**Detailed Syllabus**
**Lecture-wise Breakup**

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|---|---|---|---|
| **Course Code** | 19M21HS111 | **Semester: Odd** | **Semester:** 2019 -2020<br>**Month:** July 2019-Dec 2019 |
| **Course Name** | Presentation and Communication Skills | | |
| **Credits** | 2 | **Contact Hours** | 2-0-0 |

| | | |
|---|---|---|
| **Faculty (Names)** | **Coordinator(s)** | Dr. Parineeta Singh |
| | **Teacher(s) (Alphabetically)** | Dr. Parineeta Singh |

| **COURSE OUTCOMES** | | **COGNITIVE LEVELS** |
|---|---|---|
| **C101.1** | Develop an in-depth understanding and appreciate the subtle aspects of English as a communication tool. | Understand( C2) |
| **C101.2** | Assess the communication challenges of a diverse, global marketplace | Analyze (C4) |
| **C101.3** | Create & Compose different forms of Professional writing | Create (C6) |
| **C101.4** | Evaluate the effectiveness of sample Presentations | Evaluate (C5) |
| **C101.5** | Apply the acquired skills in delivering effective presentations | Apply (C3) |

| **Module No.** | **Title of the Module** | **Topics in the Module** | **No. of Lectures for the module** |
|---|---|---|---|
| **1.** | **Communication Process, Grammar, and Vocabulary** | • Communication: Definition, Model, Channel, Goals<br>• Process of Communication: *Linear Concept, Shannon-Weaver Model, the Two-Way Process*<br>• Communication Traits: *Communication Apprehension, Style, Argumentativeness* and *Verbal Aggressiveness*<br>• Grammar: *denotative* and *connotative* words, subject-verb agreement<br>• Techniques of Vocabulary Building | 5 |
| **2.** | **Intercultural Communication** | • Recognizing cultural diversity: variations in a diverse world<br>• Developing Cultural Intelligence: *High-Context Cultures* and *Low-Context Cultures*<br>• Time as a cultural factor: *Monochronic* and *Polychronic* Time<br>• Challenges of Intercultural Communication<br>• Developing Cultural Competency and Guidelines for Adapting. | 5 |
| **3.** | **Business Etiquettes, and Presentation Skills** | • Ekman's classification of communicative movements<br>• Face Facts, Positive Gestures, Negative Gestures, Lateral Gestures<br>• Preparing and Delivering a Presentation<br>• Using Audio-Visual Aids: Presentation Support<br>• Sample Presentations: | 5 |

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|---|---|---|---|
| | | 1. Steve Jobs, *Three Stories of my Life* (Stanford University Commencement Address, 2005)<br>2. Dr. Shashi Tharoor, *Britain does owe India reparations* (Oxford Union Debate) | |
| **4.** | **Communication for Conflict Management** | • Negotiation, Mediation, and Conciliation<br>• Stages in the Negotiation Process<br>• Strategies of Conciliation<br>• Solving Deadlocks<br>• Reaching an Agreement | 5 |
| **5.** | **Communication for Employment** | • Guidelines for writing a Resume, Types of Resumes<br>• Interviews: Purpose and Types.<br>• Interviews: Preparation, Process, Common Mistakes to Avoid.<br>• Group Discussion: Stages (Forming, Storming, Norming, Performing, Adjourning)<br>• Formal/Informal Group Dynamics | 5 |
| **6.** | **Technical Communication** | • Characteristics of a Report<br>• Types of Report<br>• 5 W's and 1 H of a Report<br>• Structure, Format, Parts of a Report<br>• Referencing, and Documentation | 5 |
| | | **Total number of Lectures** | **30** |

**Evaluation Criteria**

| **Components** | **Maximum Marks** |
|---|---|
| Mid Term Examination (Presentation) | 30 |
| End Semester Examination | 40 |
| TA | 30(Assignment/ Viva) |
| **Total** | **100** |

**Recommended Reading material:** Author(s), Title, Edition, Publisher, Year of Publication etc. ( Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)


| | |
|---|---|
| **1** | C.L.Bovee, J.V.Thill, Roshan Lal Raina, *Business Communication Today*, 13th Ed, Pearson Education, 2017. |
| **2** | R.C. Sharma and Krishna Mohan, *Business Correspondence and Report Writing*, Mc Graw Hill Education, 2016. |
| **3** | Meenakshi Raman and Sangeeta Sharma, *Technical Communication: Principles and Practice*, Oxford University Press, 2015. |
| **4** | Anna Koneru, *Professional Communication*, Mc Graw Hill Education Pvt Ltd., 2017. |
| **5** | Murli Krishna, *Communication Skills for Engineers*, Pearson, 2014. |
| **6** | Meenu Dudeja, *Communication Skills for Professionals*, Satya Prakashan, 2017. |
| **7** | Barun K. Mitra, *Personality Development and Soft Skills*, Oxford University Press, 2012. |

## Ordinary Differential Equations (19M21MA111)

### Lecture-wise Breakup

| | | | |
|---|---|---|---|
| **Course Code** | **19M21MA111** | **Semester Odd** | **Semester** I **Session- 2019-20**<br>**Month from** July 2019 –Dec 2019 |
| **Course Name** | Ordinary Differential Equations | | |
| **Credits** | 4 | **Contact Hours** | 3-1-0 |
| **Faculty (Names)** | **Coordinator(s)** | Sanjeev Sharma | |
| | **Teacher(s) (Alphabetically)** | Sanjeev Sharma | |

| **COURSE OUTCOMES** | | **COGNITIVE LEVELS** |
|---|---|---|
| After pursuing the above mentioned course, the students will be able to: | | |
| **C110.1** | explain the basic theory of ordinary differential equations and solve related problems. | Applying Level (C3) |
| **C110.2** | make use of Frobenious method in solving differential equations. | Applying Level (C3) |
| **C110.3** | apply matrix method to solve a system of homogeneous linear ordinary differential equations. | Applying Level (C3) |
| **C110.4** | explain the concept of existence and uniqueness theorem of initial value problems. | Understanding Level (C2) |
| **C110.5** | make use of orthogonality of functions in solving Sturm-Liouville boundary value problems. | Applying Level (C3) |
| **C110.6** | explain the phase plane, critical points and paths of nonlinear systems. | Understanding Level (C2) |

| **Module No.** | **Title of the Module** | **Topics in the Module** | **No. of Lectures for the module** |
|---|---|---|---|
| **1.** | Basic Theory of linear differential equations | Initial value problems, boundary-value problems and existence of solutions, the homogeneous linear equation with constant coefficients, variation of parameters, the Cauchy-Euler equation, applications to ordinary differential equations in LCR and mass spring problem. | **8** |
| **2.** | Series solution | Power series solutions about an ordinary point, solutions about singular points; the method of Frobenius, Bessel's equation and Bessel functions. | **5** |
| **3.** | System of linear | The matrix method for homogeneous linear | **5** |

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|---|---|---|---|
| | differential equations | systems with constant coefficients: two equations in two unknown functions. | |
| **4.** | Existence and uniqueness theory | The fundamental existence and uniqueness theorem, dependence of solutions on initial conditions and on the function. | **6** |
| **5.** | Sturm-Liouville boundary value problems | Theory of the homogeneous linear system, the non-homogeneous linear system, Strum Theory, Strum-Liouville problems, orthogonality of characteristic functions, the expansion of a function in a series of orthonormal functions, trigonometric Fourier series, Green's function. | **14** |
| **6.** | Nonlinear differential equations | Phase plane, paths and critical points, critical points and path of linear systems, critical points and path of non-linear systems. | **4** |
| | | **Total number of lectures** | **42** |

**Evaluation Criteria**

| **Components** | **Maximum Marks** |
|---|---|
| T1 | 20 |
| T2 | 20 |
| End Semester Examination | 35 |
| TA | 25 (Quiz, Assignments, Tutorials) |
| **Total** | **100** |

**Recommended Reading material:** Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)


| | |
|---|---|
| **1.** | **Ross, S. L.,** Differential Equations, 3rd Ed., John Wiley & Sons, Singapore, 2004. |
| **2.** | **Simmons, G. F.,** Differential Equations with Applications and Historical Notes, 3rd Ed., CRC Press, Boca Raton, 2016. |
| **3.** | **Sachdev, P. L.,** A Compendium on Nonlinear Ordinary Differential Equations, Wiley-Blackwell, 1996. |
| **4.** | **Coddington, E. A. & Carlson R.,** Introduction to Ordinary Differential Equations, SIAM, USA, 1997. |

# Real Analysis (19M21MA112)

## Lecture-wise Breakup

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|---|---|---|---|
| **Course Code** | 19M21MA112 | **Semester Odd** | **Semester I Session 2019-20**<br>**Month from** Aug 2019-Dec 2019 |
| **Course Name** | Real Analysis | | |
| **Credits** | 4 | **Contact Hours** | 3-1-0 |
| **Faculty (Names)** | **Coordinator(s)** | Prof. B. P. Chamola | |
| | **Teacher(s) (Alphabetically)** | Prof. B. P. Chamola | |

| **COURSE OUTCOMES** | | **COGNITIVE LEVELS** |
|---|---|---|
| After pursuing the above mentioned course, the students will be able to: | | |
| **C111.1** | explain the concepts of compact sets, connected sets, metric space and their properties. | Understanding level (C2) |
| **C111.2** | explain the convergence of sequences, series and their properties. | Understanding level (C2) |
| **C111.3** | make use of the concepts of continuity, compactness and connectedness of functions in solving related problems. | Applying Level (C3) |
| **C111.4** | explain the Riemann-Stieltjes integral and its properties. | Understanding level (C2) |
| **C111.5** | apply the concepts of sequence and series of functions, their uniform convergence and properties on various problems. | Applying level (C3) |
| **C111.6** | solve the problems on Lebesgue integral of functions. | Applying level (C3) |

| **Module No.** | **Title of the Module** | **Topics in the Module** | **No. of Lectures for the module** |
|---|---|---|---|
| **1.** | Review of sets | Finite, countable and uncountable sets, metric spaces, compact sets, perfect sets, connected sets. | **4** |
| **2.** | Sequences and series | Convergent sequences, sub sequences, Cauchy sequences, power series, absolute convergence, algebra of series, rearrangements of elements in a series | **5** |
| **3.** | Continuity | Limits of functions, continuous functions, compactness, connectedness, monotonic functions, infinite limits and limits at infinity. | **6** |

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|---|---|---|---|
| **4.** | The Riemann-Stieltjes integral | Definition and existence of the Riemann-Stieltjes integral, properties of the integral, integration and differentiation, integration of vector-valued functions, rectifiable curves. | **9** |
| **5.** | Sequence and series of functions | Sequences and series of functions: interchanging order of limits for sequences of functions, uniform convergence, uniform convergence and continuity, uniform convergence and integration, uniform convergence and differentiation, equi-continuous families of functions, Stone Weierstrass theorem. | **10** |
| **6.** | Lebesgue theory | Measurable sets and their properties, Lebesgue measure, measurable functions, Lebesgue integral of functions of arbitrary sign, integrable functions. | **8** |
| | | **Total number of lectures** | **42** |

**Evaluation Criteria**

| **Components** | **Maximum Marks** |
|---|---|
| T1 | 20 |
| T2 | 20 |
| End Semester Examination | 35 |
| TA | 25 (Quiz, Assignments, Tutorials) |
| **Total** | **100** |

**Recommended Reading material:** Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)


| | |
|---|---|
| **1.** | **Rudin,W.,** Principles of Mathematical Analysis, 3rd Ed., New Delhi, McGraw-Hill Inc., 2013. |
| **2.** | **Royden, H. L. and Fitzpatrick, P. M.,** Real Analysis, 4rd Ed., New Delhi, Pearson, 2010. |
| **3.** | **Carothers, N. L.,** Real Analysis, Cambridge University Press, 2000. |
| **4.** | **Apostol, T. M.,** Mathematical Analysis –A modern approach to Advanced Calculus, New Delhi, Narosa Publishing House, 1957. |
| **5.** | **Bartle, R. G. and Sherbert, D. R.,** Introduction to Real Analysis, 3rd Ed., Wiley, 1999. |

## Abstract Algebra (19M21MA113)

### Lecture-wise Breakup

| | | | | |
|---|---|---|---|---|
| **Course Code** | 19M21MA113 | **Semester Odd** | **Semester** I **Session 2019-20** **Month from** July 2019 to Dec 2019 | |
| **Course Name** | Abstract Algebra | | | |
| **Credits** | 4 | **Contact Hours** | 3-1-0 | |
| **Faculty (Names)** | **Coordinator(s)** | Dr. Pato Kumari | | |
| | **Teacher(s) (Alphabetically)** | Dr. Pato Kumari | | |

| **COURSE OUTCOMES** | | **COGNITIVE LEVELS** |
|---|---|---|
| After pursuing the above mentioned course, the students will be able to: | | |
| **CO1** | illustrate various types of groups and their properties. | Understanding Level (C2) |
| **CO2** | explain Cayley, Cauchy, Sylow theorems and solve related problems. | Applying Level (C3) |
| **CO3** | explain the concepts of rings, ideals and isomorphism. | Understanding Level (C2) |
| **CO4** | solve problems on integral domain, principal ideal domains and unique factorization domains (UFD) . | Applying Level (C3) |
| **CO5** | explain and identify modules, submodules, quotient modules and free modules. | Applying Level (C3) |
| **CO6** | explain and analyze the concepts of fields and their extensions. | Analyzing Level (C4) |

| **Module No.** | **Title of the Module** | **Topics in the Module** | **No. of Lectures for the module** |
|---|---|---|---|
| **1.** | Groups | Groups, subgroups, cyclic groups, groups of permutations and their homomor-phisms, normal subgroups, quotient groups, isomorphism theorems, group actions, Cayley's theorem, class equation of a group, Cauchy's theorem, p-groups, Sylow's theorems and their applications. | **10** |
| **2.** | Rings | Rings, ideals and homomorphisms, quotient rings, isomorphism theorems, prime and maximal ideals, rings of fractions, integral domain, Euclidean domains, principal ideal domains and unique factorization domains (UFD), polynomial rings over UFDs, criteria for irreducibility of polynomials over UFD's. | **12** |
| **3.** | Modules | Basic definitions and examples, submodules and direct sums, quotient modules, homomorphism and isomorphism | **10** |

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|---|---|---|---|
| | | theorems, cyclic modules, free modules. | |
| **4.** | Fields | fields and their extensions, algebraic and finitely generated field extensions, splitting fields and normal extensions, algebraic closures, finite fields, separable and inseparable extensions, Galois groups, fundamental theorem of Galois theory. | **10** |
| | | **Total number of lectures** | **42** |

**Evaluation Criteria**

| **Components** | **Maximum Marks** |
|---|---|
| T1 | 20 |
| T2 | 20 |
| End Semester Examination | 35 |
| TA | 25 (Quiz, Assignments, Tutorials) |
| **Total** | **100** |

**Recommended Reading material:** Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)


| | |
|---|---|
| **1.** | **Dummit D. S. and Foote R. M.,** Abstract Algebra, 3rd Ed., John Wiley & Sons, 2003. |
| **2.** | **Bhattacharya, P. B., Jain, S. K. and Nagpaul, S. R.,** Basic Abstract Algebra, 2nd Ed., Cambridge University Press, 1995. |
| **3.** | **Herstein, I. N.,** Topics in Algebra, 2nd Ed., John Wiley & Sons, 1999. |
| **4.** | **Fraleigh,** J. **B., A** First Course in Abstract Algebra, 2nd Ed., Pearson Education, 2007. |

## General Topology (19M21MA114)

## Lecture-wise Breakup

| | | | |
|---|---|---|---|
| **Course Code** | **19M21MA114** | **Semester Odd** | **Semester** I **Session 2019-2020**<br>**Month from** Aug 2019 – Dec 2019 |
| **Course Name** | General Topology | | |
| **Credits** | **3** | **Contact Hours** | **4** |
| **Faculty (Names)** | **Coordinator(s)** | Prof. Alka Tripathi | |
| | **Teacher(s) (Alphabetically)** | Prof. Alka Tripathi | |

| **COURSE OUTCOMES** | | **COGNITIVE LEVELS** |
|---|---|---|
| After pursuing the above mentioned course, the students will be able to: | | |
| **C113.1** | explain metric space, topological spaces and related concepts. | **Understanding (C2)** |
| **C113.2** | solve problems on different types of topologies. | **Applying (C3)** |
| **C113.3** | explain continuous maps, continuity theorem, homeomorphisms and related concepts. | **Understanding (C2)** |
| **C113.4** | apply the properties of connected spaces and compact spaces in proving various theorems. | **Applying (C3)** |
| **C113.5** | make use of the concepts of countability and separation in various topological spaces. | **Applying (C3)** |

| **Module No.** | **Title of the Module** | **Topics in the Module** | **No. of Lectures for the module** |
|---|---|---|---|
| **1.** | Metric Space | Metric space, open sets, closed sets | 2 |
| **2.** | Metric Space | Convergence, completeness, continuity in metric space | 3 |
| **3.** | Metric Space | Cantor intersection theorem | 1 |
| **4.** | Topological space | Topological space, elementary concept, basis for a topology | 2 |
| **5.** | Topological space | Open and closed sets, interior and closure of sets, neighbourhood of a point, limit points, boundary of a set | 3 |
| **6.** | Topological space | Subspace topology, weak topology | 2 |
| **7.** | Topological | Product topology, quotient topology | 2 |

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|---|---|---|---|
| | space | | |
| **8.** | Compactness and Connectedness | Continuous maps, continuity theorems for open and closed sets, homeomorphism | 4 |
| **9.** | Compactness and Connectedness | Connected spaces, continuity and connectedness, components, totally disconnected space, locally connected space | 4 |
| **10.** | Compactness and Connectedness | Compact space, limit point compact, sequentially compact space, local compactness | 4 |
| **11.** | Compactness and Connectedness | Continuity and compactness, Tychonoff theorem | 3 |
| **12.** | Countability and Separation | First and second countable spaces, $T_1$ spaces, Hausdorff spaces | 3 |
| **13.** | Countability and Separation | Regular spaces, normal spaces, completely normal space, completely regular space | 5 |
| **14.** | Countability and Separation | Tietz extension theorem, Metrizability, Uryshon lemma, Uryshonmetrization theorem | 4 |
| | | **Total number oflectures** | **42** |

**Evaluation Criteria**

| **Components** | **Maximum Marks** |
|---|---|
| T1 | 20 |
| T2 | 20 |
| End Semester Examination | 35 |
| TA | 25 (Quiz, Assignments, Tutorials) |
| **Total** | **100** |

**Recommended Reading material:** Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)


| | |
|---|---|
| **1.** | **G. F. Simmons,** *Introduction to Topology and Modern Analysis*, Tata Mc-Graw Hill Education, New Delhi, 2004. |
| **2.** | **J. R. Munkres,** *Topology: A First Course*, 2nd Ed., PHI, 2010. |
| **3.** | **Y. Min,** *Introduction to Topology: Theory & Applications*, Higher Education Press, 2010. |
| **4.** | **S. Lipschutz,** *General Topology*, Schaum's Outline Series, Mc-Graw-Hill, 1985. |
| **5.** | **C. A. R. Franzosa ,***Introduction to Topology*, NarosaPublishers, New Delhi, 2007. |
| **6.** | **K. D. Joshi,** *Introduction to General Topology*, New Age Publishers, New Delhi, 1983. |

## Mathematical Methods (19M21MA115)

### Lecture-wise Breakup

| | | | |
|---|---|---|---|
| **Course Code** | **19M21MA115** | **Semester Odd** | **Semester** I **Session 2019-2020**<br>**Month from** Aug 2019- Dec 2019 |
| **Course Name** | Mathematical Methods | | |
| **Credits** | 4 | **Contact Hours** | 3-1-0 |
| **Faculty (Names)** | **Coordinator(s)** | Puneet Rana | |
| | **Teacher(s) (Alphabetically)** | Puneet Rana | |

| **COURSE OUTCOMES** | | **COGNITIVE LEVELS** |
|---|---|---|
| After pursuing the above mentioned course, the students will be able to: | | |
| **C114.1** | explain functionals and their variations to optimize various problems. | **C2** |
| **C114.2** | apply different forms of Euler's equation on different variational problems. | **C3** |
| **C114.3** | explain and solve different types of integral equations and their eigenvalue problems. | **C3** |
| **C114.4** | solve boundary value problems and singular integral equations. | **C3** |
| **C114.5** | apply different linear integral transforms in solving differential and integral equations. | **C3** |

| **Module No.** | **Title of the Module** | **Topics in the Module** | **No. of Lectures for the module** |
|---|---|---|---|
| **1** | Functional and its Variation | Introduction, variation and its properties, comparison between the notion of extrema of a function and a functional, construction of functional, problem of brachistochrone, geodesics and isoperimetric problem. | **6** |
| **2** | Variational Problems with fixed and moving Boundaries | The system of Euler's equations, the fundamental lemma of the calculus of variations, examples, functionals in the form of integrals, special cases containing only some of the variables, functionals depending on the higher derivatives of the dependent variables, Euler-Poisson equation, Ostrogradsky equation, moving end problems, Rayleigh-Ritz method, | **10** |

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|---|---|---|---|
| | | Galerkin's method and Kantorovich method of solving differential equations. | |
| **3** | Integral equations | Integral equations of Fredholm and Volterra type, Conversion from IVP and BVP. Solution by successive substitution and successive approximation, integral equations with degenerate kernels. Fredholm's theorems, integral equations with symmetric kernel, eigenvalues and eigenfunctions of integral equations and their simple properties. | **10** |
| **4** | Applications of integral equations | Longitudinal vibrations of the rod, deformation of a rod, Green's function, influence function, construction of Green's function when the boundary value problem contains a parameter, Abel integral equation, weakly singular kernel, iteration of the singular equation. | **8** |
| **5** | Integral transform methods | Introduction, Laplace transform, properties of the Laplace transform, application to Volterra integral equation, Fourier transform, application of Fourier transform, introduction to Hankel and Mellin transform, Fox's integral equation. | **8** |
| | | **Total number of lectures** | **42** |

**Evaluation Criteria**

| **Components** | **Maximum Marks** |
|---|---|
| T1 | 20 |
| T2 | 20 |
| End Semester Examination | 35 |
| TA | 25 (Quiz, Assignments, Tutorials) |
| **Total** | **100** |

**Recommended Reading material:** Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)


| | |
|---|---|
| **1.** | **L. Elsegolc,** Calculus of Variation, Dover Publications, 2010. |
| **2.** | **I. M. Gelf and, S.V. Fomin,** Calculus of Variations, Prentice Hall, 1963. |
| **3.** | **R. P. Kenwal,** Linear Integral Equation; Theory and Techniques, Academic Press, 1971. |
| **4.** | **F. B. Hildebrand,** Methods of Applied Mathematics, Dover Publications, 1992. |
| **5.** | **S. Pal and S. C. Bhunia,** Engineering Mathematics, Oxford University Press, 2015. |
| **6.** | **I. G. Petrovsky,** Lectures on the Theory of Integral Equations, Mir Publishers, Moscow, 1971. |

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|---|---|
| **7.** | **L. Debnath and D. Bhatta,** Integral Transforms and Their Applications, Chapman and Hall/ CRC, 2006. |