KANNUR UNIVERSITY

(Abstract)

MSc Computational Biology Programme (CBCSS)- Credit of Elective Courses reduced from 3 to 2 in the third semester- Modified Scheme and Syllabus implemented in the University Department - w.e.f. 2021 Admission - Orders issued.

ACADEMIC C SECTION

Acad/C4/7627/2021 Dated: 29.12.2022

Read:-1. U.O. No. Acad/C4/7627/2021 dated 27.04.2021
2. Minutes of the meeting of the IQAC, held on 27.07.2022
3. The Minutes of the meeting of the Department Council, Dept of Biotechnology and Microbiology dated 07.10.2022
4. Email from HoD, Dept of Biotechnology and Microbiology forwarding the modified Scheme and Syllabus dated 26.12.2022

ORDER

1. As per paper read (1) above, the Scheme & Syllabus of MSc Computational Biology Programme (CBCSS) was implemented in the University Department - w.e.f 2020 admission.

2. Meeting of Internal Quality Assurance Cell held on 27.07.2022 as per paper read (2) above, resolved that all the Teaching Departments should offer Open Elective Courses, compulsorily in the third semester.

3. As per paper read (3) above, the Department Council, Dept. of Biotechnology and Microbiology resolved to opt one Elective with 2 Credits, and one Open Elective with 4 Credits from other Department, and also to reduce the Credit of Elective Courses from 3 to 2, so as to keep total credits 80, in the third semester. The Department Council further resolved not to offer any Open Elective Course for other Departments.

4. As per paper read (4) above, HoD, Dept. of Biotechnology and Microbiology submitted the modified Scheme and Syllabus of MSc Computational Biology Programme (CBCSS) for implementation with effect from 2021 admission.

5. The Vice Chancellor after considering the matter in detail and in exercise of the powers of the Academic Council conferred under section 11 (1) Chapter III of Kannur University Act 1996, accorded sanction to implement the modified Scheme and Syllabus of MSc Computational Biology Programme (CBCSS) in the Dept of Biotechnology and Microbiology, Dr. Janaki Ammal Campus, Palayad as detailed in para (3) above, with effect from 2021 admission, and to report to the Academic Council.

6.The modified Scheme & Syllabus of MSc Computational Biology Programme (CBCSS) implemented with effect from 2021 admission are appended and uploaded on the University Website.(www.kannuruniversity.ac.in).

7.The UO read (1) above stand modified to this effect

Orders are issued accordingly.

Sd/-
BALACHANDRAN V K
DEPUTY REGISTRAR (ACAD)
For REGISTRAR

To: 1.The Head, Dept. of Biotechnology and Microbiology
Dr. Janaki Ammal Campus, Palayad

Copy To: 1. The Examination Branch (through PA to CE).
2. PS to VC / PA to PVC / PA to R
3. DR / AR 1/ AR II (Acad), EXCI, EPIV
4. The Web Manager (for uploading in the Website), Computer Programmer
5. SF / DF /FC

KANNUR UNIVERSITY CIVIL STATION P.O. KANNUR Pin-670 002 THAVAKKARA

Forwarded / By Order

SECTION OFFICER

KANNUR UNIVERSITY

DEPARTMENT OF BIOTECHNOLOGY AND MICROBIOLOGY

SCHEME AND SYLLABUS

M Sc COMPUTATIONAL BIOLOGY

2021 ADMISSION ONWARDS

SchemeandSyllabusof
MScComputationalBiologyProgrammeUnderthe
ChoiceBasedCreditSemesterSystemwith
effectfrom2021Admission

SCHEMEANDSYLLABUSOFM.Sc.COMPUTATIONALBIOLOGYPROGRAMME

(UndertheChoiceBasedCreditSemesterSystem witheffectfrom2020Admission)

AbouttheDepartment

The DepartmentofBiotechnology andMicrobiology of KannurUniversity established in theyear2000atPalayad,ThalasseryoffersM.Sc.,Ph.D.andPost-doctoralprogramsinBiotechnology and Microbiology.The Department is a Centre of Excellence in Biosciences,receiving research funds from state, national and international agencies. Our vision is to improvequality of life through research and molding future scientists and individuals who will be a workforceto makeabetter tomorrow.

ProgramSpecificOutcomes(PSOs):

Apost-graduatestudentinthefrontierandmultidisciplinaryareasofComputationalBiologyuponcompletion oftheprogrammeis expectedtogain the following attributes:

- Capabilitytobecome futurescientists,teachers,andentrepreneurs.
- Competencefor researchandinnovationinComputationalBiology
- TechnicalskillsforthebettermentofplanetEarth
- Criticalthinkingabilitytoreviewscientificliteratureassteppingstonetoresearch
- Confidenceforcareerchoice.
- Abilitytoworkindependentlyinchosenresearchtopicsaswellasbepartofteamworkwithcollaborativeskills.
- Confidenceinscientificconversationandwritingskillsandknowingethicalbehavior

DURATIONANDOTHERDETAILS OFTHEPROGRAMME

- Thewholeprogramisdivided intofoursemesters (twoyears)
- Thenumberofstudents"intake(anticipated)is12(Twelve)
- Feestructureof theprogram is sameas that of M.Sc. BiotechnologyandMicrobiology

ELIGIBILITYFORADMISSION

1. The student is required to obtain at least 50% in his/her Bachelor's programme with notlessthan 50%marks in aggregate(excludinglanguages).
2. Bachelor"s degree in any branch of science/technology/medicine (with degrees such asBSc,BE,BTech,BPharm,MBBS, BDS,BVScandBAMS)
3. Theeligiblesubjectareasinclude:Lifesciences(botany,zoology,genetics,humanbiology,generallifesciences,ecology,environmentalbiology),bioinformatics,microbiology,biotechnology,chemistry,physics,mathematics,computerscience/informationtechnology,statistics,any branchofengineering,pharmaceuticalsciences,agriculture,medicine,dentistry,horticulture,forestry,andveterinarysciences.
4. Those who are awaiting final year results of their bachelor"s degree also can apply, buttheymust fulfill the eligibilitycriteria beforethe admission.
5. Eligible relaxation in the percentage of marks will be given to candidates belonging to SCandST.ReservationpoliciesoftheUniversity/Statearefollowedforadmission.

ADMISSIONPROCEDURE

Admissions are notified in national newspapers inviting applications for the M.Sc. programmeofferedbythe Department.

All the eligible applicants must appear for a written entrance test. Duration of the entrance testwill be 120 minutes with 200 objective type multiple choice questions for 100 marks. Questionswill be focused on thebiology, chemistry, physics, mathematics, and computer science at thebasic level.Therewill be25%negativemarks forthewronganswers.Arank listwill be preparedbased on the entrance test.The admission will be as per the rank in the list and reservationpolicy.

CURRICULUM

The MSc curriculum of Computational Biology closely follows the level and extent as conceivedbythenationalcurriculadevelopmentcentersofUGC/DBT.TheChoiceBasedCreditSemester

System (CBCSS) provides an opportunity for the students to choose courses from the prescribedcourses comprising core and elective courses. The evaluation of the courses will be throughgrading system evaluation and computation of the Cumulative Grade Point Average (CGPA)basedonstudent"sperformanceininternalandexternalexaminations.

COURSESANDCREDITS

Definitions:

I. „**AcademicProgramme'**meanstheentire course of study includingitsprogrammestructure,detailsofthecourse,evaluationmethodsetc. Thiswillbecarriedoutbyteaching and evaluation process in the parent department / centre or jointly under morethanonesuchDepartment/ Centre

II. **'Course'**meansisasubjectthatispartofanAcademicProgramme

III. **'Programme Structure'** includes the list of courses (Core, Elective, Open Elective) thatforms an Academic Programme which specifies the syllabus, credits, hours of teaching,evaluationprocessandexaminationschemes,theminimumcreditsrequiredforsuccessful completion of the programme etc. prepared in conformity to University Rulesandeligibilitycriteriafor admission

IV. **'Core Course'** means a course that a student admitted to a particular programme mustsuccessfullycompletecompulsorilytoreceivethedegreeandthatwhichcannotbesubstituted byanyother course

V. **'Elective Course'** means an optional course to be selected by a student out of suchcoursesoffered in thesame oranyother Department/Centre

VI. „**Open Elective'** means an elective course which is available from recognized onlineresources like Swayam/ MOOCS or offered by other departments within the frame workofthe subject.

VII. **'Credit'** is the value assigned to a course which indicates the level of instruction; 1lectureper weekequals 1 Credit,3 hourspractical class perweek equals1 credit.

VIII. „**SGPA'**meansGradePointAverageofthesemestercalculatedforindividualsemester.

IX. **'CGPA'** is Cumulative Grade Points Average calculated for all courses completed by thestudents at the end of the programme. A formula for conversion of CGPA into percentagemarkswill be given in themark sheet.

Aminimumof 80 creditsaremandatoryfor thesuccessful completion oftheprogramme.

Students can opt for one elective (open elective) course relevant to Computational Biologyprogramfromonlinesourcesapprovedbytheuniversity(SwayamPlatformorsimilarplatforms) or other Departmentsduring second and third semester. The choice of the studentmust be reported to the Head of the Department and approved by the Department Council. Theminimum credits per semester is 16 and the maximum credits per semester (core and electiveinclusive) cannotcross24. Allstudentshave tooptfor equalnumberof electivesineachsemester.

If the student does not earn the required credits by not appearing for the exam or due to otherreasons, the course will have to be repeated along with the concurrent semester of the next batchafterthe approval bytheDC.

PROJECTWORK

Students have to take up a research project of 5 months duration in the fourth semester for whichtheyareencouragedtogotonationalresearchinstitutes.Thestudentsmayalsogetopportunitytoun dergo 1-2 weekstrainingin industrial/ research institutionsin the field.

EVALUATION

The marks for Continuous Evaluation and End Semester Examination will be in the ratio 40:60.Allocation of marks for each component under continuous evaluation of theory courses shall beasgivenbelow.

ContinuousEvaluation:TheoryPaper(40Marks)

Assignment	Testpapers	Seminar	Total
8	16	16	40

ContinuousEvaluation:Practical(40 Marks)

Mid-semester test/viva	Record	Total

30	10	40

EndSemesterExaminationPractical:(60Marks)

The teacher conducting the practical examination will decide the components of the examEndSemesterExaminationTheory:Written examinationfor 60Marks

ATTENDANCE:

The minimum attendance required for each course in a semester shall be 60% of the total numberof classes conducted for the course. Only those who secure the minimum attendance requirementinthesemesterwill beallowed to register for theEnd Semester Examination.

TENURE

Astudentmustcompletethe entireprogram within fouryears fromthe dateofregistration

CoursesofferedintheM.Sc.ComputationalBiologyProgrammeTotalcredits80

SemesterI

Core:6(Theory:4Practical:2)Electives:2
Credits:Core:16Elective:6Total:22Credits

Sl. No	Course Code	Titleofthecourse	Contacthours /week			Marks			Credits
			L	T/S	P	ESE	CE	Total	
	CoreCourses								
1	MSCPB01C01	Biochemistry	3	2		60	40	100	3
2	MSCPB01C02	Biologicaldatabasemanagementsystems	3	2		60	40	100	3
3	MSCPB01C03	Basicsofcomputing	3	2		60	40	100	3
4	MSCPB01C04	Biostatistics	3	2		60	40	100	3
5	MSCPB01C05	Practical1:BiochemistryandBiological Databases			3+3	60	40	100	2
6	MSCPB01C06	Practical2:ProgramminglabI–Basic ComputingandApplicationofRpr ogramming			3+3	60	40	100	2
	ElectiveCourses								
7	MSCPB01E01	CellBiologyandGenetics	3	2		60	40	100	3
8	MSCPB01E02	Instrumentation	3	2		60	40	100	3
	Total Credits								

SemesterII

Courses:Core:3(Theory:2,Practical:1)Electives:4(Students must choose 4 elective courses from 5)Credits:Core:8,Elective:12,Total=20

Sl. No.	Course Code	Titleofthecourse	Contact hours/week			Marks			Credits
			L	T/S	P	ESE	CE	Total	
	Corecourses								
9	MSCPB02C07	SequenceAnalysis	3	2		60	40	100	3
10	MSCPB02C08	PythonprogramingandBiomolecular simulations	3	2		60	40	100	3
11	MSCPB02C09	Practical3:ProgramingLabII– PythonprogramingandBiomolecularsimulations			3+3	60	40	100	2
	Electivecourses(4/5)								
12	MSCPB02E03	StructuralBiology	3	2		60	40	100	3
13	MSCPB02E04	AdvancedAlgorithmsin ComputationalBiology	3	2		60	40	100	3
14	MSCPB02E05	MolecularBiology	3	2		60	40	100	3
15	MSCPB02E06	Immunology	3	2		60	40	100	3

16	MSCPB02E07	Ethics,PatencyandIntellectual PropertyRights	3	2		60	40	100	3
	Total Credits								20

SemesterIII
Core(Theory:4 Practical:2)Electives:2
Credits:Core:16Elective:6Total:22CreditsStude ntshavetochooseTwoElectivesfromFour

Sl. No.	Course Code	Titleofthecourse	Contact hours/week			Marks			Credits
			L	T/S	P	ESE	CE	Total	
	Corecourses								
17	MSCPB03C10	GenomicsandProteomics	3	2		60	40	100	3
18	MSCPB03C11	SystemsBiology	3	2		60	40	100	3
19	MSCPB03C12	CheminformaticsandComputerAided DrugDesign	3	2		60	40	100	3
20	MSCPB03C13	ProgramminginJavaandBiojava	3	2		60	40	100	3
21	MSCPB03C14	Practical4:Genomics,Proteomics andCheminformatics			3+3	60	40	100	2
22	MSCPB03C15	Practical 5: Programming lab III– JavaandBiojava			3+3	60	40	100	2
	Electivecourses(1/4)								
23	MSCPB03E08	Enzymology	2	2	0	60	40	100	2
24	MSCPB03E09	BiotechnologyinMedicine,Health, AgricultureandEnvironment	2	2	0	60	40	100	2
25	MSCPB03E10	RecombinantDNATechnology	2	2	0	60	40	100	2
26	MSCPB03E11	EnvironmentalMicrobiology	2	2	0	60	40	100	2
27		Open elective	4	2		60	40	100	4
	Total Credits								22
Students have to select one elective from the above list and one open elective from other departments.									

Semester
IVCourses:Core:1Credits:16

Sl. No.	Course Code	Titleofthecourse	Contact hours/week			Marks			Credits
		Core	L	T/S	P	ESE	CE	Total	
27	MSCPB04C16	ResearchandDissertation		5	25	60	40	100	**16**

The continuous evaluation of the project work shall be done by the research supervisor based onthe performance of the student in the lab. The end semester evaluation consists of a presentationandaviva vocebased onthe project.

SEMESTERI

(TotalCreditsRequired:22)

MSCPB01C01:
BIOCHEMISTRY
3CREDITS(48 Hours)

CourseObjectives:

1. Understandstructureandfunctionofbiological macromolecules.
2. UnderstandChemicalchanges takingplaceinthelivingcells.
3. Understandtransportacrossbiologicalmembranes.
4. Understandthe roleof smallmoleculesinthebiologicalsystem.

CourseOutcome:

Upon completion of this course, students will be able to explain and demonstrate the structure,function and dispersal of the basic building blocks of life-the chemical components of livingorganisms

CourseContent:

ModuleI

Introduction:Molecularlogicoflivingsystem,Biologicalmacromolecules.ImportanceofBiochemistryincontemporarymedicineanditsperspectives.Membranes:Structureandfunctionsofdifferentmembranesandreasonsfortheircomposition.Membranetransport:Passive transport, co-transport, anti-port, active transport, secondary active transport, Pumps andchannelsand their significance, Membraneproteins. **(10 Hrs)**

ModuleII

Carbohydrates:Definitionandclassification,Structure,conformationandfunctionsofmonosaccharides,disaccharides,polysaccharides.Starch,glycogen,dextrin,cellulose,aminosugars, Glycoproteins, Glycolipids, Mucopolysaccharides. Lipids: Definition and classification,structure, function, physical and chemical properties –Fatty acids, Fats, Waxes, Phospholipids,Sphingolipids,Cerebrosides,Gangliosides,Sterols,lipoproteins.Eicosanoids-Formationofprostaglandins;prostacyclinandthromboxanefromunsaturatedfattyacids,Saponificationnumber,acid number andiodinenumberof fats.**(14Hrs)**

ModuleIII

Proteins:Propertiesofpeptidesandproteins,Aminoacids,theirproperties,andtheirclassificationaccordingtothepolarityoftheirsidechainsandaccordingtotheacid-baseproperties. Essential and non-essential amino acids, Structure of peptides and proteins, theirprimary structure, structures of higher order and their meaning for the function of peptides andproteins.Protein-proteininteraction.Nucleicacids:Definitionandclassification,structure,function, physical and chemical properties -Purines and pyrimidines, base pairing, Hoogsteenbasepairing. **(12Hrs)**

ModuleIV

Vitaminsandminerals:chemistry,sourceandfunctionsofwatersolubleandfat-solublevitamins. Role of vitamins as cofactors. Source and functions of macro elements and traceelements,Hormones&RelatedMolecules:Chemistry,synthesisandfunctionsofvarioushormones(Plant&Animal),pigments(Plant&Animal),Pheromonesandneurotransmitters**(12Hrs)**

References

1. Lehninger"sPrincipleofBiochemistry.NelsonLDandMMCox.
2. Biochemistry.JeremyM.BergJohnandTymoczkoLubertStryer.
3. BiochemistrywithClinicalCorrelation.Thomas MDevlin.Wiley- Liss
4. Biochemistry.DonaldVoet,JudithGVoet,Charlottewpratt.JohnWiley
5. Biochemistry.JeoffreryZubay.WmCBrownPub.
6. Biochemistry.MathewsCKandKE.vanHolde.BenjaminCummingPub.
7. Biochemistry.Vol1&2DavidMetzler.

MSCPB01C02:BIOLOGICALDATABASEMANAGEMENTSYSTEMS
3CreditCourse(48hours)

Courseobjectives:

1. Tounderstandbasicstheoryandpracticeofdatabasemanagementsystems
2. Tounderstandrelationalmodel
3. TogiveanoverviewofSQLanddatamining
4. Understanddifferentbiologicaldatabases

Courseoutcomes:

Uponcompletionofthis curse,studentswill beabletounderstand thedatabasemanagementsystems,collectingandretrievingdata, anddifferent biological databases.

Coursecontent:

ModuleI

Introductiontodatabases:Traditionalfilesystem,dataandneedforinformation,databaseapproach, data models, Database languages, Database users, Classification of database systems,Database Design - Overview of the Design Process, Entity-Relationship Model, ER Diagrams,Data Storage and Querying, Transaction Management, Database Architecture, Database UsersandAdministrators **(11 hrs)**

ModuleII

Introduction to Relational model: Basic concepts: Domains Attributes, keys, tuples, Relations,Relational database schemas, Relational Database Design: Features of Good Relational Designs,AtomicDomainsandFirstNormalForm,DecompositionUsingFunctionalDependencies,Functional-DependencyTheory,AlgorithmsforDecomposition,DecompositionUsingMultivaluedDependencies, MoreNormal Forms,ModelingTemporal Data.**(11hrs)**

ModuleIII

Structured Query Language: Overview of the SQL Query Language, SQL Data Definition, BasicStructure of SQL Queries, Additional Basic Operations, Set Operations, Null Values, AggregateFunctions,NestedSubqueries,ModificationoftheDatabase.IntroductiontoDatamining:Classification,Clustering, DataWarehousing, Applicationsof Data Mining.**(11 hrs)**

ModuleIV

Biological databases: Primary, secondary and composite databases. Types of Biological data:sequence:structure,function,literature,Nucleotidesequencedatabases-GenBank,EMBL,DDBJ.Genome databases, Protein Sequence Databases- UniProtKB, UniProt, TrEMBL, Swiss-Prot, UniProt, Secondary and composite databases: MMDB, SCOP, CATH, KEGG ENZYME,BRENDA,Prosite,ProDom,Pfam,InterPro;MetagenomicandEnvironmentalSequences-UniMES.LiteratureDatabases-PubMed,PLos, BioMedCentral.Databasefileformatsandretrieval system: GenBank, FASTA, ALN/ClustalW2, PIR; Text-based search engines (Entrez,DBGET/LinkDB).BiologicalDatabaseManagement-IntroductiontoBiologicalDataIntegration,challengesfaced intheintegrationofBiologicalInformation.**(15hrs)**

References

1. DatabaseSystemConceptsbyHenryF.Korth,AbrahamSilberschatz,S.Sudarshan,TataMac-Graw Hill.
2. An Introductionto DatabaseSystems byC.J. Date,Addison-Wesley.
3. IntroductiontoDatabaseSystems,ItlEducationSolutionsLimited,PearsonEducation

4. Introduction toDatabase Management Systems,AtulKahate,Pearson EducationIndia
5. N.Gautham;Bioinformatics:DatabasesandAlgorithms;AlphaScience.
6. D.W.Mount;BioinformaticsSequenceandGenomeAnalysis;ColdSpringLaboratoryPress.
7. F.JBurkowski;StructuralBioinformatics:AnAlgorithmicApproach;CRCPress.
8. A.MLesk;Introduction toBioinformatics;OxfordUniversityPress.
9. J.Bedell,I.KorfandM.Yandell;BLAST;O'ReillyPress.
10. J. M. Keith; Bioinformatics Vol. 1, Data, sequence analysis & evolution; HumanaPress.
11. R.Durbin;Biologicalsequenceanalysis;CambridgeUniversityPress.
12. R.M.Holmes;Acellbiologists'guidetomodelingandbioinformatics;WileyInterscience.

MSCPB01C03:BASICS OFCOMPUTING
3CreditsCourse(48hours)

Courseobjectives:

1. Understandthehardwareorganizationofdigitalcomputersandoperatingsystems
2. Understandbasicsofcomputernetworking
3. Understandbasics of HTML
4. Understandbasicsofcomputerprograming

Courseoutcome:

Studentsshall beable to

1. Explainthefunctioningofcomputerhardwareandoperatingsystem
2. Explainthefunctioningofnetworkinganddatacommunication
3. Understandthebasicswebdesigning
4. WritesimplecomputerprogramsusingR

Coursecontent:

ModuleI

FundamentalsofComputing:Introductiontocomputer,Operationofprocessor;NumberSystemsandDigitalCircuits;ALU;MemoryChips(ROM,RAM,DRAM),StorageDevices,

Memory Hierarchy; I/O Devices; Moore's Law, Classification of computers (Notebook, PersonalComputers,Workstation,Mainframes,Minicomputers,Microcomputers,Supercomputers).I ntroduction to operating systems: Characteristics and Types of Operating system like DOS,windowsXP, Window-NT,LINUX.Introductionto ComputerViruses.**(10hrs)**

ModuleII

ComputerNetworking:OSIreferencemodel,NetworkTopologies,Router,Switch,Networkcards, Data Communication (ISDN, Cable Modem, Wireless Modem),Concept of Wirelessnetworking, LAN, WAN, MAN, Security of the network, Firewalls, TCP/IP family of protocols,Concepts of client Server Architecture, Concept of search Engine - Database search engines.Introduction to Internet, World Wide Web, Advantages of Web, Web Terminology, Concepts ofDomain,Conceptof WebBrowser, Internet Services,InternetTools. Telnet,FTP.**(12hrs)**

ModuleIII

HTML:Introduction,commontags,creatinghyperlinks,incorporationofimages;Tables;Frames; Formatting of text with fonts; Dynamic HTML; cascading style sheets; Creation ofBackground images, HTML object models; dynamic positioning; direct animation path control.**(12 hrs)**

ModuleIV

Introductiontoprogramming:Thebasicmodelofcomputing,algorithmandflowcharts,programmingla nguages,compilation,linking,testing,debugginganddocumentation.Introductionto R programing.**(14 hrs)**

References

1. GurvinderSingh,RachhpalSingh.ATextbookonWindowsBasedComputerCourses,Kaly ani Publishers, Jalandhar
2. RachhpalSingh,MamtaVerma,SoniaMahindru.A TextbookofScriptingLanguageandWeb Designing,Kalyani Publishers,Jalandhar
3. KapilaH.PCComputingWindowBasedComputerSystem.DineshPublishers,Jalandhar.
4. Norton"sP.IntroductiontoComputing.McGrawHillEducation,NewDelhi.
5. SinhaP.K.FundamentalofComputers.BPBPublication,NewDelhi.
6. E.Siever;LinuxinaNutshell;O'ReillyPublication,6thedition,2009.
7. L.Robert;LinuxSystemProgramming;ShroffPublishersandDistributorsPrivateLtd, 2ndrevisededition,2014.
8. M.J.Bach;TheDesignoftheUNIXOperatingSystem;PearsonEducationIndia,1steditio n,2015.

MSCPB01C04:BIOSTATISTICS
3Credits(48Hours)

Courseobjectives:

1. Understanddatatypesanddatapresentations.
2. Understandthe conceptsofaveragesanddispersionofmeasurement values.
3. Understand theconcept of probabilityand probabilitydistributions.
4. Understandthemethodoftestingstatisticalhypotheses.

Courseoutcomes:

Studentsshall beable to

1. Makegraphical/diagrammaticrepresentationofgivenstatisticaldata.
2. Calculatemeasuresof centraltendenciesandmeasuresofdispersionofa givensetofvalues.
3. Explain differentprobabilitydistributions.
4. Testhypothesisusingnormal, students-t,chisquareandFdistributions.

Coursecontent:

ModuleI

Collection,classificationanddiagrammaticrepresentationofstatisticaldata:Variablesandconstants, Different types of numerical data, Collection of data, Sampling techniques, Randomsampling,Stratifiedrandomsampling.Classificationandtabulationofdata,frequencydistribution.Graphical/diagrammatic representation of data: line charts, Bar charts, Pie-chart,Histograms,frequencypolygons, ogives.**(12 hrs)**

ModuleII

Measures of central tendency: Arithmetic mean, Median, Mode, Geometric and Harmonic mean.Measuresofdispersion:Range,Inter-quartilerange,VarianceandStandardDeviation,coefficient of variation. Correlation and Regression: Relation between two variables, scatterdiagram, definition of correlations, Pearson"s correlation coefficient, Spearman Rank correlationcoefficient. Definition of regression: regression lines. Fitting lines using method of least squares.(**14hrs)**

ModuleIII

Probabilityandprobabilitydistributions:Permutationandcombination,typesofevents,Definitionofprobability,additionandmultiplicationtheoremsofprobability.Probabilitydistributions: Binomial, Poisson and Normal distributions. Skewness and Kurtosis: Definitions,KarlPearsonscoefficients of Skewness and Kurtosis,moments.**(10 hrs)**

ModuleIV

Normal distribution and statistical inference: Central Limit Theorem, Concept of confidenceinterval:Estimation,confidencelimit,levelofsignificance,standarderror.Statisticalhypotheses,Testsofsignificanceofmeans,differencebetweentwomeansandproportion.Student"st-distributionandtestingofhypothesisforsmallsamples.Chi-squaredistribution,Chi-

squaredtestsforindependenceandforgoodnessoffit,F-distributionandAnalysisofvariance.**(12hrs)**

References

1. PrinciplesofBiostatistics-PaganoM.&KimberleeG.DuxburyPress
2. ProbabilityandStatisticalInference-HoggR. V.Tanis E.A.,PrenticeHall,New Jersey
3. Experimental Design Data Analysis for Biologists-QuinnG. P. &KeoughM. J. CambridgeUniversity7Press
4. StatisticalMethodsinBiology-3rdedition,BaileyN.T.J.,CambridgeUniversityPress
5. Biostatisticalanalysis -4th edition,Zar,J.H.PearsonEducation.
6. FundamentalsofBiostatistics – P.HanmanthRaoandK.Janardhan,I.K.InternationalPublishingHouse, NewDelhi.
7. Introduction to Biostatistics and Research Methods-P.S.S. SundarRaoandJ.Richard, PHIlearningPvtLtd, New Delhi.

MSCPB01C05: Practical1BiochemistryandBiologicalDatabases2Credits (96 Hours)

Biochemistry

1. Qualitativeanalysisofcarbohydrates.
2. Qualitativeanalysisofproteins.
3. Qualitativeanalysisoflipids.
4. Estimationof protein.
5. Estimationoflipids(cholesterol,phospholipids,triacylglycerols).
6. Estimationofcarbohydrates(glucose,fructose,lactose,starch).
7. Denaturationstudiesonproteins.
8. Extractionoftotalnucleicacidsfromplanttissue.
9. PreparationofbuffersofrequiredpH.
10. Purificationofproteinsusingdialysis.
11. Separationofaminoacidsusingpaperchromatography.

References

1. DavidPlummer,AnIntroductiontoPracticalBiochemistry,McGrawHill
2. HaroldVarley,PracticalClinicalBiochemistry,byGowenlockA.H.,CBS.
3. HansBisswanger,PracticalEnzymology.WileyVCH.
4. RobertEisenthal,EnzymeAssays:APractical Approach,OxfordUniversityPress
5. Sadasivam&Manickam,BiochemicalMethods,NewAge International
6. DMVasudevan&SubirKumarDas,PracticalTextbookOfBiochemistry,JaypeeBrothers
7. SK.Sawhney,RandhirSingh,IntroductoryPracticalBiochemistry.AlphaScienceInternational

BiologicalDatabase

1. Makelistof Biologicaldatabasesfor DNA andprotein bybrowsingsearchengines.
2. Visit NCBI, EMBL, and DDBJ. Explore them, List out the salient features of thesedatabases. Retrieve the gene sequences by exploring and querying the nucleic aciddatabases,Retrievetheproteinsequencesbyexploringandqueryingtheproteindatabases, Find the chromosomal location of gene sequence and basic experiments inNCBImapviewer
3. Exercises to understand DBMS: Creating and working with databases, creating tables,droppingtables,primaryandsecondarykeys,datavalidation,cursors,storedprocedures.Oracle/PosGreSQL-Usageofimportant commands/instructions.

References

1. DatabaseSystemConceptsbyHenryF.Korth,AbrahamSilberschatz,S.Sudarshan,TataMac-Graw Hill.
2. An Introductionto DatabaseSystems byC.J. Date,Addison-Wesley.
3. IntroductiontoDatabaseSystems,ItlEducationSolutionsLimited,PearsonEducation
4. Introduction toDatabase Management Systems,AtulKahate, PearsonEducationIndia
5. N.Gautham;Bioinformatics:DatabasesandAlgorithms;AlphaScience.
6. D.W.Mount;BioinformaticsSequenceandGenomeAnalysis;ColdSpringLaboratoryPress.
7. F.JBurkowski;StructuralBioinformatics:AnAlgorithmicApproach;CRCPress.
8. A.MLesk;Introduction toBioinformatics;OxfordUniversityPress.
9. J.Bedell,I.KorfandM.Yandell;BLAST;O'ReillyPress.
10. J.M.Keith;BioinformaticsVol.1,Data,sequenceanalysis&evolution;HumanaPress.
11. R.Durbin;Biologicalsequenceanalysis;CambridgeUniversityPress.
12. R.M.Holmes;Acellbiologists'guidetomodelingandbioinformatics;WileyInterscience.

MSCPB01C06:Practical2
ProgramminglabI–
BasicComputingandApplicationofRProgramming2Credits (96 hours)

BasicComputing

1. Introductiontooperatingsystems(DOS,Windows, Linux etc)andtheirinstallation.