UNIVERSITY OF CALICUT

Abstract


General and Academic Branch – IV ‘E’ Section

No.GA.IV/E1/8226/2011(3) Dated Calicut University P.O. 08.05.2012.

Read:-
2. Minutes of the meeting of Board of Studies in Engineering (P.G) held on 30.03.2012 Item.No.1)
3. Orders of Vice-Chancellor in the file of even No. dated 17.04.2012.
4. Letter from the Dean, Faculty of Engineering dated 23.04.2012.
5. Orders of Vice-Chancellor in the file of even No. dated 03.05.2012.

ORDER

As per paper read as (1) above, a technical expert committee consisting of the following members were constituted to scrutinize the syllabus of the M.Tech Course in Computational Linguistics as few mistakes and omissions were noticed by the Board in the Syllabus forwarded by the Principal, Govt.Engineering College, Sreekrishnapuram, Palakkad and to submit the modified version to the University.

a) Smt.Helen.K.J (Co-ordinator), Member, Board of Studies in Engineering (UG)
   Assistant Professor, Dept.of. Computer Science & Engineering, Govt.Engineering College, Thrissur.

b) Dr.Reghuraj.P.C, Professor, Dept.of.Computer Science & Engineering,

c) Dr.K.Najeeb, Head, Dept.of.Computer Science & Engineering

Vide paper read as 2nd above, the meeting of Board of Studies in Engineering (P.G) held on 30.03.2012, vide item.No. 1 unanimously resolved to approve the Scheme & Syllabus of the M.Tech course in Computational Linguistics submitted by the Expert Committee.

Vide paper read as 3rd above, the Vice-Chancellor had ordered to seek the opinion of the Dean, Faculty of Engineering regarding the approval of the minutes of the meeting of the Board of Studies in Engineering (PG) held on 30.03.2012

The Dean, Faculty of Engineering vide paper read as 4th above, recommended for the approval of the minutes of the meeting of the Board of Studies in Engineering (PG) held on 30.03.2012.

Contd..2
Considering the urgency of the matter, the Vice-Chancellor has accorded sanction to implement the Scheme & Syllabus of the M.Tech Course in Computational Linguistics, subject to ratification by the Academic Council, vide paper read as 5th above.

Sanction has therefore been accorded for implementing the Scheme & Syllabus of the M.Tech course in Computational Linguistics with effect from 2011 admission onwards.

Orders are issued accordingly.

(The Syllabus is available in the University website)

Sd/-
DEPUTY REGISTRAR (GA.IV)
For Registrar.

To

The Principals of all affiliated Engineering Colleges offering M.Tech Course.
Copy to :- P.S to V.C/PA. to PVC/ P.A to Registrar/P.A to C.E/Enquiry/ Ex.Sn/EG Sn/DR,M.Tech/M.Tech.Tabulation Section/Dean, Faculty of Engineering/ Chairman, BOS in Engg (PG)&(UG) System Administrator (with a request to upload in the university website)/ SF/FC

Forwarded/By Order

Sd/-
SECTION OFFICER
UNIVERSITY OF CALICUT

M.Tech. DEGREE COURSE
COMPUTATIONAL LINGUISTICS

Curricula, Scheme of Examinations and Syllabus
(With effect from 2011 admissions)

M.Tech in Computational Linguistics
## CURRICULUM

### FIRST SEMESTER

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Name of the Subject</th>
<th>Hours/Week</th>
<th>Marks</th>
<th>Total Marks</th>
<th>Sem-end exam duration - Hrs.</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>L  T</td>
<td>P/D</td>
<td>Internal</td>
<td>Sem-end</td>
<td></td>
</tr>
<tr>
<td>MCL10 101</td>
<td>Mathematical Foundations of Computer Science</td>
<td>3 1 0</td>
<td>100</td>
<td>100</td>
<td>200</td>
<td>3</td>
</tr>
<tr>
<td>MCL10 102</td>
<td>Natural Language Processing</td>
<td>3 1 0</td>
<td>100</td>
<td>100</td>
<td>200</td>
<td>3</td>
</tr>
<tr>
<td>MCL10 103</td>
<td>Computational Linguistics-I</td>
<td>3 1 0</td>
<td>100</td>
<td>100</td>
<td>200</td>
<td>3</td>
</tr>
<tr>
<td>MCL10 104</td>
<td>Speech Processing</td>
<td>3 1 0</td>
<td>100</td>
<td>100</td>
<td>200</td>
<td>3</td>
</tr>
<tr>
<td>MCL10 105</td>
<td>Elective I</td>
<td>3 1 0</td>
<td>100</td>
<td>100</td>
<td>200</td>
<td>3</td>
</tr>
<tr>
<td>MCL10 106(P)</td>
<td>Seminar I</td>
<td>0 0 2</td>
<td>100</td>
<td>0</td>
<td>100</td>
<td>-</td>
</tr>
<tr>
<td>MCL10 107(P)</td>
<td>Computational Linguistics Lab I</td>
<td>0 0 4</td>
<td>100</td>
<td>0</td>
<td>100</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>15 5</td>
<td>700</td>
<td>500</td>
<td>1200</td>
<td>24</td>
</tr>
</tbody>
</table>

Note: Remaining 6 hours / week is meant for departmental assistance by students

### SECOND SEMESTER

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Name of the Subject</th>
<th>Hours/Week</th>
<th>Marks</th>
<th>Total Marks</th>
<th>Sem-end exam duration – Hrs.</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>L  T</td>
<td>P/D</td>
<td>Internal</td>
<td>Sem-end</td>
<td></td>
</tr>
<tr>
<td>MCL10 201</td>
<td>Statistical Natural Language Processing</td>
<td>3 1 0</td>
<td>100</td>
<td>100</td>
<td>200</td>
<td>3</td>
</tr>
<tr>
<td>MCL10 202</td>
<td>Algorithms and Complexity</td>
<td>3 1 0</td>
<td>100</td>
<td>100</td>
<td>200</td>
<td>3</td>
</tr>
<tr>
<td>MCL10 203</td>
<td>Data and Text Mining</td>
<td>3 1 0</td>
<td>100</td>
<td>100</td>
<td>200</td>
<td>3</td>
</tr>
<tr>
<td>MCL10 204</td>
<td>Elective II</td>
<td>3 1 0</td>
<td>100</td>
<td>100</td>
<td>200</td>
<td>3</td>
</tr>
<tr>
<td>Subject Code</td>
<td>Name of the Subject</td>
<td>Equivalent Subject in M.Tech(Computer Sc&amp;Engg)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------------</td>
<td>---------------------</td>
<td>---------------------------------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Elective I</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MCL10 105(A)</td>
<td>Computational Intelligence</td>
<td>MCS10 105(A)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MCL10 105(B)</td>
<td>Information Retrieval and Extraction</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MCL10 105(C)</td>
<td>Theories of Syntax and Semantics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MCL10 105(D)</td>
<td>Special Architectures</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Elective II</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MCL10 204(A)</td>
<td>Machine Learning</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MCL10 204(B)</td>
<td>Machine Translation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MCL10 204(C)</td>
<td>Information Theory</td>
<td>MCS10 204(C)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Elective III</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MCL10 205(A)</td>
<td>Pattern Recognition</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MCL10 205(B)</td>
<td>Software Architecture and Project Management</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MCL10 205(C)</td>
<td>Soft Computing</td>
<td>MCS10 205(C)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Remaining 6 hours / week is meant for departmental assistance by students.
### III Semester

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Name of the Subject</th>
<th>Hours/Week</th>
<th>Marks</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>L</td>
<td>T</td>
<td>P/D</td>
<td>Internal</td>
<td>Sem-end</td>
<td>Total Marks</td>
<td>Sem-end exam duration Hrs.</td>
<td>Credits</td>
</tr>
<tr>
<td>MCL10 301</td>
<td>Elective IV</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>100</td>
<td>100</td>
<td>200</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>MCL10 302</td>
<td>Elective V</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>100</td>
<td>100</td>
<td>200</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>MCL10 303(P)</td>
<td>Industrial Training</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>50</td>
<td>-</td>
<td>50</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>MCL10 304(P)</td>
<td>Master Research Project Phase I</td>
<td>0</td>
<td>0</td>
<td>22</td>
<td>Guide</td>
<td>EC*</td>
<td>300</td>
<td>-</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>150</td>
<td>150</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>6</td>
<td>2</td>
<td>22</td>
<td>550</td>
<td>200</td>
<td>750</td>
<td>15</td>
<td></td>
</tr>
</tbody>
</table>

NB: The student has to undertake the departmental work assigned by HoD

*EC – Evaluation Committee

### IV Semester

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Name of the Subject</th>
<th>Hours/Week</th>
<th>Internal Marks</th>
<th>Sem-end exam duration Hrs.</th>
<th>Total Marks</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>L</td>
<td>T</td>
<td>P/D</td>
<td>Guide</td>
<td>Evaluati</td>
</tr>
<tr>
<td>MCL10 401(P)</td>
<td>Project Work</td>
<td>-</td>
<td>-</td>
<td>30</td>
<td>150</td>
<td>on Commit</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td>30</td>
<td>150</td>
<td>tee</td>
</tr>
</tbody>
</table>

NB: The student has to undertake the departmental work assigned by HoD

**Elective IV**

- MCL10 301(A) Multimedia
- MCL10 301(B) Research Methodology (Common with MCS10 301(B))
MCL10 301(C) Knowledge based System Design

Elective V

MCL10 302(A) Advanced Computational Linguistics
MCL10 302(B) Semantic Web Architecture
MCL10 302(C) Indian Theories of Meaning

SYLLABUS

SEMESTER 1

MCL10 101 Mathematical Foundations of Computer Science

Teaching scheme: 3 hours lecture & 1 hour tutorial per week Credits: 4

Objective: To introduce the mathematical theory relevant to Computational Linguistics.

Module I (12 hrs)
Review of Formal Languages and Automata Theory: Mathematical notion of a language and language recognizers-Types of languages-Chomsky Hierarchy-Grammars, languages and their recognizers-notions of computability

Module II (12hrs)
Linear Algebra: Matrix operations, Eigen values and Eigen vectors, LU decomposition, Singular Value decomposition, Review of Vector Algebra

Module III (15 hrs)
Continuous Time Markov Chains: General pure Birth processes and Poisson processes, Birth and death processes, Finite state continuous time Markov chains
Bayes’ Theorem and applications
Information Theory Essentials: Entropy and Cross Entropy-relation to language-Mutual information

Module IV (13 hours)
Essential statistics: Random variables and Standard distributions-Poisson distribution-Term distribution models-k mixture, Statistical Estimators.

References:
4. S. M. Ross, Introduction to Probability Models, Harcourt Asia Pvt. Ltd. and

Internal continuous assessment: 100 marks
Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced right at the beginning of the semester by the teacher.

End semester Examination: 100 marks

Question pattern
Answer any 5 questions by choosing at least one question from each module.
Module I
Question 1: 20 marks, Question 2: 20 marks
Module II
Question 3: 20 marks, Question 4: 20 marks
Module III
Question 5: 20 marks, Question 6: 20 marks
Module IV
Question 7: 20 marks, Question 8: 20 marks

MCL10 102 Natural Language Processing

Teaching scheme: 3 hours lecture & 1 hour tutorial per week
Credits: 4

Objective: To introduce the basics of Language processing from algorithmic viewpoint.

Module I (12 hrs)
Introduction to Natural Language Understanding: Linguistic Background-An Outline of English Syntax-Grammars and Parsing-Features and Augmented Grammars.

Module II (14 hrs)

Module III (14 hrs)
Module IV (12 hrs)

References


Internal continuous assessment: 100 marks
Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced right at the beginning of the semester by the teacher.

End semester Examination: 100 marks
Question pattern
Answer any 5 questions by choosing at least one question from each module.

Module I
Question 1: 20 marks, Question 2: 20 marks

Module II
Question 3: 20 marks, Question 4: 20 marks

Module III
Question 5: 20 marks, Question 6: 20 marks

Module IV
Question 7: 20 marks, Question 8: 20 marks

MCL10 103 Computational Linguistics-I

Teaching scheme: 3 hours lecture & 1 hour tutorial per week

Objective: To introduce the fundamentals of Language processing from computational viewpoint.

Module I (14 hrs)
Learning PCFG Probabilities-Problems with PCFGs-Probabilistic Lexicalized CFGs-Dependency Grammars-Human Parsing
Module II (14 hrs)
Unification of Feature Structures: Feature Structures in the Grammar-Agreement-Head Features-Subcategorization-Long Distance Dependencies-Implementing Unification-Unification Data Structures-The Unification Algorithm-Unification Parsing-Integrating Unification into an Earley Parser-Types and Inheritance-Extensions to Typing
Module III (12hrs)
Semantics: Representing Meaning-Semantic Analysis-Lexical Semantics - Word Sense Disambiguation and Information Retrieval
Module IV (12 hrs)

References

Internal continuous assessment: 100 marks
Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced right at the beginning of the semester by the teacher.

End semester Examination:100 marks
Question pattern
Answer any 5 questions by choosing at least one question from each module.
Module I
Question 1 : 20 marks, Question 2 : 20 marks
Module II
Question 3 : 20 marks, Question 4: 20 marks
Module III
Question 5 : 20 marks, Question 6: 20 marks
Module IV
Question 7 : 20 marks, Question 8: 20 marks

MCL10 104 Speech Processing
Teaching scheme: 3 hours lecture & 1 hour tutorial per week
Credits: 4

Objective: To introduce the relevant theory and algorithms for processing human speech.
Module I (14 hrs)
Introduction: The Role of Knowledge in Speech and Language Processing-Models and Algorithms-Language, Thought, and Understanding-The Turing Test-A Short History of Speech and Language Processing-Formal Languages and recognizers
Computational Phonology and Pronunciation Modeling-Speech Sounds and Phonetic Transcription-The Vocal Organs-Consonants: Places of Articulation
Consonants: Manner of Articulation-Vowels-The Phoneme and Phonological Rules-Phonological Rules and Transducers

Module II (14 hrs)
Mapping Text to Phonemes for TTS-Pronunciation Dictionaries
Beyond Dictionary Lookup: Text Analysis-An FSA based Pronunciation Lexicon
English Pronunciation Variation, Models of Pronunciation and Spelling--Introduction to Spell Checking-Spelling Error Patterns-Detecting Non-word Errors-Probabilistic Models-
Applying the Bayesian Method to Spelling Correction-Minimum Edit Distance

Module III (12 hrs)
The Bayesian Method for Pronunciation-Decision Tree Models of Pronunciation Variation-Weighted Automata-Computing Likelihoods: The Forward Algorithm-Decoding: The Viterbi Algorithm-Weighted Automata and Segmentation

Module IV (12 hrs)

References

Internal continuous assessment: 100 marks
Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced right at the beginning of the semester by the teacher.

End semester Examination:100 marks

Question pattern
Answer any 5 questions by choosing at least one question from each module.

Module I
Question 1 : 20 marks, Question 2 : 20 marks
Module II
Question 3 : 20 marks, Question 4: 20 marks
Module III
Question 5 : 20 marks, Question 6: 20 marks
Module IV
Question 7 : 20 marks, Question 8: 20 marks

ELECTIVES
MCL10 105(A) Computational Intelligence
Teaching scheme: 3 hours lecture & 1 hour tutorial per week
Credits: 4

Objective: To introduce the fundamentals of intelligent systems, their architecture and programming.

Module I (16 hours)

Module II (14 hours)
Knowledge representation - the propositional calculus - rules of inference - proof techniques - semantics - soundness and completeness - the PSAT problem- resolution in propositional calculus - soundness of resolution - converting arbitrary wffs to conjunctions of clauses - resolution refutations - horn clauses - the predicate calculus - quantification - semantics of quantifiers - resolution in predicate calculus - unification - converting arbitrary wffs to clause form - using resolution to prove theorems - answer extraction - knowledge representation by networks - taxonomic knowledge - semantic networks - frames - scripts

Module III (12 hours)

Module IV (10 hours)
Programming in Prolog: Basics- Predicates – Representing rules, and facts-recursion-unification-control-the cut-Input/Output-the Fail predicate-dynamic databases-Applications to Natural Language Processing

References
2. Luger G.F. and Stubblefield W.A., Artificial Intelligence, Addison Wesley
3. Elain Rich & Kevin Knight, Artificial Intelligence, Tata McGraw Hill
4. Tanimoto S.L., The Elements of Artificial Intelligence, Computer Science Press
5. Carl Townsend- Turbo Prolog-BPB Publications

Internal continuous assessment: 100 marks
Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced right at the beginning of the semester by the teacher.

End semester Examination: 100 marks

Question pattern
Answer any 5 questions by choosing at least one question from each module.
Module I
Question 1: 20 marks, Question 2: 20 marks
Module II
Question 3: 20 marks, Question 4: 20 marks
Module III
Question 5: 20 marks, Question 6: 20 marks
Module IV
Question 7: 20 marks, Question 8: 20 marks

MCL10 105(B) Information Retrieval and Extraction

Teaching scheme: 3 hours lecture & 1 hour tutorial per week
Credits: 4

Objective: To introduce the basics of modeling and design of Information Retrieval systems and methods of information extraction.

Module I (12 hours)
Module II (12 hours)
Reference Collections such as TREC, CACM, and ISI data sets. Query Languages: Keyword based queries, single word queries, context queries, Boolean Queries, Query protocols, query operations.
Text and Multimedia Languages and properties, Metadata, Text formats, Markup languages, Multimedia data formats, Text Operations. Indexing and searching:
Module III (14 hours)
Information Extraction: Basic Assumptions-Various Tasks-Chunking- Developing and Evaluating Chunkers-Entity Recognition-Topic Spotting-Slot Filling-Layered Finite State
Methods-Query Expansion-Question Answering Systems  
Module IV (14 hrs)  
Word Sense Disambiguation and Information Retrieval: Selectional Restriction Based Approaches-Limitations of Selectional Restrictions-Robust Word Sense Disambiguation Machine Learning Approaches, Dictionary-Based Approaches  
Applications to Information Retrieval:Term Weighting,Term Selection and Creation-Homonymy, Polysemy and Synonymy -Improving User Queries-Other Information Retrieval Tasks  
References  
6. Introduction to Information Retrieval: Christopher D. Manning, Raghavan, and Schutze

Internal continuous assessment: 100 marks  
Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced right at the beginning of the semester by the teacher.  
End semester Examination: 100 marks  
Question pattern  
Answer any 5 questions by choosing at least one question from each module.  
Module I  
Question 1 : 20 marks, Question 2 : 20 marks  
Module II  
Question 3 : 20 marks, Question 4: 20 marks  
Module III  
Question 5 : 20 marks, Question 6: 20 marks  
Module IV  
Question 7 : 20 marks, Question 8: 20 marks  

MCL10 105(C) Theories of Syntax and Semantics  
Teaching scheme: 3 hours lecture & 1 hour tutorial per week  
Credits: 4  
Objective: To introduce various frameworks of syntactic and semantic theories of linguistics from computational viewpoint.
Module I (12 hrs)
Universal grammar, X-bar-theory, thematic roles, transformations, minimalism, lexical-functional grammar (LFG), Head-driven phrase structure grammar-(HPSG), syntax and spoken language, functional grammar, cognitive grammar, construction grammar, grammar theory in first and second language acquisition

Module II (12 hrs)

Module III (14 hrs)

Module IV (14 hrs)
Lexical Semantics: Introduction-Relations among Lexemes and Their Senses-Homonymy-Polysemy-Synonymy-Hyponymy
Semiotics, semantic change, tense and aspect, semantic roles, formal semantics, and cognitive semantics-Specific language impairment and aphasia.

References


Internal continuous assessment: 100 marks
Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced right at the beginning of the semester by the teacher.

End semester Examination: 100 marks
Question pattern
Answer any 5 questions by choosing at least one question from each module.

Module I
Question 1: 20 marks, Question 2: 20 marks
Objective: To introduce the modern trends in computer architecture for processing huge volumes of information, such as information retrieval, Language processing, etc.

Module I (13 hours):
Cluster-based Computing: Overview -The Role of Clusters-Definition and Taxonomy-Distributed Computing-Limitations.

Module II (13 hours)

Module III (13 hours)
Cloud Computing: Introduction:Introduction to cloud computing, cloud architecture and service models, the economics and benefits of cloud computing, horizontal/vertical scaling, thin client, multimedia content distribution, multiprocessor and virtualization, distributed storage, security and federation/presence/identity/privacy in cloud computing, disaster recovery, free cloud services and open source software, and example commercial cloud services.

Module IV (13 hours)
Evolving Paradigms and Software Platforms: Hadoop, Map-Reduce Paradigm.
Ontology Engineering: The role of Ontologies in the semantic web-Theoretical Foundations of Ontologies-Methods for building Ontologies-Languages for Building Ontologies-Ontology Tools- Ontology-based Applications

(Open Source implementations/toolkits of the above concepts may be introduced wherever necessary, as case studies)

References

Internal continuous assessment: 100 marks
Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced right at the beginning of the semester by the teacher.
End semester Examination: 100 marks
Question pattern
Answer any 5 questions by choosing at least one question from each module.
Module I
Question 1 : 20 marks, Question 2 : 20 marks
Module II
Question 3 : 20 marks, Question 4: 20 marks
Module III
Question 5 : 20 marks, Question 6: 20 marks
Module IV
Question 7 : 20 marks, Question 8: 20 marks
MCL 10 106(P) Seminar I

Teaching scheme: 2 hours practical per week

Credits: 2

Objective:

To assess the debating capability of the student to present a technical topic. Also to impart training to a student to face audience and present his/her ideas and thus creating self esteem and courage that are essential for an engineer.

Each student is expected to present a seminar on a topic of current relevance in Computational Linguistics for about 45 minutes. They are expected to refer current research and review papers from standard journals like ACM, IEEE, JPDC, IEE etc. - at least three cross references must be used - the seminar report must not be the reproduction of the original paper. A committee consisting of at least three faculty members shall assess the presentation of the seminar and award marks to the students based on merits of topic of presentation. Each student shall submit two copies of a write up of the seminar topic. One copy shall be returned to the student after duly certifying it by the chairman of the assessing committee and the other will be kept in the departmental library. Internal continuous assessment marks are awarded based on the relevance of the topic, presentation skill, quality of the report and participation.

Internal Continuous Assessment (Maximum Marks-100)
Presentation +Discussion : 60
Relevance + Literature : 10
Report : 20
Participation : 10
Total marks : 100

MCL10 107(P) Computational Linguistics Lab-I

Teaching scheme: 2 hours Practical per week

Credits: 2

Objective: To familiarize the students with practical aspects of natural language processing.

(A subset of the following experiments shall be conducted)


Processing Raw Text- Accessing Text from the Web and from Disk- Strings: Text Processing at the Lowest Level-Text Processing with Unicode
Regular Expressions for Detecting Word Patterns -Useful Applications of Regular Expressions-Normalizing Text-Regular Expressions for tokenizing Text-Segmentation-
SEMESTER 2

MCL10 201 Statistical Natural Language Processing

Teaching scheme: 3 hours lecture & 1 hour tutorial per week

Credits: 4

Objective: To introduce the basics of statistical techniques for processing human languages and large text corpora.

Module I (10 hrs)

Module II (15 hrs)
Statistical Inference: n-gram Models over Sparse Data, Word Sense Disambiguation: Supervised and Dictionary based approaches, Lexical Acquisition

Module III (15 hrs)

Module IV (12 hrs)
Applications: Statistical Alignment and Machine Translation-Clustering-Topics in Information Retrieval-Text Categorization

References
2. J. Allen: Natural Language Understanding: Benjamin Cummins

Internal continuous assessment: 100 marks
Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced right at the beginning of the semester by the teacher.

End semester Examination: 100 marks

Question pattern
Answer any 5 questions by choosing at least one question from each module.

Module I
MCL10 202 Algorithms and Complexity
Teaching scheme: 3 hours lecture & 1 hour tutorial per week
Credits: 4

Objective: To introduce the advanced concepts of data structures and algorithms with an insight into the complexity-related aspects of computing.

Module I: (13 hours)
Analysis: RAM model – Notations, Recurrence analysis - Master's theorem and its proof - Amortized analysis - Advanced Data Structures: B-Trees, Binomial Heaps, Fibonacci Heaps, Disjoint Sets, Union by Rank and Path Compression

Module II: (13 hours)
Graph Algorithms and complexity: Matroid Theory, All-Pairs Shortest Paths, Maximum Flow and Bipartite Matching.

Module III: (14 hours)
Randomized Algorithms : Finger Printing, Pattern Matching, Graph Problems, Algebraic Methods, Probabilistic Primality Testing, De-Randomization

Module IV: (14 hours)

References

Internal continuous assessment: 100 marks
Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced right at the beginning of the semester by the teacher.

End semester Examination: 100 marks

Question pattern

Answer any 5 questions by choosing at least one question from each module.

Module I
Question 1: 20 marks, Question 2: 20 marks

Module II
Question 3: 20 marks, Question 4: 20 marks

Module III
Question 5: 20 marks, Question 6: 20 marks

Module IV
Question 7: 20 marks, Question 8: 20 marks

MCL10 203 Data and Text Mining

Teaching scheme: 3 hours lecture & 1 hour tutorial per week
Credits: 4

Objective: To introduce the relevant theoretical and practical aspects of data and text mining, with an emphasis on algorithms.

Module I (12 hours)
Basic data mining tasks: Classification, Regression, Time Series Analysis, Prediction, Clustering, and Summarization, Sequence discovery.
Introduction to data ware housing: OLAP, OLTP, Knowledge discovery in databases.

Module II: (12 Hours)
Data Mining Techniques: Statistical Perspective on Data Mining: Point Estimation, Models based on summarization, Bayes Theorem, Hypothesis testing, similarity measures, Application of Decision trees, Neural Networks and Genetic algorithms in data mining.

Module III (12 hours)
Core Topics in Data Mining: Issues in classification, statistical algorithms, Distance-based algorithms, Decision tree based algorithms, Neural Network-based algorithms, rule-based algorithms.
Clustering: Similarity and distance measures, outliers, partitional, and hierarchical algorithms

Module IV (16 hrs)
Association Rule Mining-Large Item sets: Basic algorithms, Comparison of approaches.
Advanced topics: Generalized Association rules, multiple-level association rules, Quantitative rules, web mining, spatial Mining and temporal mining (Introduction only)

References
1. Data Mining: Introductory and Advanced Topics-Margaret H. Dunham. 2004 (Pearson Education)
2. Data Mining: Concepts and Techniques-Jiawei Han and Micheline Kamber 2002. (Morgan Kauffman Publishers)
5. The Text Mining Handbook: Advanced Approaches in Analyzing Unstructured Data: Ronen Feldman and James Sanger
6. Soumen Chakrabarti: Mining the Web: Discovering Knowledge from Hypertext Data. 

Internal continuous assessment: 100 marks
Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced right at the beginning of the semester by the teacher.

End semester Examination:100 marks
Question pattern
Answer any 5 questions by choosing at least one question from each module.

Module I
Question 1 : 20 marks, Question 2 : 20 marks

Module II
Question 3 : 20 marks, Question 4: 20 marks

Module III
Question 5 : 20 marks, Question 6: 20 marks

Module IV
Question 7 : 20 marks, Question 8: 20 marks

MCL10 204(A) Machine Learning
Teaching scheme: 3 hours lecture & 1 hour tutorial per week
Credits: 4

Objective: To introduce the prominent methods for machine learning, such as supervised and unsupervised learning, connectionist and other architectures for machine learning, etc.

Module I (10 hours)
Preliminaries - Introduction - Learning Input-Output Functions - Learning and Bias - Sample applications - Boolean Functions - Representation - Classes of Boolean Functions - Introduction to Neural Networks

Module II (14 hours)
Using Version Spaces for Learning - Version Spaces and Mistake Bounds - Version Graphs - Learning as Search of a Version Space - The Candidate Elimination Method - Neural Networks - Threshold Logic Units - Linear Machines - Networks of TLUs - Training Feedforward Networks by Backpropogation - Synergies Between Neural Network and Knowledge-Based Methods - Statistical Learning - Using Statistical Decision Theory -
Learning Belief Networks - Nearest-Neighbor Methods

Module III (14 hours)

Module IV (14 hours)

References

Internal continuous assessment: 100 marks
Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced right at the beginning of the semester by the teacher.
End semester Examination:100 marks

Question pattern
Answer any 5 questions by choosing at least one question from each module.
Module I
Question 1 : 20 marks, Question 2 : 20 marks
Module II
Question 3 : 20 marks, Question 4: 20 marks
Module III
Question 5 : 20 marks, Question 6: 20 marks
Module IV
Question 7 : 20 marks, Question 8: 20 marks
Objective: To introduce the important approaches to the automatic translation between natural languages.

Module I (12 hrs)
History-Translation process-Approaches-Rule-based-Statistical-Example based-Hybrid MT-
Major issues-Disambiguation-Named entities-Applications-Evaluation

Module II (12 hrs)
Language Similarities and Differences-The Transfer Metaphor-Syntactic Transformations-
Lexical Transfer

Module III (12 hrs)
The Interlingua Idea: Using Meaning-Direct Translation-Using Statistical Techniques-
Quantifying Fluency-Quantifying Faithfulness

Module IV (16 hrs)
Statistical MT-Basis-Benefits-Word based translation-Phrase based translation- Syntax based translation-Challenges with statistical machine translation-Compound words- Idioms-
Morphology-Different word orders-Syntax-Out of vocabulary (OOV) words

References

Internal continuous assessment: 100 marks
Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced right at the beginning of the semester by the teacher.

End semester Examination: 100 marks

Question pattern
Answer any 5 questions by choosing at least one question from each module.

Module I
Question 1: 20 marks, Question 2: 20 marks

Module II
Question 3: 20 marks, Question 4: 20 marks

Module III
Question 5: 20 marks, Question 6: 20 marks

Module IV
Question 7: 20 marks, Question 8: 20 marks
Objective: To introduce the mathematical aspects of information theory.

Module 1: Entropy and Loss less Source coding (12 hours)

Module II: Channel Capacity and Coding Theorem (14 hours)
Asymptotic Equipartition Property (AEP)- High probability sets and typical sets- Method of typical sequence as a combinatorial approach for bounding error probabilities. Channel Capacity- Capacity computation for some simple channels- Arimoto-Blahut algorithm-Fano's inequality- Shannon's Channel Coding Theorem and its converse- Channels with feedback- Joint source channel coding Theorem.

Module III Continuous Sources and Channels (14 hours)
Differential Entropy- Joint, relative and conditional differential entropy-Mutual information-Waveform channels- Gaussian channels- Mutual information and Capacity calculation for Band limited Gaussian channels- Shannon limit- Parallel Gaussian Channels-Capacity of channels with colored Gaussian noise-Water filling.

Module IV: Rate Distortion Theory (12 hours)
Introduction - Rate Distortion Function - Properties - Continuous Sources and Rate Distortion measure - Rate Distortion Theorem - Converse - Information Transmission Theorem - Rate Distortion Optimization.

References
4. T. Bergu, Rate Distortion Theory a Mathematical Basis for DataCompression PH Inc. 1971.

Internal continuous assessment: 100 marks
Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced right at the beginning of the semester by the teacher.
End semester Examination: 100 marks

Question pattern
Answer any 5 questions by choosing at least one question from each module.

Module I
Question 1 : 20 marks, Question 2 : 20 marks
Module II
Question 3 : 20 marks, Question 4 : 20 marks
Module III
Question 5 : 20 marks, Question 6 : 20 marks
Module IV
Question 7 : 20 marks, Question 8 : 20 marks

MCL10 205 (A) Pattern Recognition
Teaching scheme: 3 hours lecture & 1 hour tutorial per week
Credits: 4

Objective: To introduce the theoretical and practical aspects of pattern recognition, including the syntactic approaches.

Module I (12 hours)
Introduction - introduction to statistical - syntactic and descriptive approaches - features and feature extraction - learning - Bayes Decision theory - introduction - continuous case - 2-category classification - minimum error rate classification - classifiers - Discriminant functions - and decision surfaces - error probabilities and integrals - normal density - Discriminant functions for normal density

Module II (12 hours)
Parameter estimation and supervised learning - maximum likelihood estimation - the Bayes classifier - learning the mean of a normal density - general Bayesian learning - nonparametric technique - density estimation - Parzen windows - k-nearest neighbor estimation - estimation of posterior probabilities - nearest-neighbor rule – k nearest neighbour rule

Module III (12 hours)

Module IV (16 hours)
Syntactic approach to PR - introduction to pattern grammars and languages - higher dimensional grammars - tree, graph, web, plex, and shape grammars - stochastic grammars - attribute grammars - parsing techniques - grammatical inference

References
1. Duda & Hart P.E, Pattern Classification And Scene Analysis, John Wiley
3. Fu K.S., Syntactic Pattern Recognition And Applications, Prentice Hall, Eaglewood cliffs

Internal continuous assessment: 100 marks
Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced right at the beginning of the semester by the teacher.

End semester Examination: 100 marks
Question pattern
Answer any 5 questions by choosing at least one question from each module.
Module I
Question 1 : 20 marks, Question 2 : 20 marks
Module II
Question 3 : 20 marks, Question 4: 20 marks
Module III
Question 5 : 20 marks, Question 6: 20 marks
Module IV
Question 7 : 20 marks, Question 8: 20 marks

MCL10 205(B) Software Architecture and Project Management
Teaching scheme: 3 hours lecture & 1 hour tutorial per week
Credits: 4

Objective: To introduce the theoretical and practical aspects of pattern recognition, including the syntactic approaches to pattern recognition.

Module I (13 hours)
Module II (13 hours)
Archetypes and Archetype Patterns, Model Driven Architecture with Archetype Patterns. Literate Modeling, Archetype Pattern. Customer Relationship Management (CRM) Archetype Pattern, Product Archetype Pattern, Quantity Archetype Pattern, Rule Archetype Pattern. Design Patterns, Creational Patterns, Patterns for Organization of Work, Access Control Patterns, Service Variation Patterns, Service Extension Patterns

Module III (13 hours)
Object Management Patterns Adaptation Patterns, Communication Patterns, Architectural Patterns, Structural Patterns, Patterns for Distribution, Patterns for Interactive Systems Adaptable Systems, Frameworks and Patterns, Analysis Patterns Patterns for Concurrent and Networked Objects, Patterns for Resource Management, Pattern Languages, Patterns for Distributed Computing.

Module IV (13 hours)
Defining EAI, Data-Level EAI, Application Interface-Level EAI. Method-Level EAI. User Interface-Level EAI, The EAI Process - An Introduction to EAI and Middleware, Transactional Middleware and EAI, RPCs, Messaging, and EAI, Distributed Objects and EAI, Database- Oriented Middleware and EAI, Java Middleware and EAI, Implementing and Integrating Packaged Applications—The General Idea, XML and EAI, Message Brokers —The Preferred EAI Engine, Process Automation and EAI. Layering, Organizing Domain Logic, Mapping to Relational Databases.

Reference Books
4. Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides, Design Patterns: Elements of Reusable Object-Oriented Software, Addison-Wesley Professional; 1st edition.
Internal continuous assessment: 100 marks
Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced right at the beginning of the semester by the teacher.

End semester Examination: 100 marks

Question pattern
Answer any 5 questions by choosing at least one question from each module.

Module I
Question 1 : 20 marks, Question 2 : 20 marks

Module II
Question 3 : 20 marks, Question 4 : 20 marks

Module III
Question 5 : 20 marks, Question 6 : 20 marks

Module IV
Question 7 : 20 marks, Question 8 : 20 marks

MCL10 205(C) Soft Computing
Teaching scheme: 3 hours lecture & 1 hour tutorial per week
Credits: 4

Objective: To familiarize the students with the salient approaches in soft computing, based on artificial neural networks, fuzzy logic, and genetic algorithms.

Module I (13 hours)
Introduction to artificial neural networks - biological neurons - Mc Culloch and Pitts models of neuron - types of activation function - network architectures - learning process - error-correction learning - supervised learning - unsupervised learning - single unit mappings and the perceptron - perceptron convergence theorem - method of steepest descent - least mean square algorithms - adaline/medaline units - multilayer perceptrons-backpropagation algorithm

Module II (13 hours)

Module III (13 hours)
Fuzzy logic - fuzzy sets - properties - operations on fuzzy sets - fuzzy relations - operations on fuzzy relations - the extension principle - fuzzy measures - membership functions - fuzzification and defuzzification methods - fuzzy controllers - Mamdani and Sugeno types - design parameters - choice of membership functions - fuzzification and defuzzification methods - applications

Module IV (13 hours)
Introduction to genetic algorithm and hybrid systems - genetic algorithms - natural
Teaching scheme: 3 hours lecture & 1 hour tutorial per week  

Credits: 4

Objective: To familiarize the students with the fundamentals of different media types and the issues in processing multimedia data.

Module I (13 hours)
Multimedia system organization and architecture - QOS architecture - multimedia distributed processing models - multimedia conferencing model - storage organization.

Module II (13 hours)
Psychoacoustics - digital audio and computer - digital representation of sound - audio signal processing (editing and sampling) - audio production - digital music - musical instrument synthesizer - MIDI protocol

Module III (13 hours)
Raster scanning principle - color fundamental - color video performance measurement - analog audio - stereo effect - MPEG and DVI technology - multimedia applications - toolkit and hyper application.

Module IV (13 hours)
Multimedia information system - operating system support middleware system service architecture - presentation services - user interface - file system and information and information model - presentation and anchoring file - Multimedia standards - role of standards - standardization issues - distributed multimedia systems.

References

Internal continuous assessment: 100 marks
Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced right at the beginning of the semester by the teacher.

End semester Examination: 100 marks

Question pattern
Answer any 5 questions by choosing at least one question from each module.

Module I
Question 1 : 20 marks, Question 2 : 20 marks

Module II
Question 3 : 20 marks, Question 4: 20 marks

Module III
Question 5 : 20 marks, Question 6: 20 marks

Module IV
Objective: To give the students a sound introduction to structured methodologies recommended while carrying out high end research.

Module I - Research Methodologies (12 Hrs)
Introduction, Research and Scientific methods, Objectives and Motivation of Research, Criteria of Good Research, research Approaches, Significance of research, Type of Researches, Research methods VS Methodology, Research problems, Defining a research problem, Research Design, Sampling Design

Module II – Data Collection and Analysis (13 Hrs)
Collection of Primary Data, Observation method, Interview Method, Collection of data through Questionnaires and Schedules, Secondary Data, Processing operations, Statistics in research, Measures of central Tendency, Other methods of data collection, Collection of secondary data, Processing operations, Types of analysis, statistics in research, Dispersion, Asymmetry, relationship, Simple regression analysis, Partial correlation

Module-III – Testing (14 Hrs)
Hypothesis-I - Introduction, Testing of Hypothesis, Procedure for hypothesis testing, Flow diagram for hypothesis testing, Measuring the power of hypothesis test, Tests of Hypothesis, Hypothesis testing of Means, Proportions, Correlation Coefficients, Chisquare test, Phi Coefficient, Hypothesis-II - Introduction, Nonparametric, Distributionfree Tests, Sign tests, Fisher-Irwin test, Spearman’s Rank Correlation, Kendall’s Coefficient of concordance

Module-4 – Report (14 Hrs)
Report writing – Introduction and Significant, Interpretation – Meaning, Techniques, and Precautions, Layout of research reports, Types of report, Mechanics and precautions of writing a research report, Computer role in research, computers and computer technology, computer system, Characteristics

References

Internal continuous assessment: 100 marks
Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced right at the beginning of the semester by the teacher.
End semester Examination: 100 marks

Question pattern
Answer any 5 questions by choosing at least one question from each module.

Module I
Question 1 : 20 marks, Question 2 : 20 marks

Module II
Question 3 : 20 marks, Question 4 : 20 marks

Module III
Question 5 : 20 marks, Question 6 : 20 marks

Module IV
Question 7 : 20 marks, Question 8 : 20 marks

MCL10 301(C) Knowledge based System Design

Teaching scheme: 3 hours lecture & 1 hour tutorial per week

Credits: 4

Objective: To familiarize the students with the architecture and design principles of knowledge based systems.

Module I (13 hours)

Module II (13 hours)

Module III (13 hours)

Module IV (13 hours)

References

Internal continuous assessment: 100 marks
Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced right at the beginning of the semester by the teacher.

End semester Examination: 100 marks

Question pattern

Answer any 5 questions by choosing at least one question from each module.

Module I
Question 1: 20 marks, Question 2: 20 marks

Module II
Question 3: 20 marks, Question 4: 20 marks

Module III
Question 5: 20 marks, Question 6: 20 marks

Module IV
Question 7: 20 marks, Question 8: 20 marks

MCL10 302(A) Advanced Computational Linguistics

Teaching scheme: 3 hours lecture & 1 hour tutorial per week

Credits: 4

Objective: To introduce the advanced concepts in computational linguistics, modern grammar formalisms, NL generation, etc.

Module I (12hrs)

Module II (12 hrs)
Natural Language Generation-Problems in NL Generation-Basic Generation Techniques-Hard Problems in NLP-Speech Understanding and Translation-Discourse Processing

Module III (14 hrs)

Module IV (14 hrs)

References

1. Alexander Clark, Chris Fox, and Shalom Lappin (Editors): The Handbook of Computational Linguistics and Natural Language Processing (Blackwell Handbooks in Linguistics)
2. Akshar Bharathi, Vineet Chaitanya, and Rajeev Sangal: Natural Language
Internal continuous assessment: 100 marks
Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced right at the beginning of the semester by the teacher.
End semester Examination: 100 marks

Question pattern
Answer any 5 questions by choosing at least one question from each module.
Module I
Question 1: 20 marks, Question 2: 20 marks
Module II
Question 3: 20 marks, Question 4: 20 marks
Module III
Question 5: 20 marks, Question 6: 20 marks
Module IV
Question 7: 20 marks, Question 8: 20 marks

MCL 302(B) Semantic Web Architecture

Teaching scheme: 3 hours lecture & 1 hour tutorial per week

Objective: To introduce the advanced concepts in emerging trends in Web architecture.

Module I (13 hours):
Introduction to semantic web technology: Traditional web to semantic web – meta data-search engines.

Module II (13 hours)
Resource Description Framework – elements - rules of RDF – tools- RDFS core elements-
Taxonomy and ontology concepts.
Web ontology language: OWL: define classes- set operators – enumerations- defining
properties – Validating OWL ontology.

Module III (13 hours)
Semantic web services and applications:
Web services – web services standards – web services to semantic web services- UDDI-
Concept of OWL-S – building blocks of OWL-S- mapping OWL-S to UDDI- WSDL-S overview

Module IV (13 hours)
Real world examples and applications: Swoogle- architecture and usage of meta data;
FOAF – vocabulary – creating documents – overview of semantic markup – semantic web
search engines.

References
1. Liyang Yu. Introduction to the Semantic Web and Semantic web services. Chapman
Internal continuous assessment: 100 marks
Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced right at the beginning of the semester by the teacher.

End semester Examination: 100 marks
Question pattern
Answer any 5 questions by choosing at least one question from each module.

Module I
Question 1: 20 marks, Question 2: 20 marks

Module II
Question 3: 20 marks, Question 4: 20 marks

Module III
Question 5: 20 marks, Question 6: 20 marks

Module IV
Question 7: 20 marks, Question 8: 20 marks

MCL10 302(C) Indian Theories of Meaning
Teaching scheme: 3 hours lecture & 1 hour tutorial per week
Credits: 4

Objective: To introduce the students to the rich traditional India theories of semantics and their relevance to the modern linguistics.

Module I (14hrs)
Introduction-Indian Theories of Logic, Theories of Inference: Nyaya

Module II (14 hrs)
Sphota Theory: Act of Speech-Conceptualization-Performance and Comprehension

Module III (14 hrs)
Dhwani Theory: Nature of Dhwani- Different Views on Dhwani-Comparison with Sphota-Primary and Secondary sounds

Module IV (10 hrs)
Karaka Theory

References
Internal continuous assessment: 100 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced right at the beginning of the semester by the teacher.

End semester Examination: 100 marks

Question pattern
Answer any 5 questions by choosing at least one question from each module.

Module I
Question 1: 20 marks, Question 2: 20 marks

Module II
Question 3: 20 marks, Question 4: 20 marks

Module III
Question 5: 20 marks, Question 6: 20 marks

Module IV
Question 7: 20 marks, Question 8: 20 marks

MCL 10 303(P): Industrial Training
Teaching scheme: 1 hour per week
Credits: 1

The students have to undergo an industrial training of minimum two weeks in an industry during the semester break after second semester and complete within 15 calendar days from the start of third semester. The students have to submit a report of the training undergone and present the contents of the report before the evaluation committee constituted by the department. An internal evaluation will be conducted for examining the quality and authenticity of contents of the report and award the marks at the end of the semester.

Internal continuous assessment: Marks 50

MCL 10 304(P): MASTERS RESEARCH PROJECT (PHASE – I)
Teaching scheme: 22 hours per week
Credits: 6

Objective:
To improve the professional competency and research aptitude by touching the areas which otherwise not covered by theory or laboratory classes. The project work aims to develop the work practice in students to apply theoretical and practical tools/techniques to solve real life problems related to industry and current research.

The project work should be a project in computer science & engineering stream. The project work is allotted individually on different topics. The students shall be encouraged to do their project work in the parent institute itself. If found essential, they may be permitted to do their project outside the parent institute subject to the conditions in clause 10 of M.Tech regulations. Department will constitute an Evaluation Committee to review the project work. The Evaluation committee consists of at least three faculty members of which internal guide and another expert in the specified area of the project shall be two essential members.

The student is required to undertake the masters research project phase-I during the third semester and the same is continued in the 4th semester (Phase-II). Phase-I consists of preliminary thesis work, two reviews of the work and the submission of preliminary report. First review would highlight the topic, objectives, methodology and expected results. Second review evaluates the progress of the work, preliminary report and scope of the work which is to be completed in the 4th semester.

Internal Continuous assessment:

First Review:

Guide Evaluation Committee
50 marks 50 marks

Second review:

Guide Evaluation Committee
100 marks 100 marks

Total 300 marks

SEMESTER 4

MCL10 401(P) : MASTERS RESEARCH PROJECT PHASE 2

Teaching scheme: 30 hours per week Credits: 12

Objectives:
To improve the professional competency and research aptitude by touching the areas which otherwise not covered by theory or laboratory classes. The project work aims to develop the work practice in students to apply theoretical and practical tools/techniques to solve real life problems related to industry and current research.
Masters Research project phase-II is a continuation of project phase-I started in the third semester. Before the end of the fourth semester, there will be two reviews, one at middle of the fourth semester and other towards the end. In the first review, progress of the project work done is to be assessed. In the second review, the complete assessment (quality, quantum and authenticity) of the Thesis is to be evaluated. Both the reviews should be conducted by guide and Evaluation committee. This would be a pre qualifying exercise for the students for getting approval for the submission of the thesis. At least one technical paper is to be prepared for possible publication in journal or conferences. The technical paper is to be submitted along with the thesis. The final evaluation of the project will be external evaluation.

Internal Continuous assessment:

First review:

<table>
<thead>
<tr>
<th>Guide</th>
<th>50 marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation committee</td>
<td>50 marks</td>
</tr>
</tbody>
</table>

Second review:

<table>
<thead>
<tr>
<th>Guide</th>
<th>100 marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation committee</td>
<td>100 marks</td>
</tr>
</tbody>
</table>