SARVAJANIK UNIVERSITY
Sarvajanik College of Engineering and Technology
Bachelor of Technology
Civil Engineering

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B. Tech. III Semester VI

Subject Name : Application of Soft Computing Techniques in Water Resource Engineering **Subject Code:** BTCL14601
Type of course : PEC - II
Prerequisite : Hydrology and Water Resource Management (BTCL13504)
Rationale : Students will be able to enhance the computational knowledge in the field of water resources systems and develop the ability to generate simulation models and use the latest intelligent technology and algorithms.

Teaching and Examination Scheme:

Teaching Scheme				Theory Marks			Practical Marks		Total
L	T	P	C	TEE	CA1	CA2	TEP	CA3	150
3	0	2	4	60	25	15	30	20	

CA1: Continuous Assessment (assignments/projects/open book tests/closed book tests **CA2:** Sincerity in attending classes/class tests/ timely submissions of assignments/self-learning attitude/solving advanced problems **TEE:** Term End Examination **TEP:** Term End Practical Exam (Performance and viva on practical skills learned in course) **CA3:** Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course

Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1	**Computing Techniques** Computer methods in water resources - Algorithms and Flowcharts- Computing techniques -Solution to ordinary and partial differential equation using Finite difference and Method of Characteristic- Numerical integration and differentiation Design of digital models - Visual programming - Graphical user interface - Real computing - Interactive model concepts.	08	15%
2	**Artificial Intelligence** Heuristic search - Knowledge based Expert system concepts - Architecture and applications in Water Resources Management - Expert system shells - Principle of Artificial Neural Network (ANN) - Application of ANN Model to Hydrology and Crop Water Requirement model. Fuzzy Logic concepts and Applications – Genetic Algorithms	10	25%
3	**Digital Data Management** Data base structure - Data acquisition - Data warehouse - Data retrieval- Data format Attribute - RDBMS - Data analysis - Network data sharing - Statistical Analysis (SYSTAT) - Regression - factor analysis - histogram - scatter diagram - Goodness of fit.	09	20%
4	**Simulation Software in Water Resources** Surface water models (HMS) - Storm Water Management Models (SWMM) - Water CAD, STORM CAD - Ground Water Flow models - Visual Modflow.	10	25%
5	**Simulation Models in Irrigation Water Management**	08	15%

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	Soil moisture simulation models - Basin simulation models, Real time operation models - Water Resources Information System, Management Information System.		

Suggested Specification table with Marks (Theory/Practical):

% Distribution of Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
10	25	15	20	20	10

Legends: R: Remembrance, **U:** Understanding; **A:** Application, **N:** Analyze, **E:** Evaluate **C:** Create and above Levels **(Revised Bloom's Taxonomy)**

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Text Books:

Sr. No.	Title of book /article	Author(s)	Publisher and details like ISBN	Year of publication	Publication Edition
1.	Soft Computing and its Applications 2001	Aliev R. A and Aliev Rashad	World Scientific Publications Co. Pvt. Ltd. Singapore, ISBN: 981-02-4700-1	2001	1st
2.	Hydrologic Systems: Rainfall Runoff Modeling	Vijay P Singh	Prentice Hall, ISBN: 978-0134480510	1988	1st
3.	Introduction to hydraulics and hydrology with applications for Storm water Management	John E. Gribbin,	DELMAR, Thomson Learning, USA, ISBN: 0766827941, 9780766827943	2002	1st
4.	Principal of Soft Computing	S. N. Sivanandam, S. N. Deepa	Wily India Publication, ISBN: 978-81-265-8041-5	2011	2nd
5.	Water Resources Systems Planning and Analysis	Loucks Daniel P., Jery R Stedinger and Douglas, A. Haith	Prentice Hall Inc., Englewood Clifts, New Jersey, ISBN-13 : 978-0139459238	1981	1st

Course Outcome:

Sr. No.	CO Statement After learning this subject, students will be able to	Marks % weightage
CO-1	Comprehend soft computing techniques and its applications.*(R,U… - Cognitive Level)*	15
CO-2	Apply the artificial neural networks and its applications. *(U,A,N …- Cognitive Level)*	30
CO-3	Accomplish the digital data. *(N,U,C …- Cognitive Level)*	15
CO-4	Apply software for Simulation in water resources management. *(A,N,C… - Cognitive Level)*	20
CO-5	Formulate Models for simulation in Irrigation Water Management. *(A,N,C… - Cognitive Level)*	20

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Mapping with POs:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO-1	1	2	2	1	3	-	2	1	-	2	-	3	2	3	1
CO-2	1	1	1	1	2	-	1	-	1	1	-	1	1	-	-
CO-3	2	-	-	1	1	1	1	2	2	1	1	-	-	1	-
CO-4	1	2	3	2	2	1	3	1	2	2	1	3	3	2	2
CO-5	2	1	3	2	1	2	3	1	2	2	1	3	3	2	2
Rationale *	**7**	**6**	**9**	**7**	**9**	**4**	**10**	**5**	**7**	**8**	**3**	**10**	**9**	**8**	**5**

Rationale*: All the COs are satisfying the well-defined POs & PSOs up to the certain extent. Students will be able to enhance the computational knowledge in the field of water resources systems and develop the ability to generate simulation models and use the latest intelligent technology and algorithms.

List of Practical:

1. Problems based on digital data management.
2. Problems based on surface water models using HEC-HMS.
3. Problems based on ANN and its applications in water resource engineering
4. Problems based on Water CAD or STORM CAD.
5. Problems based on Modflow.

List of Open Source/learning website:

- https://onlinecourses.nptel.ac.in/noc21_ce60/preview
  - Detail of coverage as Optimization methods for Civil engineering
- https://www.javatpoint.com/artificial-neural-network
  - Detail of coverage as artificial neural network
- https://link.springer.com/journal/500/volumes-and-issues
  - Detail of coverage as soft computing techniques
- https://www.sciencedirect.com/journal/applied-soft-computing
  - Detail of coverage as applied soft computing techniques
- https://libguides.mines.edu/oer/simulationslabs
  - Detail of coverage as simulation software

List of Open Source Software:

- QGIS
- MODFLOW
- SWAT
- HEC-RAS
- HEC-HMS
- MATLAB

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