LESSON PLAN
Semester-VI

Type	Code	COMPUTER GRAPHICS	L-T-P	Credits	Marks
CS	CC-13		3-1-2	4	100
Topic Objective		To be able to learn the core concepts of Computer Graphics. To be able to create effective programs for solving graphics problems.			
Prerequisites		Problem solving ability, Some idea on Number Theory, Linear Algebra, Graph Theory, pseudo code and programming experience in 'C'.			
Lecture Scheme		Regular lectures (classroom/virtual class with computer/Smartphone) with use of ICT as and when required, lectures are planned to be interactive with focus on application.			

Evaluation Scheme

Internal Assessment			Written Assessment	Total
Assignment(s)	Unit Test	Mid-Term (Written)	End-Term	
		15	60	75

University Syllabus

Unit No	Topics	Hours
Unit-1	Computer Graphics: A Survey of Computer graphics, Overview of Graphics System: Video Display Devices, Raster-Scan Systems, Input Devices, Hard-Copy Devices, Graphics Software.	10
Unit-2	Graphics Output Primitives: Point and Lines, Algorithms for line, circle & ellipse generation, Filled-Area Primitives. Attributes of Graphics Primitives: Point, line, curve attributes, fill area attributes, Fill methods for areas with irregular boundaries.	10
Unit-3	Geometric Transformations (both 2-D & 3-D): Basic Geometric Transformations, Transformation Matrix, Types of transformation in 2-D and 3-D Graphics: Scaling, Reflection, shear transformation, rotation, translation. 2-D, 3-D transformation using homogeneous coordinates.	10
Unit-4	Two Dimensional Viewing: Introduction to viewing and clipping, Viewing transformation in 2-D, Viewing pipeline, Clipping Window, Clipping Algorithms: Point clipping, Line clipping and Polygon clipping.	10
	Total (Hours)	40

Text Books:
1. Mathematical Elements for Computer Graphics, D. F. Rogers & J. A. Adams, MGH, 2/ed. 2. Donald Hearn & M. Pauline Baker, "Computer Graphics with OpenGL", Pearson Education.

Type	Code	LESSON PLAN	L-T-P	Credits	Marks
Lecture No	Unit No	**COMPUTER GRAPHICS**	3-1-2	4	75
Lecture 1	1	**Topic:** A Survey of Computer graphics **Ref:** TB (1.1, 1.2,1.3,pg 24-33); OR1;OR2;OR3;OR4;OR5;			
Lecture 2	1	**Topic:** A Survey of Computer graphics **Ref:** TB (1.4,1.5,1.6,1.7,pg 34-52); OR1;OR2;OR3;OR4;OR5;			
Lecture 3	1	**Topic:** Overview of Graphics System: Video Display Devices **Ref:** TB (2.1,pg 53-56); OR1;OR2;OR3;OR4;OR5;			
Lecture 4	1	**Topic:** Overview of Graphics System: Video Display Devices **Ref:** TB(2.1,pg 57-61); OR1;OR2;OR3;OR4;OR5;			
Lecture 5	1	**Topic:** Raster-Scan Systems **Ref:** TB(2.2,pg 73-75); OR1;OR2;OR3;OR4;OR5;			
Lecture 6	1	**Topic:** Input Devices **Ref:** TB (2.5, pg 80-85); OR1;OR2;OR3;OR4;OR5;			
Lecture 7	1	**Topic:** Input Devices **Ref:** TB (2.5,pg 85-90); OR1;OR2;OR3;OR4;OR5;			
Lecture 8	1	**Topic:** Hard-Copy Devices **Ref:** TB (2.6,pg 91-94); OR1;OR2;OR3;OR4;OR5;			
Lecture 9	1	**Topic**: Graphics Software **Ref:** TB (2.7,pg 95-97); OR1;OR2;OR3;OR4;OR5;			
Lecture 10	1	**Topic:** Graphics Software **Ref:** TB (2.7,pg 98-99); OR1;OR2;OR3;OR4;OR5;			
Lecture 11	2	**Topic** : Graphics Output Primitives: Point and Lines **Ref:** TB (3.1,pg 103-104); OR1;OR2;OR3;OR4;OR5;			
Lecture 12	2	**Topic:** Graphics Output Primitives: Point and Lines **Ref:** TB (3.1,pg 104-106); OR1;OR2;OR3;OR4;OR5			
Lecture 13	2	**Topic:** Algorithms for line **Ref:** TB (3.2-3.4,pg 112-115); OR1;OR2;OR3;OR4;OR5;			
Lecture 14	2	**Topic:** Algorithm for circle generation **Ref:** TB (3.5,pg 117-119); OR1;OR2;OR3;OR4;OR5;			
Lecture 15	2	**Topic:** Algorithm for ellipse generation **Ref:** TB (3.6,pg 122-125); OR1;OR2;OR3;OR4;OR5;			
Lecture 16	2	**Topic:** Filled-Area Primitives **Ref:** TB (3.11,pg 137-146); OR1;OR2;OR3;OR4;OR5;			
Lecture 17	2	**Topic:** Attributes of Output Primitives: Point and Line attribute **Ref:** TB (4.1,pg 163-170); OR1;OR2;OR3;OR4;OR5;			
Lecture 18	2	**Topic:** Attributes of Graphics Primitives: Curve attribute **Ref:** TB (4.2,pg 171-178); OR1;OR2;OR3;OR4;OR5;			
Lecture 19	2	**Topic:** Fill area attributes **Ref:** TB (4.3,pg 179-181); OR1;OR2;OR3;OR4;OR5;			
Lecture 20	2	**Topic:** Fill methods for areas with irregular boundaries **Ref:** TB (4.4, pg 182-183); OR1;OR2;OR3;OR4;OR5;			
Lecture 21	3	**Topic:**Geometric Transformations (both 2-D & 3-D): Basic Geometric Transformations **Ref:** TB (5.1,pg 203-205); OR1;OR2;OR3;OR4;OR5;			
Lecture 22	3	**Topic:**Geometric Transformations (both 2-D & 3-D): Basic Geometric Transformations **Ref:** TB (5.1,pg 206-207); OR1;OR2;OR3;OR4;OR5;			

Lecture 23	3	**Topic:** Transformation Matrix **Ref:** TB (5.2,pg 208-211); OR1;OR2;OR3;OR4;OR5;
Lecture 24	3	**Topic:** Types of transformation in 2-D and 3-D Graphics: Scaling. **Ref:** TB (5.3,pg 212-214); OR1;OR2;OR3;OR4;OR5;
Lecture 25	3	**Topic:** Types of transformation in 2-D and 3-D Graphics: Reflection **Ref:** TB (5.3,pg 215-217); OR1;OR2;OR3;OR4;OR5;
Lecture 26	3	**Topic:**Types of transformation in 2-D and 3-D Graphics: Shear Transformation **Ref:** TB (5.3,pg 218-220); OR1;OR2;OR3;OR4;OR5;
Lecture 27	3	**Topic:** Types of transformation in 2-D and 3-D Graphics: Rotation **Ref:** TB (5.4,pg 221-223); OR1;OR2;OR3;OR4;OR5;
Lecture 28	3	**Topic:** Types of transformation in 2-D and 3-D Graphics: Translation **Ref:** TB (5.4,pg 224-226); OR1;OR2;OR3;OR4;OR5;
Lecture 29	3	**Topic** :2-D transformation using homogeneous coordinates. **Ref:** TB (5.5,pg 227-229); OR1;OR2;OR3;OR4;OR5;
Lecture 30	3	**Topic:** 3-D transformation using homogeneous coordinates. **Ref:** TB (5.5,pg 230-233); OR1;OR2;OR3;OR4;OR5;
Lecture 31	4	**Topic:** Two Dimensional Viewing: Introduction to viewing **Ref:** TB (6.1,pg 237-239); OR1;OR2;OR3;OR4;OR5;
Lecture 32	4	**Topic:** Two Dimensional Viewing: Introduction to Clipping **Ref:** TB (6.2,pg 240-242); OR1;OR2;OR3;OR4;OR5;
Lecture 33	4	**Topic:** Viewing transformation in 2-D **Ref:** TB (6.3,pg 243-245); OR1;OR2;OR3;OR4;OR5;
Lecture 34	4	**Topic:** Viewing pipeline **Ref:** TB (6.4,pg 246-247); OR1;OR2;OR3;OR4;OR5;
Lecture 35	4	**Topic:** Clipping Window **Ref:** TB (6.5,pg 248-250); OR1;OR2;OR3;OR4;OR5;
Lecture 36	4	**Topic:** Clipping Algorithms: Point clipping **Ref:** TB (6.6,pg 252-253); OR1;OR2;OR3;OR4;OR5;
Lecture 37	4	**Topic:** Clipping Algorithms: Point clipping **Ref:** TB (6.6,pg 254-256); OR1;OR2;OR3;OR4;OR5;
Lecture 38	4	**Topic:** Clipping Algorithm: Line clipping **Ref:** TB (6.7,pg 257-258); OR1;OR2;OR3;OR4;OR5;
Lecture 39	4	**Topic:** Clipping Algorithm: Line clipping **Ref:** TB (6.7,pg 259-260); OR1;OR2;OR3;OR4;OR5;
Lecture 40	4	**Topic:** Clipping Algorithm: Polygon clipping **Ref:** TB (6.8,pg 261-263); OR1;OR2;OR3;OR4;OR5;

Type	Code	Numerical Techniques	L-T-P	Credits	Marks
BS	CC-14		3-1-0	4	75
Topic Objective		To learn various numerical techniques.			
Prerequisites		To be able to implement different numerical techniques using programming language.			
Lecture Scheme		Regular lectures (classroom/virtual class with computer/Smartphone) with use of with the help of scientific calculator, lectures are planned to be interactive with focus on problem solving activities.			

University Syllabus

Unit No	Topics	Hours
Unit-1	Floating point representation and computer arithmetic, Significant digits, Errors: Round-off error, Local truncation error, Global truncation error, Order of a method, Convergence and terminal conditions, Efficient computations.	8
Unit-2	Bisection method, Secant method, Regula−Falsi method Newton−Raphson method, Newton's method for solving nonlinear systems.	7
Unit-3	Interpolation: Lagrange's form and Newton's form Finite difference operators, Gregory Newton forward and backward differences Interpolation Piecewise polynomial interpolation: Linear interpolation.	10
Unit-4	Numerical integration: Trapezoid rule, Simpson's rule (only method), Newton−Cotes formulas, Gaussian quadrature, Ordinary differential equation: Euler"s method Modified Euler's methods, Runge-Kutta second methods	10
	Total (Hours)	35

Text Books:
TB1:   S S.S. Sastry, "Introductory Methods of Numerical Analysis", EEE , 5/ed.
TB2:   M.K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering Computation, New Age International Publisher, 6/e (2012)

Reference Books:
RB1:   Numerical Analysis: J. K. Mantri & S. Prahan, Laxmi Publication.
RB2:   Introduction to Numerical Analysis, Josef Stoer and Roland Bulirsch, Springer.
RB3:   Dutta and Jana, "Introductory Methods of Numerical Analysis", Sreedhar Prakashani.

Online Resources:
OR1:   www.ikiu.ac.ir/public-files
OR2:   www.fac.ksu.edu.sa
OR3:   www.iitb.ac.in
OR4:   www.pdfdrive.com/numerical-analysis
OR5:   http://studyspot.in/numerical-methods-problem

BS	CC-14	**LESSON PLAN**	L-T-P	Credits	Marks
Lecture No	Unit No	**(Statistics)**	3-1-0	4	75
Lecture 1	1	Topic: Floating point representation, **Ref:** RB3 (Dutta and Jana-Introductory Methods of Numerical Analysis) chapter-1			
Lecture 2	1	Computer arithmetic of Floating point representation **Ref:** RB3 (Dutta and Jana-Introductory Methods of Numerical Analysis) chapter-1			
Lecture 3	1	Significant digits **Ref:** RB3 (Dutta and Jana-Introductory Methods of Numerical Analysis) chapter-1			
Lecture 4	1	Errors: Round-off error **Ref:** RB3 (Dutta and Jana-Introductory Methods of Numerical Analysis) chapter-1			
Lecture 5	1	Local truncation error, Global truncation error **Ref:** RB3 (Dutta and Jana-Introductory Methods of Numerical Analysis) chapter-1			
Lecture 6	1	Order of a method **Ref:** RB3 (Dutta and Jana-Introductory Methods of Numerical Analysis) chapter-1			
Lecture 7	1	Convergence and terminal conditions **Ref:** RB3 (Dutta and Jana-Introductory Methods of Numerical Analysis) chapter-1			
Lecture 8	1	Efficient computations **Ref:** RB3 (Dutta and Jana-Introductory Methods of Numerical Analysis)			
Lecture 9	2	Basic Concepts of finding roots of an equation **Ref:** TB1 (SS Sastry-Introductory Methods of Numerical Analysis) chapter-2			
Lecture 10	2	Bisection method **Ref:** TB1 (SS Sastry-Introductory Methods of Numerical Analysis) chapter-2			
Lecture 11	2	Secant method **Ref:** TB1 (SS Sastry-Introductory Methods of Numerical Analysis) chapter-2			
Lecture 12	2	Regula−Falsi method **Ref:** TB1 (SS Sastry-Introductory Methods of Numerical Analysis) chapter-2			
Lecture 13	2	Newton−Raphson method **Ref:** TB1 (SS Sastry-Introductory Methods of Numerical Analysis) chapter-2			
Lecture 14	2	Newton's method for solving nonlinear systems **Ref:** TB1 (SS Sastry-Introductory Methods of Numerical Analysis) chapter-2			
Lecture 15	2	Newton's method for solving nonlinear systems (continue) **Ref:** TB1 (SS Sastry-Introductory Methods of Numerical Analysis) chapter-2			
Lecture 16	3	Introduction to Interpolation: **Ref:** TB1 (SS Sastry-Introductory Methods of Numerical Analysis) chapter-3			
Lecture 17	3	Lagrange's Interpolation **Ref:** TB1 (SS Sastry-Introductory Methods of Numerical Analysis) chapter-3			
Lecture 18	3	Newton's Interpolation **Ref:** TB1 (SS Sastry-Introductory Methods of Numerical Analysis) chapter-3			
Lecture 19	3	Finite difference operators **Ref:** TB1 (SS Sastry-Introductory Methods of Numerical Analysis) chapter-3			
Lecture 20	3	Gregory Newton forward differences Interpolation **Ref:** TB1 (SS Sastry-Introductory Methods of Numerical Analysis) chapter-3			
Lecture 21	3	Gregory Newton backward differences Interpolation **Ref:** TB1 (SS Sastry-Introductory Methods of Numerical Analysis) chapter-3			
Lecture 22	3	Piecewise polynomial interpolation **Ref:** TB1 (SS Sastry-Introductory Methods of Numerical Analysis) chapter-3			
Lecture 23	3	Piecewise polynomial interpolation **Ref:** TB1 (SS Sastry-Introductory Methods of Numerical Analysis) chapter-3			

Lecture 24	3	Linear interpolation **Ref:** TB1 (SS Sastry-Introductory Methods of Numerical Analysis) chapter-3
Lecture 25	3	Linear interpolation **Ref:** TB1 (SS Sastry-Introductory Methods of Numerical Analysis) chapter-3
Lecture 26	4	Introduction to Numerical integration **Ref:** TB1 (SS Sastry-Introductory Methods of Numerical Analysis) chapter-5
Lecture 27	4	Numerical integration by Trapezoid rule **Ref:** TB1 (SS Sastry-Introductory Methods of Numerical Analysis) chapter-5
Lecture 28	4	Numerical integration by Simpson's rule (only method) **Ref:** TB1 (SS Sastry-Introductory Methods of Numerical Analysis) chapter-5
Lecture 29	4	Numerical integration by Newton−Cotes formulas **Ref:** TB1 (SS Sastry-Introductory Methods of Numerical Analysis) chapter-5
Lecture 30	4	Numerical integration by Gaussian quadrature **Ref:** TB1 (SS Sastry-Introductory Methods of Numerical Analysis) chapter-5
Lecture 31	4	Introduction to Ordinary differential equation **Ref:** TB1 (SS Sastry-Introductory Methods of Numerical Analysis) chapter-7
Lecture 32	4	Euler's method **Ref:** TB1 (SS Sastry-Introductory Methods of Numerical Analysis) chapter-7
Lecture 33	4	Modified Euler's methods **Ref:** TB1 (SS Sastry-Introductory Methods of Numerical Analysis) chapter-7
Lecture 34	4	Modified Euler's methods **Ref:** TB1 (SS Sastry-Introductory Methods of Numerical Analysis) chapter-7
Lecture 35	4	Runge-Kutta second methods **Ref:** TB1 (SS Sastry-Introductory Methods of Numerical Analysis) chapter-7

LESSON PLAN

Type	Code	DATA SCIENCE	L-T-P	Credits	Marks
CS	DSE-4		3-1-2	4	100
Topic Objective		To learn emerging issues related to various fields of data science.			
		To understand the underlying principles of data science, exploring data analysis.			
		To learn the basics of R Programming			
Prerequisites		Basic concepts of machine learning, statistics, modeling, programming, databases.			
Lecture Scheme		Regular lectures (classroom/virtual class with computer/Smartphone) with use of ICT as and when required, lectures are planned to be interactive with focus on application.			

Evaluation Scheme

Internal Assessment			Written Assessment	Total
Assignment(s)	Unit Test	Mid-Term (Written)	End-Term	
0	0	15	60	75

University Syllabus

Unit No	Topics	Hours
Unit-1	**Data Scientist's Tool Box**: Turning data into actionable knowledge, introduction to the tools that will be used in building data analysis software: version control, markdown, git, GitHub, R, and RStudio	**10**
Unit-2	**R Programming Basics**: Overview of R, R data types and objects, reading and writing data, Control structures, functions, scoping rules, dates and times, Loop functions, debugging tools, Simulation, code profiling.	**10**
Unit-3	**Getting and Cleaning Data**: Obtaining data from the web, from APIs, from databases and from colleagues in various formats, basics of data cleaning and making data "tidy".	**10**
Unit-4	**Exploratory Data Analysis**: Essential exploratory techniques for summarizing data, applied before formal modeling commences, eliminating or sharpening potential hypotheses about the world that can be addressed by the data, common multivariate statistical techniques used to visualize high-dimensional data.	**10**
	Total (Hours)	**40**

Text Books:
1.   Sumitabha Das, Unix Concepts And Applications, Tata McGraw-Hill Education, 2017, 4/Ed.

Type	Code	LESSON PLAN DATA SCIENCE	L-T-P	Credits	Marks
Lecture No	Unit No		3-1-2	4	75

Lecture 1	1	**Topic:** Data Scientist's Tool Box: Turning data into actionable knowledge **Ref:** https://www.classcentral.com/course/datascitoolbox-1712 OR1;OR2;OR3;OR4;OR5;
Lecture 2	1	**Topic:** Data Scientist's Tool Box: Turning data into actionable knowledge **Ref:**https://www.classcentral.com/course/datascitoolbox-1712 OR1;OR2;OR3;OR4;OR5;
Lecture 3	1	**Topic:** introduction to the tools that will be used in building data analysis software **Ref:**https://www.datapine.com/articles/data-analyst-tools-software OR1;OR2;OR3;OR4;OR5;
Lecture 4	1	**Topic:** introduction to the tools that will be used in building data analysis software: Version control **Ref:**https://www.geeksforgeeks.org/version-control-systems/ OR1;OR2;OR3;OR4;OR5;
Lecture 5	1	**Topic** introduction to the tools that will be used in building data analysis software:version control **Ref:**https://www.geeksforgeeks.org/version-control-systems/ OR1;OR2;OR3;OR4;OR5;
Lecture 6	1	**Topic:** introduction to the tools that will be used in building data analysis software:Markdown **Ref:** https://www.javatpoint.com/markdown OR1;OR2;OR3;OR4;OR5;
Lecture 7	1	**Topic:** introduction to the tools that will be used in building data analysis software:Git **Ref:** https://www.javatpoint.com/markdown OR1;OR2;OR3;OR4;OR5;
Lecture 8	1	**Topic:** introduction to the tools that will be used in building data analysis software:Github **Ref:** https://www.javatpoint.com/markdown OR1;OR2;OR3;OR4;OR5;
Lecture 9	1	**Topic**: introduction to the tools that will be used in building data analysis software:R **Ref:** https://www.javatpoint.com/markdown OR1;OR2;OR3;OR4;OR5;
Lecture 10	1	**Topic** introduction to the tools that will be used in building data analysis software:R Studio Ref:https://www.rstudio.com/blog/r-and-rstudio-the-interoperability-environment-for-data-analytics/ OR1;OR2;OR3;OR4;OR5;
Lecture 11	2	**Topic** : R Programming Basics: Overview of R Ref:https://www.geeksforgeeks.org/r-programming-for-data-science/ OR1;OR2;OR3;OR4;OR5;
Lecture 12	2	**Topic:** R Programming Basics: Overview of R Ref:https://www.geeksforgeeks.org/r-programming-for-data-science/ OR2;OR3;OR4;OR5
Lecture 13	2	**Topic:** R data types and objects Ref:https://www.tutorialspoint.com/r/r_data_types.htm OR1;OR2;OR3;OR4;OR5;
Lecture 14	2	**Topic:** Reading and writing data

		Ref:https://www.geeksforgeeks.org/reading-writing-text-files-python/ OR1;OR2;OR3;OR4;OR5;
Lecture 15	2	**Topic:** Control structures Ref:https://www.geeksforgeeks.org/control-statements-in-r-programming/ OR1;OR2;OR3;OR4;OR5;
Lecture 16	2	**Topic:** functions Ref:https://www.w3schools.com/datascience/ds_functions.asp OR1;OR2;OR3;OR4;OR5;
Lecture 17	2	**Topic:** scoping rules & date and times Ref:https://www.geeksforgeeks.org/lexical-scoping-in-r-programming/ OR1;OR2;OR3;OR4;OR5;
Lecture 18	2	**Topic:** Loop functions **Ref:**https://www.tutorialspoint.com/r/r_loops.htm OR1;OR2;OR3;OR4;OR5;
Lecture 19	2	**Topic:** debugging tools Ref:https://www.quora.com/How-do-you-debug-your-data-science-and-machine-learning-projects OR1;OR2;OR3;OR4;OR5;
Lecture 20	2	**Topic:** Simulation and code profiling Ref:https://www.sciencedirect.com/topics/earth-and-planetary-sciences/data-simulation OR1;OR2;OR3;OR4;OR5;
Lecture 21	3	**Topic:** Getting and Cleaning Data Ref:https://www.geeksforgeeks.org/data-cleansing-introduction/ OR1;OR2;OR3;OR4;OR5;
Lecture 22	3	**Topic:** Obtaining data from the web Ref:https://www.geeksforgeeks.org/data-cleansing-introduction/ OR1;OR2;OR3;OR4;OR5;
Lecture 23	3	**Topic:** Obtaining data from the APIs Ref:https://www.geeksforgeeks.org/data-cleansing-introduction/ OR1;OR2;OR3;OR4;OR5;
Lecture 24	3	**Topic:** Obtaining data from the APIs **Ref:**https://www.geeksforgeeks.org/data-cleansing-introduction/ OR1;OR2;OR3;OR4;OR5;
Lecture 25	3	**Topic:** Obtaining data from databases Ref:https://towardsdatascience.com/databases-101-introduction-to-databases-for-data-scientists-ee18c9f0785d OR1;OR2;OR3;OR4;OR5;
Lecture 26	3	**Topic:** Obtaining data from the databases Ref:https://towardsdatascience.com/databases-101-introduction-to-databases-for-data-scientists-ee18c9f0785d OR1;OR2;OR3;OR4;OR5;
Lecture 27	3	**Topic** : Obtaining data from the colleagues in varios formats Ref:https://www.tutorialspoint.com/r/r_loops.htm OR1;OR2;OR3;OR4;OR5;
Lecture 28	3	**Topic:** Obtaining data from the colleagues in varios formats Ref:https://www.tutorialspoint.com/r/r_loops.htm OR1;OR2;OR3;OR4;OR5;
Lecture 29	3	**Topic** : basics of data cleaning and making data "tidy". Ref:https://www.tutorialspoint.com/r/r_loops.htm OR1;OR2;OR3;OR4;OR5;
Lecture 30	3	**Topic:** basics of data cleaning and making data "tidy". **Ref:**https://www.tutorialspoint.com/r/r_loops.htm OR1;OR2;OR3;OR4;OR5;

Lecture 31	4	**Topic:** Exploratory Data Analysis **Ref:**https://medium.com/analytics-vidhya/exploratory-data-analysis-with-sql-mysql-2e823445525b OR1;OR2;OR3;OR4;OR5;
Lecture 32	4	**Topic:** Exploratory Data Analysis **Ref:**https://medium.com/analytics-vidhya/exploratory-data-analysis-with-sql-mysql-2e823445525b OR1;OR2;OR3;OR4;OR5;
Lecture 33	4	**Topic:** Essential exploratory techniques for summarizing data **Ref:**https://www.quora.com/How-do-you-debug-your-data-science-and-machine-learning-projects OR1;OR2;OR3;OR4;OR5;
Lecture 34	4	**Topic:** Essential exploratory techniques for summarizing data **Ref:**https://www.geeksforgeeks.org/version-control-systems/ OR1;OR2;OR3;OR4;OR5;
Lecture 35	4	**Topic:** applied before formal modeling commences **Ref:**https://www.geeksforgeeks.org/version-control-systems/ OR1;OR2;OR3;OR4;OR5;
Lecture 36	4	**Topic**: applied before formal modeling commences **Ref:** https://www.javatpoint.com/markdown OR1;OR2;OR3;OR4;OR5;
Lecture 37	4	**Topic** eliminating or sharpening potential hypotheses about the world that can be addressed by the data **Ref:**https://www.geeksforgeeks.org/version-control-systems/ OR1;OR2;OR3;OR4;OR5;
Lecture 38	4	**Topic:** eliminating or sharpening potential hypotheses about the world that can be addressed by the data **Ref:** https://www.quora.com/How-do-you-debug-your-data-science-and-machine-learning-projects OR1;OR2;OR3;OR4;OR5;
Lecture 39	4	**Topic:** common multivariate statistical techniques used to visualize high-dimensional data **Ref:** https://www.javatpoint.com/markdown OR1;OR2;OR3;OR4;OR5;
Lecture 40	4	**Topic:** common multivariate statistical techniques used to visualize high-dimensional data. **Ref:** https://www.javatpoint.com/markdown OR1;OR2;OR3;OR4;OR5;