**LU ACM Workshop Plan**

**Level: 1**

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| **Week** | **Topic** | **Problems** |
| 1 | I/O Basics | **UVa:** 458, 10300, 11172, 10035, 10018, 10783, 591 |
| 2 | String Simulation 1 | **LightOJ**: 1338  **UVa**: 11734, 11541, 401, 353, 11530, 11233, 11743, 11716, 11713, 11362, 11572, 11697, 263, 10010, 10279, 457, 445  **TJU**: 1263, 2522, 1394 |
| 3 | String Simulation 2 |  |
| 4 | STL: vector, map, stack, queue, priority\_queue, algorithm | **UVa:** 612 |
| 5 | Binary Search | **UVa:** 10611 |
| 6 | Generating prime numbers, primality test, prime factorization | **UVa:** 10924, 10235, 583, 406, 1575, 1213, 1644, 1210, 10650, 10140, 10311 |
| 7 | Number of divisors, Sum of divisors |  |
| 8 | Factorization of factorials, trailing zeros | **LightOJ:** 1035 |
| 9 | Extended GCD, Modular arithmetic | **UVa:** 10104, 10090, 11312, 10127, 10929 |
| 10 | Recursion and Backtracking (Basic) | **UVa:** 441, 112, 167, 208, 487, 524, 539, 571, 574, 598, 624, 628, 639, 677, 750, 10276, 10344, 10452, 10475, 11085, 11151, 11753,  **LightOJ:** 1023 |
| 11 | Backtracking with pruning | **UVa:** 10776, 729 |

**Level: 2**

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| **Week** | **Topic** | **Problems** |
| 1 | Introduction to Graph Theory, Graph representation, Graph Traversal | **UVa:** 599, 10895, 10928, 11550, 11991 |
| 2 | BFS | **SPOJ:** MAKEMAZE |
| 3 | DFS | **LightOJ:** 1094, 1257  **CF:** 510B |
| 4 | Topological Sort | **UVa:** 124, 200, 872, 10305, 11060, 11686  **CF:** 510C |
| 5 | Articulation Point, Bridge, BCC | **LightOJ:** 1003, 1026, 1034, 1063, 1168, 1210, 1291, 1300, 1417,  **UVa:**  247, 315, 610, 796, 10199, 10731, 11504, 11709, 11770, 11838, |
| 6 | Strongly Connected Components | **SPOJ:** CAPCITY  **URI:** 1082 |
| 7 | Dijkstra, Bellman-Ford |  |
| 8 | Floyd Warshall |  |
| 9 | MST: Kruskal & Prim | **UVa:** 11710, 544  **SPOJ:** MST |

**Level: 3**

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| **Week** | **Topic** | **Problems** |
| 1 | DP: Standard Problems, Assembly Line Scheduling | **LightOJ:** 1169 |
| 2 | 0-1 Knapsack, Subset Sum | **UVa:** 10130, 562, 990 |
| 3 | Coin change |  |
| 4 | LIS | **SPOJ:** ELIS  **UVa:** 481, 231, 10534, 111, 497, 437 |
| 5 | LCS | **UVa:** 10066, 111, 531, 10100  **LightOJ:** 1110 |
| 6 | Digit DP |  |
| 7 | String Related DP |  |
| 8 | Bit-Mask DP | **LightOJ:** 1011, 1119  **Timus:** 1152 |
| 9 | Counting |  |
| 10 | Inclusion Exclusion | **LightOJ:** 1117 |
| 11 | Combinatorics | **CF:** 300C, 554C |
| 12 | Geometry 1 |  |
| 13 | Geometry 2 |  |

**Level: 4**

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| **Week** | **Topic** | **Problems** |
| 1 | Segment  Tree**(**1D, 2D, online and offline approach) |  |
| 2 | Segment Tree: Lazy Propagation | **LightOJ:** 1080, 1082, 1083, 1085, 1087, 1089, 1093, 1097, 1103, 1112, 1135, 1164, 1183, 1187, 1188, 1204, 1207, 1339, 1348,  **HDU:** 3333  **UVa:** 1513, 11297, 11402, 12086, 12532, 12697,  **UVaLive:** 5902  **SPOJ:** 1043, 9889, 7259 |
| 3 | Binary Indexed Tree |  |
| 4 | Lowest Common Ancestor (LCA) | **LightOJ:** 1081, 1082, 1101, 1128, 1162,  **UVa:** 10938, 12238 |
| 5 | KMP, Z-Algorithm | **UVa:** 11475, 11576, 12467,  **POJ**: 2752, 3461  **HDU:** 3336, 2594, 3746, 1358, 2087  **LightOJ:** 1255, 1258 |
| 6 | Trie | **LightOJ:** 1114, 1129, 1224 |
| 7 | Aho-Corasick, Suffix Array |  |
| 8 | Nim, Sprague-Grundy |  |
| 9 | Matrix Exponentiation | **UVa:** 10229, 10518, 10655, 10689, 10870, 11486, 12470,  **LightOJ:** 1052, 1065, 1070, 1096, 1131, 1132, 1142, 1160, 1244, 1332,  POJ - 3233  HDU - 1757, 2157, 1575, 2855,  SPOJ - 8001, 339 |
| 10 | Flow Network |  |

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**Link of Tutorials:**

I/O Basics:

<http://www.outsbook.com/uva/?page=input_output_method>

<http://www.shafaetsplanet.com/uploads/pdf/c_tutorial.zip>

Extended Euclidean Algorithm:

<http://zobayer.blogspot.com/2009/07/extended-euclidean-algorithm.html>

<http://discuss.codechef.com/questions/20842/a-tutorial-on-the-extended-euclids-algorithm>

<http://en.wikibooks.org/wiki/Algorithm_Implementation/Mathematics/Extended_Euclidean_algorithm>

Modular Arithmetic:

<http://www.shafaetsplanet.com/planetcoding/?p=936>

Modular Multiplicative Inverse:

<http://comeoncodeon.wordpress.com/2011/10/09/modular-multiplicative-inverse/>

Backtracking:

<http://www.shafaetsplanet.com/planetcoding/?p=1266>

<http://www.seas.gwu.edu/~ayoussef/cs212/backtracking.html>

<http://algorithmsandme.blogspot.in/2013/10/backtracking-eight-queens-problem.html#.VAB0n9KSyE6>

Graph Theory Basics:

<http://www.shafaetsplanet.com/planetcoding/?p=143>

<http://www.shafaetsplanet.com/planetcoding/?p=184>

<http://www.shafaetsplanet.com/planetcoding/?p=211>

<http://help.topcoder.com/data-science/competing-in-algorithm-challenges/algorithm-tutorials/introduction-to-graphs-and-their-data-structures-section-1/>

BFS:

<http://www.shafaetsplanet.com/planetcoding/?p=604>

DFS, TopSort:

<http://www.shafaetsplanet.com/planetcoding/?p=848>

<http://www.shafaetsplanet.com/planetcoding/?p=973>

AP, Bridge, BCC:

<http://www.csie.ntu.edu.tw/~wcchen/algorithm/biconnectedGraph/algorithm.htm>

<http://www.geeksforgeeks.org/articulation-points-or-cut-vertices-in-a-graph/>

<http://e-maxx.ru/algo/cutpoints>

SCC:

<http://www.geeksforgeeks.org/strongly-connected-components/>

<http://en.wikipedia.org/wiki/Tarjan's_strongly_connected_components_algorithm>

<https://www.ics.uci.edu/~eppstein/161/960220.html>

<http://stackoverflow.com/questions/11010881/how-do-i-learn-tarjans-algorithm>

<http://en.algoritmy.net/article/44220/Tarjans-algorithm>

DP Basics:

<http://www.shafaetsplanet.com/planetcoding/?p=1022>

<http://www.geeksforgeeks.org/dynamic-programming-set-34-assembly-line-scheduling/>

LCS:

<http://www.shafaetsplanet.com/planetcoding/?p=1862>

LIS:

<http://www.lightoj.com/article_show.php?article=1000>

<http://www.8bitavenue.com/2011/11/dynamic-programming-longest-increasing-sub-sequence/>

<http://www.shafaetsplanet.com/planetcoding/?p=1211>

Bitmask DP:

<http://www.codechef.com/wiki/tutorial-bitwise-operations>

<http://www.shafaetsplanet.com/planetcoding/?p=1357>

Segment Tree:

<http://www.shafaetsplanet.com/planetcoding/?p=1557>

<http://www.shafaetsplanet.com/planetcoding/?p=1591>

<http://letuskode.blogspot.com/2013/01/segtrees.html>

<http://e-maxx.ru/algo/segment_tree>

Binary Indexed Tree:

<http://community.topcoder.com/tc?module=Static&d1=tutorials&d2=binaryIndexedTrees>

<http://cs.stackexchange.com/questions/10538/bit-what-is-the-intuition-behind-a-binary-indexed-tree-and-how-was-it-thought-a>

<http://codeforces.com/blog/entry/619>

<http://karthikpresumes.blogspot.com/2011/01/binary-indexed-tree.html>

<http://gborah.wordpress.com/2011/09/24/bit-indexed-tree-fenwick-tree/>

<http://comeoncodeon.wordpress.com/2009/09/17/binary-indexed-tree-bit/>

<http://kartikkukreja.wordpress.com/2013/05/11/bit-fenwick-tree-data-structure-c-implementation/>

<http://bitdevu.blogspot.com/2013/06/bit.html#comment-form>

<http://zobayer.blogspot.in/2013/11/various-usage-of-bit.html>

Matrix Exponentiation:  
<http://www.progkriya.org/gyan/matrix-expo.html>

<http://zobayer.blogspot.com/2010/11/matrix-exponentiation.html>

<http://comeoncodeon.wordpress.com/2011/05/08/recurrence-relation-and-matrix-exponentiation/>

<http://community.topcoder.com/tc?module=Static&d1=features&d2=010408>

<http://discuss.codechef.com/questions/2335/building-up-the-recurrence-matrix-to-compute-recurrences-in-ologn-time>

<http://lbv-pc.blogspot.com/2012/05/summing-up-powers.html>