UNIVERSITY OF MUMBAI

Syllabus for the M.A. / M.Sc. Semester – I and II
Program: M.A. / M.Sc.
Course: Statistics

(Credit Based Semester and Grading System with effect from the academic year 2012–2013)

M.A. / M.Sc. Part - I Statistics Syllabus

Credit Based and Grading System
To be implemented from the Academic year 2012-2013

Table showing the proposed ten papers to be covered in the first year in two semesters.

	COURSE PSST 101	COURSE PSST 102	COURSE PSST 103	COURSE PSST 104	PSST P1A & PSST P1B
SEMESTER I	PROBABILITY THEORY AND SAMPLING I	LINEAR MODELS I	DISTRIBUTION THEORY AND ESTIMATION -I	PLANNING AND ANALYSIS OF EXPERIMENTS-I	PRACTICALS BASED ON PSST 101 TO PSST 104
	COURSE PSST 201	COURSE PSST 202	COURSE PSST 203	COURSE PSST 204	PSST P2A & PSST P2B
SEMESTER II	PROBABILITY THEORY AND SAMPLING II	LINEAR MODELS II	DISTRIBUTION THEORY AND ESTIMATION - II	PLANNING AND ANALYSIS OF EXPERIMENTS-II	PRACTICALS BASED ON PSST 201 TO PSST 204

Each batch of practicals consists of 10 students

SEMESTER I

PSST101

Page numbers given below indicate depth and scope of syllabus

Total No. of Classroom Teaching 60 hours +60 notional Hours =120 hours= 4 credits

Course Code	UNIT	PROBABILITY THEORY AND SAMPLING - I	Books & Page Numbers
PSST101	**I**	i) Sample Space : and relevance of Probability theory	Feller 1-6
		ii)Various definitions, Properties of Probability, Basic formulas	Rohatagi 1-25
		iii)Combination of events, the realization of m among n events	Feller 98-100 106-11
		iv) Conditional Probability, Independent events (Stochastic independence) Bayes theorem.	Feller 114-28
		V)Occupancy Problems on runs and recurrent events	Feller 38-49

	II	Generating functions, convolutions, compound distribution	Feller 265-278
		Branching Process.	Medhi 362-377
		Characteristic Function.	Bhat 132-146
	III	Stratified random sampling. Optimum, proportional, Neyman Allocation.	W.G. Cochran 89-111
		Comparison of variance (opt),Var(prop),Var(rand). Collapsed strata, Number of strata, Strata boundaries	W.G. Cochran 115-121
		Post stratification, Estimation of population proportion. Allocation with more than one item	W.G. Cochran 127-138
	IV	Ratio estimation - properties of estimate of R ;Confidence intervals; Comparison of ratio estimate with mean per unit.	W.G. Cochran 150-157
		Bias in ratio estimate. Hartley Ross exact result for bias. Ratio estimate in stratified sampling. Separate, combined.	W.G. Cochran 158-178
		Regression estimate with preassigned b; Regression estimate when b is computed from sample, Comparison of regression Estimate with Ratio estimate and mean per unit. Regression estimate in stratified sampling : Separate, combined	W.G. Cochran 189-200

References Books

1. Bhat B.R. (1985) - Modern Probability Theory
2. Feller W. (1972) - Introduction to Probability Theory and its Applications, Vol –I (3rd edition)
3. Medhi J (1994)- Sochastic Processes (2rd Edition)
4. Ross S.M (1993) - Introduction to Probability Models
5. Rohatgi V.K. & Saleh A.K. Md. Ehasanes (2001) - An Introduction to Probability and Statistics.
6. Cochran W.G.: Sampling techniques
7. Parimal Mukhopadhyay : Theory and Methods of Survey Sampling
8. Murthy M.N.: Sampling theory and Methods
9. Sukhatme,P.V.and Sukhatme B.V. : Sampling theory of Surveys and applications
10. C.Narayan Bhatt and Millar : Elements of Applied Stochastic Processes.

Recommended books for further reading

1. T. Cacoullos L: Exercises in Probability
2. Kathleen Subrahmaniam : A primer in Probability
3. Leslie Kish : Survey sampling : John Wiley & Sons
4. Williams : Sampler on Sampling

PSST102

Total No. of Classroom Teaching 60 hours +60 notional Hours =120 hours= 4 credits

Prerequisites :

1. Basic operations, determinants, inverse and rank of a matrix, canonical forms.
2. Solving linear equations, generalized inverse.
3. Partitioned matrices, its determinant and inverse.
4. Eigenvalues and Eigenvectors of a matrix.
5. Vector spaces.

Course Code	UNIT	LINEAR MODELS I	Books & Page Numbers
PSST 102	I	Linear parametric function and its estimability, Solving linear equations, generalized inverse. Gauss markoff theorem, Interval estimates and test of hypothesis, fundamental theorems on conditional error ss, Test of $\Lambda\beta=d$, generalized least squares	Kshirsagar 1-118 & 333-342
	II	Liner regression models, subset selection, Stepwise regression: Forward selection, backward elimination and stepwise. Orthogonal polynomials	Kshirsagar 119-142 Draper & Smith 327-342
	III	Assumptions and box-cox transformations in the Analysis of Variance: q-q plot, use of skewness and kurtosis, Bartlett's test for equality of variances, Levene's test. Regression diagnostics: Analysis of residuals, definition of ordinary and Studentized residuals, their properties and use in regression diagnostics. Influence Analysis, Cook's distance.	Wang and Chow 335-357
		Logistic regression: Example, model, MLE of parameters, Iterative procedure to solve likelihood equations, multiple regressors.	Hosmer & Lemeshow 1-34

	IV	Ridge regression: Eigenvalues and Eigenvectors of a matrix. Ill conditioned matrix, need of ridge regression, biased estimator, Mean square error. Bias and MSE of ridge estimator, ridge trace method.	Wang and Chow 285-295

References Books : Linear Models

1. Hohn Franz E   : Elementary Matrix Algebra
2. Searle S.R. : Matrix Algebra useful for Statistics
3. Kshirsagar A.M. : A course in Linear Models
4. Draper N.R & Smith H : Applied Regression Analysis.
5. Wang S. GUI and Chow S.C. : Advanced Linear Models.
6. Hosmer D. and Lemeshow S.: Applied Logistic regression.
7. Agresthi: Categorical data analysis.
8. Chattterjee and Haddi: Sensitivity Analysis

Recommended books for further reading

1. Healy M. J. R. : Matrices for Statistics
2. Shantinarayan : Textbook of Matrices
3. Bishop: discrete data analysis.
4. Cox, D. R. : Analysis of binary data.
5. Chaterjee and Price: Regression Analysis with examples
6. Finney D, J :- Statistical methods in biological assays.
7. Graybill F.A :- An introduction to linear statistical models Vol. I.
8. Montgomery D.C. & Peck B.A. :- Introduction to linear regression analysis.
9. Rao C.R :- Linear statistical inference and its applications.
10. Searle S.R :- Linear models.
11. Seber G.A.F :- Linear regression analysis.
12. Sen A & Srivastava M. :- Regression analysis. Springer.
13. Scheffe H :- Analysis of variance.

Total No. of Classroom Teaching 60 hours +60 notional Hours =120 hours= 4 credits

Course Code	UNIT	DISTRIBUTION THEORY AND ESTIMATION - I	Books & Page Numbers
PSST 103	**I**	Distribution functions	Rohatgi 40-57
		Decomposition of D.F, Jordan Decomposition theorem	Bhat 72-80
	II	Functions of Random variables	Rohatgi 57-68
		Moments, Generating function	Rohatgi 69-85
	III	Problem of point Estimation, Unbiasedness, sufficiency, completeness and Ancillarity, UMVUE	Rohatgi 354-391 Lehmann 83-146
		Method of moments and maximum Likelihood, Invariance.	Shao 261-299
	IV	Bayes and minimax method, Loss function, risk functions	Lehmann 147-223

References Books

1. Bhat , B.R.(1988) : Modern Probability Theory.
2. David H.A (1981): Order Statistics
3. Jun Shao (2005): Mathematical Statistics.
4. Lehmann, E.L.and George Casella(1998) :- Theory of point estimation
5. Rohatgi V.K.and Ehsanes Saleh A.K.(2001) : An introduction to probability theory and Statistics.
6. Ross S.M :- Introduction to Probability Models
7. Morgan J.T.Byron :- Elements of Simulation

Recommended books for further reading

1. Ferguson T.S.(1967) : Mathematical statistics : A Decision Theoretic Approach
2. Johnson N.L. & Kotz S. : Distribution in statistics
                          a) Discrete distribution
3.Continuous univariate distribution-I
4.Continuous univariate distribution-II
5.Lee, A.J. : U- statistics – Theory and practices
6.Lehmann, E.L. : Notes on the theory of estimation
7.Rao, C.R : Linear statistical inference and its applications
8.Rohatgi V.K.(2001) : Statistical inference.
9.Sturat A and Ord J.R.(1987) :- Kendall's advanced theory of statistics Vol-I
10.Zacks, S.(1971) : Theory of statistical inference.

PSST104

Total No. of Classroom Teaching 60 hours +60 notional Hours =120 hours= 4 credits

Course Code	UNIT	PLANNING AND ANLYSIS OF EXPERIMENTS - I	Books & Page Numbers
PSST 104	**I**	Brief history of statistical design. Strategy of experimentation. Some typical application of experimental design. Basic principles of design. Guidelines for designing experiments	Montgomery 1-20
		Completely randomized design.-an example. Statistical analysis of CRD Model adequacy Checking. Practical interpretation of results. Sample computer output. Determining sample size. Discovering Dispersion effects The regression approach to the ANOVA. Nonparametric methods in the ANOVA.	Montgomery 60-125
		The randomized block design-an example. Statistical analysis of RBD Model adequacy Checking. Practical interpretation of results. Sample computer output.	Montgomery 126-144

	II	Generalized block design-an example Statistical analysis of GBD C-Matrix and its properties. Properties of design-Connectedness, Balance and Orthogonal. Optimality of block design : A,D,E-optimality	Chakrabarti 17-21 Raghavarao 48-55
		Balanced incomplete block design,	Chakrabarti 43-55
	III	Factorial design-an example Basic definitions and principles. The advantage of factorials. The two factor factorial design. The general factorial design. Fitting response curves and surfaces. Blocking in a factorial design	Montgomery 170-217 Chakrabarti 60-61
	IV	The 2^k factorial design A single replicate of the 2^k design. The addition of center points to the design	Montgomery 218-286
		Blocking a replicated 2^k factorial design Confounding in the 2^k factorial design. Partial confounding.	Montgomery 287-302 Raghavarao 245-247

Reference Books :-

1. Montgomery D.C.:-, Design and Analysis of Experiment 4th Edition.
2. Chakrabarti M.C.:-   Mathematics of Design and Analysis of Experiments.
3. Raghavarao D.   :-   Construction and Combinatorial Problems in Design of Experiments

Recommended Books for Further Reading

1. Das. M.M. and Giri N.C. : - Design and Analysis of Experiments.
2. Fisher R.A. :- Design of Experiments.
3. John A.C. :- Experiments with Mixtures . Designs , Models and the Analysis of Mixture Data ,3rd edition.
4. Meyers R.H. :- Response surface methodology
5. Shah K.R and Sinha B.K. : - Theory of Optimal Designs.
6. Dean Voss :- Design and Analysis of Experiments

PRACTICALS

PSST P1A	BASED ON PSST 101	2 credits	Total 8 Credits
	BASED ON PSST 102	2 credits	
PSST P1B	BASED ON PSST 103	2 credits	
	BASED ON PSST 104	2 credits	

Contents of PSST P1A AND PSST P1B to be covered with the help of Statistical Software like SAS, SPSS, MINITAB, ' R' Software etc.

6 hours practical per week
2 hours software per week
 Therefore Practicals + Software = 8 hours per week
Hence   120 Teaching hours + 120 Notional hours
        = 240 hours
        = 8 credits

Reference Books : **Statistical Software**

1. Carver R.H. & others : Data analysis with SPSS.
2. Cody R.P. & Smith J.H. : Applied Statistics and the SAS programming language.
3. Darren Georage and Paul Mallery : SPSS for windows.
4. Spencer N.H.(2004) : SAS Programming, the one day course.
5. Owen Neville Bishop :Statistics for biology: a practical guide for the experimental biologist
6. Random A and Everitt R.S. : A handbook of statistical analysis using R.
7. Nom o' Rowke, Larry Hatcher, Edward J. Stepansk : A Step by step approach using SAS for univariate and multivariate Statistics (2nd Edition)
8. A step by step Approach using SAS for unvariate and multivariate Statistics-2nd Edition by Nom O' Rourke, Larry Hatcher Edward J. Stepansk. SAS Institution. Inc. Wily.
9. Data. Statistics and Decision Models with Excel : Donald L. Harmell, James F.Horrell.

Data Site :

http://www.cmie.com/ - time series data (paid site)

www.mospi.nic.in / websitensso.htm (national sample survey site)

www.mospi.nic.in /cso_test.htm (central statistical organization)

www.cenrusindia.net (cenrus of India)

www.indiastat.com (paid site on India statistics)

www.maharashtra.gov.in /index.php (Maharashtra govt.site)

www.mospi.gov.in (government of India)

Case studies :

1. A.C Rosander : Case Studies in Sample Design
2. Business research methods – Zikund
   (http://website, swlearning.com)
3. C. Ralph Buncher 21 and Jia-Yeong Tsay : Statistical in the Pharmaceutical Industry
4. Contempory Marketing research – carl McDaniel, Roges Gates.
   (McDaniel, swcollege.com)
5. Edward J Wegmes g. Smith : Statistical Methods for Cancer Studies
6. Eugene K. Harris and Adelin Albert : Survivorship Analysis for Clinical Studies
7. Marketing research – Zikmund
   (http://website.swlearing.com)
8. Marketing research – Naresh Malhotra
   (http://www.prenhall.com /malhotra)
9. http://des.maharashtra.gov.in (government of maharashtra data)
10. Richard G. Cornell :Statistical Methods for Cancer Studies
11. Stanley H. Shapiro and Thomas H.Louis Clinical Trials
12. William J. Kennedy, Jr. and James E. Gentle. Statistical Completing
13. Case Studies in Bayesion Statistics vol. VI
    Lecture notes in Bayesion Statistics number 167 (2002)
    Constantine, Gatsonis Alicia, Carriquary Andrew, Gelman
14. Wardlow A.C (2005) Practical Statistical for Experimental bilogoists
    (2nd Edition)

Seminar : Case Studies listed in the paper to be discussed and brief summary should be prepared.

2 hours per week : (30 Teaching hours+ 30 Notional hours)

$$= 60 \text{ hours}$$

$$= 2 \text{ credits}$$

 Total number of Credits for First Semester

Theory 16 + Practicals 8 = 24

Exam Pattern For Theory And Practical

Internal Exam   40 Marks

Semister End Exam   60 Marks of 3 hours duration

At the end of First Semester there will be a practical examination based on Theory papers PSST 101, PSST 102, PSST 103 and PSST 104.

PSST201

Page numbers given below indicate depth and scope of syllabus

Total No. of Classroom Teaching 60 hours +60 notional Hours =120 hours= 4 credits

Course Code	UNIT	PROBABILITY THEORY AND SAMPLING-II	Books & Page Numbers
PSST 201	**I**	Probability inequalities : Basic Markov , Chebychevs, Cauchy Schawartz, Jensen, Holder, Minkowski.	Rohatagi 158-60
		Modes of convergence Weak Law of Large Numbers Strong Law of Large Numbers Central Limit theorem	Rohatagi 256-305
	II	Markov chains	Ross 163-200 Medhi 54-90
	III	Systematic sampling-procedure. Advantage over simple random sample. Properties of the estimate. Variance in terms of ρ_w, Comparison of systematic sampling with Simple random sample without replacement.	W.G.Cochran 205-208
		Systematic sampling and stratified sampling and their comparison Systematic sampling in population with linear trend.	W.G.Cochran 209-214
		Use of centrally located sample; Method of end correction; Balanced systematic sample; Estimation of population Mean when N=nk+c. Circular systematic sampling, Variance of sample mean, Method of inter penetrating sample.	W.G.Cochran 214-217
		PPS sampling.-wr; Methods of obtaining a sample .(a)Cumulative Total Method b) Lahiri's method Properties of the estimator	Mukhopadhyaya 182-187
		PPSWOR Hansen Hurtwitz estimator and its variance ; Yates and Grundy estimator;	Mukhopadhyaya 196-200
		Horvitz Thompson estimator for population	Mukhopadhyaya

		total and its variance	201-202
	IV	Cluster sampling	W.G.Cochran 233-240
		Jessen's result. Relation between optimum size of cluster and cost. cluster sampling for proportion	W.G.Cochran 240-247
		Cluster sampling when clusters are of unequal size.	W.G.Cochran 249-250
		Multi stage – Two stage sampling.(srswr-srswor) estimation of population mean and variance of the estimate and its estimate cost function; optimum value of m=size of second stage sample.	W.G.Cochran 274-278 & 283-285
		Two stage sampling for proportion. Double sampling (two phase) for stratification.	W.G.Cochran 279-280 W.G.Cochran 327-333
		Non-sampling errors; non-response.	W.G.Cochran 359-360 364-365 370-374

References Books

1. Bhat B.R. (1985) - Modern Probability Theory
2. Feller W. (1972) - Introduction to Probability Theory and its Applications, Vol –I (3rd Edition)
3. Medhi J (1994)- Sochastic Processes (2rd Edition)
4. Ross S.M (1993) - Introduction to Probability Models
5. Rohatgi V.K. & Saleh A.K. Md. Ehasanes (2001) - An Introduction to Probability and Statistics.
6. Cochran W.G.: Sampling techniques
7. Parimal Mukhopadhyay : Theory and Methods of Survey Sampling
8. Murthy M.N.: Sampling theory and Methods
9. Sukhatme,P.V.and Sukhatme B.V. : Sampling theory of Surveys and applications

Recommended books for further reading

1. T. Cacoullos L: Exercises in Probability
2. Kathleen Subrahmaniam : A primer in Probability
3. Leslie Kish : Survey sampling : John Wiley & Sons
4. Williams : Sampler on Sampling

Total No. of Classroom Teaching 60 hours +60 notional Hours =120 hours= 4 credits

Course Code	UNIT	LINEAR MODELS II	Books & Page Numbers
PSST 202	**I**	Analysis of variance, fixed effect models : i. One –way classification model ii. Two – way classification model with and without interaction effect, one observation per cell and r observations per cell. Tukey's test for non additivity. iii. Two – way classification model with and without interaction effect with unequal number of observations per cell.	Kshirsagar 161-309
	II	i) Simultaneous Confidence Intervals : Scheffe's , Bonferroni and Tukey's interval. ii)Multiway classification model. iii)Nested classification models.	Kshirsagar 195-207
	III	Analysis of variance with random and mixed effect models: Estimation and testing of variance components in one-way, two-way and multiway classification models. ANOVA method.	Kshirsagar 377-395
		Analysis of Categorical data : Loglinear models, Contingency tables.	Agresthi 36-69 & 314-356
		Sensitivity Analysis.	Chattterjee & Hadi 1-59
	IV	Analysis of Covariance: Model, BLUE, ANOCOVA table, testing of hypothesis, use of ANOCOVA for missing observation.	Kshirsagar 311-332

References Books : Linear Models

1. Hohn Franz E   : Elementary Matrix Algebra
2. Searle S.R. : Matrix Algebra useful for Statistics
3. Kshirsagar A.M. : A course in Linear Models
4. Draper N.R & Smith H : Applied Regression Analysis.
5. Song GUI Wang and S.C Chow: Advanced Linear Models.
6. Agresthi: Categorical data analysis.
7. Chattterjee and Haddi: Sensitivity Analysis
8. David W Hosmer and Stanley Lemeshow: Applied Logistic regression.

Recommended books for further reading

1. Healy M. J. R. : Matrices for Statistics
2. Shantinarayan : Textbook of Matrices
3. Bishop: discrete data analysis.
4. Cox, D. R. : Analysis of binary data.
5. Chaterjee and Price: Regression Analysis with examples
6. Finney D, J :- Statistical methods in biological assays.
7. Graybill F.A :- An introduction to linear statistical models Vol. I.
8. Montgomery D.C. & Peck B.A. :- Introduction to linear regression analysis.
9. Rao C.R :- Linear statistical inference and its applications.
10. Searle S.R :- Linear models.
11. Seber G.A.F :- Linear regression analysis.
12. Sen A & Srivastava M. :- Regression analysis. Springer.
13. Scheffe H :- Analysis of variance.

Total No. of Classroom Teaching 60 hours +60 notional Hours =120 hours= 4 credits

Course Code	UNIT	DISTRIBUTION THEORY AND ESTIMATION -II	Books & Page Numbers
PSST 203	**I**	Standard distributions : discrete and continuous	Bhat 132-137
		Characterization of some distribution	Rohatgi 180-255
	II	Distribution of order statistics Extreme value theory	David 13-25 & 33-49
		Generation of random sample from different distribution	Ross(1) 455-467
	III	Lower bounds for the variance of an Estimator	Rohatgi 391-424
		Consistency ,Large sample properties of estimators , Minimaxity and Admissibility	Lehmann 429-443
	IV	Non-parametric Estimation, Generalized Estimating Equations, Jacknife and Bootstrap Estimator	Shao 319-383
		Equivariance	Shao 231-245
		Confidence Sets	Shao 471-527

References Books

1. Bhat , B.R.(1988) : Modern Probability Theory.
2. David H.A (1981): Order Statistics
3. Jun Shao (2005): Mathematical Statistics.
4. Lehmann, E.L.and George Casella(1998) :- Theory of point estimation
5. Rohatgi V.K.and Ehsanes Saleh A.K.(2001) : An introduction to probability theory and Statistics.
6. Ross S.M :- Introduction to Probability Models
7. Ross S.M.(1) : A First course in Probability 6th edition.

 Recommended books for further reading

1. Ferguson T.S.(1967) : Mathematical statistics : A Decision Theoretic Approach
2. Johnson N.L. & Kotz S. : Distribution in statistics
                          a) Discrete distribution
 3. Continuous univariate distribution-I
 4. Continuous univariate distribution-II
5.Lee, A.J. : U- statistics – Theory and practices
6.Lehmann, E.L. : Notes on the theory of estimation
7.Rao, C.R : Linear statistical inference and its applications
8.Rohatgi V.K.(2001) : Statistical inference.

9. Sturat A and Ord J.R.(1987) :- Kendall's advanced theory of statistics Vol-I
10. Zacks, S.(1971) : The theory of statistical inference.

PSST204

Total No. of Classroom Teaching 60 hours +60 notional Hours =120 hours= 4 credits

Semester : 15 weeks

Course Code	UNIT	PLANNING AND ANALYSIS OF EXPERIMENTS-II	Books & Page Numbers
PSST 204	**I**	Group divisible design Partially Balanced incomplete block design, Lattice design.Statistical analysis of above design	Chakrabarti 43-55 Raghavarao63-76
		Row-column design-an example Statistical analysis of Row-column design.	Chakrabarti 21-24
		Latin square design Youden square design Cross over design Graeco latin square design. Statistical analysis of above designs.	Chakrabarti 39-43,47
	II	The Split –plot design-An example Statistical analysis of above design.	Montgomery 573-578
		Chemical balance weighing designs. Hadamard Matrix and its relation to the above design. A,D,E optimality of above design	Raghavarao 305-319
	III	Two level Fractional factorial designs. The one-half fraction of the 2^k design The one-Quarter fraction of the 2^k design Resolution-III designs. Resolution-IV and V designs.	Montgomery 303-362 Raghavarao 273-275
		The 3^k factorial design. Confounding in the 3^k factorial design.	Montgomery 363-391 Raghavarao

		Fractional replication of the 3^k factorial design. Factorials with mixed levels	274-276
	IV	Response Surface methodology The method of steepest ascent Analysis of a second order response surface. Experimental designs for fitting response surfaces	Montgomery 427-472
		Mixture experiments Evolutionary operation Robust design.	Montgomery 472-510

Reference Books :-

1. Montgomery D.C. :-, Design and Analysis of Experiment 4th Edition.
2. Chakrabarti M.C.:-   Mathematics of Design and Analysis of Experiments.
3. Raghavarao D. :-Construction and Combinatorial Problems in Design of
                        Experiments

Recommended Books for Further Reading

1. Das. M.M. and Giri N.C. : - Design and Analysis of Experiments.
2. Fisher R.A. : Design of Experiments.
3. John A.C. :- Experiments with Mixtures. Designs, Models and Analysis of Mixture
                Data,3rd edition
4. Meyers R.H. :- Response surface methodology
5. Shah K.R and Sinha B.K. : - Theory of Optimal Designs.
6. Dean Voss :-Design and Analysis of Experiments

PRACTICALS

PSST P2A	BASED ON PSST 201	**2 credits**	**Total 8 Credits**
	BASED ON PSST 202	**2 credits**	
PSST P2B	BASED ON PSST 203	**2 credits**	
	BASED ON PSST 204	**2 credits**	

Contents of PSST P1A AND PSST P1B   to be covered with the help of Statistical Software like SAS, SPSS, MINITAB, ' R' Software etc.

6 hours practical per week
2 hours software per week
 Therefore Practicals + Software = 8 hours per week
Hence   120 Teaching hours + 120 Notional
      = 240 hours
      = 8 credits

Reference Books : Statistical Software

1.   Carver R.H. & others Data analysis with SPSS.
2.   Cody R.P. & Smith J.H. Applied Statistics and the SAS programming language.
3.   Darren Georage and Paul Mallery SPSS for windows.
4.   Spencer N.H.(2004) SAS Programming, the one day course.
5.   Practical Statistical for experimental biologists.
6.   Random A and Everitt R.S. : A handbook of statistical analysis using R
7.   Nom o' Rowke, Larry Hatcher, Edward J. Stepansk : A Step by step approach using SAS for univariate and multivariate Statistics (2nd Edition)
8.   A step by step Approach using SAS for unvariate and multivariate Statistics-2nd Edition by Nom O' Rourke, Larry Hatcher Edward J. Stepansk. SAS Institution. Inc. Wily.
9.   Data. Statistics and Decision Models with Excel Donald L. Harmell, James F.Horrell.

Data Site :

http://www.cmie.com/ - time series data (paid site)

www.mospi.nic.in / websitensso.htm (national sample survey site)

www.mospi.nic.in /cso_test.htm (central statistical organization)

www.cenrusindia.net (cenrus of India)

www.indiastat.com (paid site on India statistics)

www.maharashtra.gov.in /index.php (Maharashtra govt.site)

www.mospi.gov.in (government of India)

Case studies :

1. A.C Rosander : Case Studies in Sample Design
2. Business research methods – Zikund
   (http://website, swlearning.com)
3. C. Ralph Buncher 21 and Jia-Yeong Tsay : Statistical in the Pharmaceutical Industry
4. Contempory Marketing research – carl McDaniel, Roges Gates.
   (McDaniel, swcollege.com)
5. Edward J Wegmes g. Smith : Statistical Methods for Cancer Studies
6. Eugene K. Harris and Adelin Albert : Survivorship Analysis for Clinical Studies
7. Marketing research – Zikmund
   (http://website.swlearing.com)
8. Marketing research – Naresh Malhotra
   (http://www.prenhall.com /malhotra)
9. http://des.maharashtra.gov.in (government of maharashtra data)
10. Richard G. Cornell :Statistical Methods for Cancer Studies
11. Stanley H. Shapiro and Thomas H.Louis Clinical Trials
12. William J. Kennedy, Jr. and James E. Gentle. Statistical Completing
13. Case Studies in Bayesion Statistics vol. VI
    Lecture notes in Bayesion Statistics number 167 (2002)
    Constantine, Gatsonis Alicia, Carriquary Andrew, Gelman
14. Wardlow A.C (2005) Practical Statistical for Experimental bilogoists
    (2nd Edition)

Seminar : Case Studies listed in the paper to be discussed and brief summary should be prepared.

2 hours per week : 30 Teaching hours+ 30 Notional hours

$$= 60 \text{ hours}$$

$$= 2 \text{ credits}$$

Total number of Credits for Second Semester

Theory 16 + Practicals 8 = 24

At the end of Second Semester there will be a practical examination based on Theory papers PSST 201, PSST 202, PSST 203 and PSST 204 .

Semester I	Theory	4 x 4=16
	Practicals	8
		_____
		24 credits
Semester II	Theory	4 x 4=16
	Practicals	8
		_____
		24 credits

Exam Pattern For Theory And Practical

Internal Exam   40 Marks

Semester End Exam   60 Marks of 3 hours duration

Eligibility for admission to M.A./M.Sc. Part I

A candidate for being eligible for admission to the M.A./M.Sc degree in Statistics must have passed the Bachelor of Science or Arts degree examination with Statistics as a major subject, or an examination of another University recognised as equivalent thereto. In addition, the student should secure at least 60% for general category and 55% for reserved category at B.A./B.Sc. examination in Statistics.

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