-30 | 40-50 | - |
|  | WRN-520 | Environmental Impact Assessment of Water Resource Projects | PEC | 4 | 3 | 1 | - | 3 | - | 20-35 | - | 20-30 | 40-50 | - |
|  | WRN-521 | Groundwater Hydrology | PEC | 4 | 3 | 1 | - | 3 | - | 20-35 | - | 20-30 | 40-50 | - |
|  | WRN-522 | Climate Change and Water Resources | PEC | 4 | 3 | 1 | - | 3 | - | 20-35 | - | 20-30 | 40-50 | - |
|  | WRN-534 | Substation and Transmission line Design | PEC | 4 | 3 | 1 | - | 3 | - | 20-35 | - | 20-30 | 40-50 | - |
|  | WRN-535 | Installation Maintenance and Testing of Hydro Generating Equipment | PEC | 4 | 3 | 1 | - | 3 | - | 20-35 | - | 20-30 | 40-50 | - |
|  | WRN-536 | Maintenance Management in Power Plants | PEC | 4 | 3 | 1 | - | 3 | - | 20-35 | - | 20-30 | 40-50 | - |
|  | WRN-537 | Power System Management | PEC | 4 | 3 | 1 | - | 3 | - | 20-35 | - | 20-30 | 40-50 | - |
|  | WRN-538 | Electrical Design of Hydro Power Station  | PEC | 4 | 3 | 1 | - | 3 | - | 20-35 | - | 20-30 | 40-50 | - |
|  | WRN-539 | Power System Operation and Control  | PEC | 4 | 3 | 1 | - | 3 | - | 20-35 | - | 20-30 | 40-50 | - |
|  | WRN-540 | Control and Instrumentation of Hydro Power Plant  | PEC | 4 | 3 | 1 | - | 3 | - | 20-35 | - | 20-30 | 40-50 | - |
|  | WRN-541 | Power System Analysis  | PEC | 4 | 3 | 1 | - | 3 | - | 20-35 | - | 20-30 | 40-50 | - |
|  | WRN-542 | Power System Reliability | PEC | 4 | 3 | 1 | - | 3 | - | 20-35 | - | 20-30 | 40-50 | - |
|  | WRN-543 | Insulating Systems  | PEC | 4 | 3 | 1 | - | 3 | - | 20-35 | - | 20-30 | 40-50 | - |
|  | WRN-544 | Planning and Design of Small Hydro Power Schemes  | PEC | 4 | 3 | 1 | - | 3 | - | 20-35 | - | 20-30 | 40-50 | - |
|  | WRN-545 | Power Electronics Controlled Hydro-Electric Systems | PEC | 4 | 3 | 1 | - | 3 | - | 20-35 | - | 20-30 | 40-50 | - |
|  | WRN-546 | Modelling and Simulation of Hydro-Electric Energy Systems | PEC | 4 | 1 | 1 | 4 | 2 | 2 | 20-35 | 20 | - | 40-50 | 20 |
|  | WRN-547 | Synchronous and Asynchronous Generators Laboratory | PEC | 4 | 1 | - | 6 | - | 3 | - | 50 | - | - | 50 |
|  | WRN-548 | Power Electronics Laboratory | PEC | 4 | 1 | - | 6 | - | 3 | - | 50 | - | - | 50 |
|  | WRN-549 | Control and Instrumentation Laboratory | PEC | 4 | 1 | - | 6 | - | 3 | - | 50 | - | - | 50 |
|  | WRN-553 | Design of Construction Job Facilities  | PEC | 4 | 3 | 1 | - | 3 | - | 20-35 | - | 20-30 | 40-50 | - |
|  | WRN-554 | Construction Plant Machinery | PEC | 4 | 3 | 1 | - | 3 | - | 20-35 | - | 20-30 | 40-50 | - |
|  | WRN-555 | Air Conditioning and Ventilation  | PEC | 4 | 3 | 1 | - | 3 | - | 20-35 | - | 20-30 | 40-50 | - |
|  | WRN-556 | Construction Techniques | PEC | 4 | 3 | 1 | - | 3 | - | 20-35 | - | 20-30 | 40-50 | - |
|  | WRN-571 | Design of Irrigation Structures and Drainage Works | PCC | 4 | 3 | 1 | - | 3 | - | 20-35 | - | 20-30 | 40-50 | - |
| 34. | WRN-572 | Soil and Agronomy  | PEC | 4 | 3 | 1 | - | 3 | - | 20-35 | - | 20-30 | 40-50 | - |
| 35. | WRN-580 | Renewable Energy System Technology  | PEC | 4 | 3 | 1 | - | 3 | - | 20-35 | - | 20-30 | 40-50 | - |
| 36. | WRN-581 | Water Quality Monitoring and Modeling  | PEC | 4 | 3 | 1 | - | 3 | - | 20-35 | - | 20-30 | 40-50 | - |
| 37. | WRN-583 | Remote Sensing and GIS Applications in Agriculture  | PEC | 4 | 3 | 1 | - | 3 | - | 20-35 | - | 20-30 | 40-50 | - |
| 38. | WRN-586 | Groundwater Development and Management  | PEC | 4 | 3 | 1 | - | 3 | - | 20-35 | - | 20-30 | 40-50 | - |
| 39 | WRN-587 | Watershed Development and Management  | PEC | 4 | 3 | 1 | - | 3 | - | 20-35 | - | 20-30 | 40-50 | - |
| 40 | WRN-597 | Machine Learning Models in Water Resources Planning and Management | PEC | 4 | 3 | 1 | - | 3 | - | 20-35 | - | 20-30 | 40-50 |  |