COURSE TITLE	**AGRO-INFORMATICS**
COURSE CODE	**01CB0601**
COURSE CREDITS	**4**

Objective:

1 The goal of this course is to provide students with the information and abilities needed to maximize agricultural processes by utilizing data analytics for farming technologies.

Course Outcomes: After completion of this course, student will be able to:

1 Apply agro-informatics tools and databases to retrieve biological data.
2 Apply modern tools for agricultural data collection.
3 Analyze genomic, transcriptomic, and agricultural data.
4 Analyze genes and pathways using bioinformatics tools.
5 Evaluate ICT and AI solutions for precision agriculture.

Pre-requisite of course: Basic knowledge of Bioinformatics.

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	0	2	50	30	20	25	25

Contents : Unit	Topics	Contact Hours
1	**Introduction to Agro-informatics** Definition, terminologies, and scope of Agro-informatics, Applications of Agro-informatics, Challenges and opportunities	9
2	**Data collection and management in agriculture** Types of Agricultural data (spatial, temporal, and spectral data), data collection technologies (remote sensing, unmanned aerial vehicles, digital imaging and computer vision, sensor technologies, handheld devices, IoT devices, wearable devices for livestock, and mobile applications) and their applications, data storage and retrieval.	9
3	**Data analysis** Statistical analysis in agriculture, data visualization techniques, high-throughput transcriptomic and genomic data analysis, Genome-wide association study (GWAS), Genomic Selection	8
4	**Agriculture information sources** Agricultural database concepts and their types, importance and Functioning of Agricultural Databases, Plant Genome Databases, Ensembl, Phytozome, Gramene, AGRICOLA, PlantcircBase, miRbase, PlantTFDB, Rice Expression Database, PPMdb, TAIR, GrainGene, BRAD, MaizeDB, SoyBase, TIGR	8

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Contents : Unit	Topics	Contact Hours
5	**Use of Information and communication technologies (ICTs) in agriculture** Geospatial technology, Decision Support Systems, Artificial Intelligence and IoT, Smartphone Apps in Agriculture, E-Agriculture, Concepts and Applications	8
Total Hours		**42**

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	**Module1:** To retrieve plant species genome, GFF, GTF, and proteome data files	2
2	**Module1:** To compare the transcriptomic and genomic SRA data of any plant species	2
3	**Module 2:** To analyze the genomic data of a given plant species in fastq format.	2
4	**Module 2:** To identify transcription factors in given sequences by using PlantTFDB	2
5	**Module 3:** To apply the Venny tool to identify common and unique genes among different combinations of genes.	2
6	**Module 3:** To compare the genome, GFF, and GTF files of individual plant species	2
7	**Module 3:** To perform the protein-protein interaction network analysis	2
8	**Module 3:** To perform the pathway enrichment analysis	2
9	**Module 4:** To classify genes using functional annotation data	2
10	**Module 4:** To analyze KEGG orthology data of selected pathways	2
11	**Module 4:** To identify the genomic coordinates	2
12	**Module 4:** To identify simple sequence repeat (SSR) in plants	2
13	**Module 4:** To compare common and unique genes in plant species	2

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Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
14	**Module 4:** To perform functional annotation of genes	2
Total Hours		**28**

Textbook :

1 Introductory Agri-Informatics, Subrat Kumar Mahapatra,Prasannajit Mishra, Jayashankar Pradhan, Jain Brothers, second edition 2022 ISBN, 2022

2 A Textbook Of Agro-informatics, Dr. Kalpana M , Dr. (Mrs.) C S Sumath, M/s AGROBIOS (INDIA), 2022

References:

1 Genomic Selection in Plants: A Guide for Breeders, Genomic Selection in Plants: A Guide for Breeders, Ani A. Elias, Shailendra Goel, CRC Press, 2022

2 Agro Informatics With Reference to Features, Functions and Emergence as a Discipline in Agricultural Sciences, Agro Informatics With Reference to Features, Functions and Emergence as a Discipline in Agricultural Sciences, Prantosh Paul, RR Sinha, PS Aithal, Ricardo Saavedra M, Bashiru Aremu, An Analysis Asian Journal of Information Science and Technology, 2020

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery					
Remember / Knowledge	**Understand**	**Apply**	**Analyze**	**Evaluate**	**Higher order Thinking / Creative**
20.00	30.00	20.00	10.00	10.00	10.00

Instructional Method:

1 The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

2 The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.

3 Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

Supplementary Resources:

1 https://www.ebi.ac.uk/training/

2 https://omicstutorials.com/

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Supplementary Resources:

3 Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory.

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