

9.0 Human Resource Development in Knowledge Engineering

Why generation of Human Resources in both CL and KE required?

India is a large multi-lingual country with 22 constitutionally recognized languages. Proliferation of Information Technology in the society requires availability of user-friendly tools and technologies that can enable work using their languages on the computers deriving the maximum advantage of the Information & Communication Technology (ICT) revolution.

Development of Language Technology in India has been taken a quantum leap and in future, India is poised to become multilingual computing hub of the world. The Software Localization market is growing at a very fast rate and this expansion has created a demand for specialized human resources having expertise of both linguistics & computing which existing programme unable to fill. With this objective it is proposed that necessary human resources needs to generated to meet the demand-gap in the Language Technology market in India.

Rule of Thumb:

Projects related to Language Technology Resources require 20 % of Language Engineering People and 80 % of Linguistics.

On the other hand Projects such as Machine Translation requires 80 % of HRD from KE domain and 20 % of CL domain.

Projects on Speech Technology require 70 % of KE people and 30 % of CL people.

Thus there exists demands generation Human Resources in both KE and CL domains.

Computational Linguistics

Computational linguistics (CL) is a discipline between linguistics and computer science, which is concerned with the computational aspects of the human language faculty. It belongs to the cognitive sciences and overlaps with the field of *artificial intelligence (AI)*, a branch of *computer science* aiming at computational models of human cognition. Computational linguistics has applied and theoretical components.

Human language is a most exciting and demanding puzzle

Theoretical CL takes up issues in *theoretical linguistics* and *cognitive science*. It deals with formal theories about the linguistic knowledge that a human needs for generating and understanding language. Today these theories have reached a degree of complexity that can only be managed by employing computers. Computational linguists develop formal models simulating aspects of the human language faculty and implement them as computer programmes.

Applied CL focusses on the practical outcome of modelling human language use. The methods, techniques, tools and applications in this area are often subsumed under the term *Knowledge engineering*

Knowledge Engineering (KE)

The application of computerized data and text manipulation to manage and interpret large bodies of knowledge, or find useful information in large bodies of data. The study of methods for knowledge engineering is generally considered as a branch of Artificial Intelligence (AI). Knowledge Engineering has close association with digital engineering. Linguistic data in digital form can be marked up at the meta-semantic level to integrate logical, knowledge-classification-related data into the data stream.

M.Tech Curriculum

Proposed Computational Linguistics

1st Semester (Autumn)

Subject No.	Subject Name	Credit
011	Introduction to Linguistics (core)	4
012	Linguistics basics of Natural language Processing (Core)	4
013	Statistical Methods of NLP –I (core)	4
014	Elective I	4/3
015	Elective II	4/3
016	Natural Language Processing Lab - I	2
017	Computer Programming Laboratory-I Seminar	1
	Total	25/23

2nd Semester (Spring)

Subject No.	Subject Name	Credit
021	Statistical Methods for NLP-II (core)	4
022	Natural Language Understanding (Core)	4
023	Natural Language Semantics (Core)	4/3
024	Elective III	4/3
025	Elective IV	4/3
026	Natural Language Processing Laboratory - II	2
027	Computer Programming 2 Laboratory -II Seminar	1
Total		25/22

Note : Total credits to be registered and completed in first two Semesters must be 45 - 50.

3rd Semester (Autumn)

Subject No.	Subject Name	Credit
031	Speech Understanding	4
032	Machine Translation	4
033	Software Engineering for Language Technology	4
034	Elective VI	4
035	Elective VII	4
036	Laboratory Seminar	2 1
Total		23

4th Semesters

Subject No.	Subject Name	Credit
041	Comprehensive Viva-Voce	3
042	Project, Thesis & Viva-Voce	17
Total		20

*Electives I & II (Any two)**

Subject No.	Subject Name	Credit
0111	Computational lexicon	4
0112	Knowledge representation issues in Computational linguistics	4
0113	Ontology and Wordnet	3
0114	Computational Grammar	4
0115	Experimental phonetics	4
0116	Web technology including Java, XML and Perl Programming	4
0117	Modern Computer Languages and architecture	3

*Electives III,IV (Any two)**

Subject No.	Subject Name	Credit
0221	Morphology	4
0222	Contextualization of Knowledge	4
0223	Language Modelling	4
0224	Speech analysis, synthesis and coding	4

*Electives VI & VII (Any two)**

Subject No.	Subject Name	Credit
0331	Information retrieval techniques	4
0332	Language Engineering Applications	4
0333	Introduction to cognitive science	4
0334	System Integration, Quality practises and Software testing	4

M.Tech Curriculum

Proposed Knowledge Engineering

1st Semester (Autumn)

Subject No.	Subject Name	Credit
071	Introduction to Knowledge Framework and basics of Knowledge Engineering (core)	4
072	Cognitive Science – I (core)	4
073	Data & Knowledge Mining techniques	4
074	Digital Signal Processing	4
075	Elective I	4
076	Computer Programming Laboratory-I	2
077	Software Engineering Laboratory-I Seminar	2 1
Total		25

2nd Semester (Spring)

Subject No.	Subject Name	Credit
081	Information and Knowledge management: tools techniques	4
082	Multimodal interface technologies	4
083	Vedic Mathematics and Indic knowledge base	4
084	Elective II	4
085	Elective III	4
086	Natural Language Processing Lab.	2
087	Advanced Web Programming Lab Seminar	2 1
Total		25

Note : Total credits to be registered and completed in first two Semesters must be 50.

Knowledge Engineering
3rd Semester (Autumn)

Subject No.	Subject Name	Credit
091	Knowledge Management for Enterprise Resource management	4
092	Applications of Knowledge Engineering	4
093	Contextualization of Knowledge and Knowledge discovery	4
094	Elective IV	4
095	Elective V	4
096	Advanced Software systems lab. Seminar	2 1
Total		25

4th Semester(Spring)

Subject No.	Subject Name	Credit
101	Comprehensive Viva-Voce	3
102	Project, Thesis & Viva-Voce	17
Total		20

*Electives I (Any one)**

Subject No.	Subject Name	Credit
0711	Speech Processing Technology	4
0712	Natural language Processing	3
0713	Statistical Pattern Recognition	4
0714	Advanced discrete mathematics	4
0715	Information Theory and Coding	3
0716	Artificial Intelligence, Neural Computing and genetic algorithm	4
0717	Emerging areas of ICT technology: mobile communication, pervasive computing	4
0718	Software system architectures and advanced Programming languages	3

*Electives II,III(Any two)**

Subject No.	Subject Name	Credit
0812	Innovative Cross-lingual applications	4
0813	Linear Algebra & Error Control techniques	4
0814	Economic aspects of Knowledge Management	4
0815	Knowledge Acquisition techniques	4
0816	Operational techniques	4
0817	Knowledge resource exchange	4

*Electives IV & V (Any two)**

Subject No.	Subject Name	Credit
0991	Introduction to queueing theory	4
0992	Language Engineering as a Knowledge resource	4
0993	Introduction to cognitive science	4
0994	System Integration, Quality practises and Software testing	4

Post-graduate Diploma in Localization (Two Semesters Programme)

1st Semester (Autumn)

Subject No.	Subject Name	Credit
L01	Fundamentals of Localization Engineering (core)	3
L02	Localization Process – I (core)	3
L03	Data & Knowledge Mining techniques (core)	3
L04	Introduction to Language Engineering (core)	3
L05	Introduction to Localization of OS	3
L06	Localization tools	3
L07	Elective I	4
L08	Computer Programming Laboratory	2
L09	Language Engineering Laboratory Seminar	2 1
Total		25

2nd Semester (Spring)

Subject No.	Subject Name	Credit
L08	Introduction to Quality Process & Software Testing (Core)	4
L09	Localization Process – II (Core)	3
L10	Localization Techniques for global applications	3
L11	Localization of Web , Multimedia & content with the introduction to XML	4
L12	Advanced Language Engineering	3
L12	Elective I	2
L13	Elective II	2
L14	Advanced Web Programming Lab Seminar	2 2
Total		25

The electives may be selected from various topics such as, entrepreneurship development, graphics design, Localization of metadata, management techniques etc.

Note : Total credits to be registered and completed in this course must be 50.